Trials@uspto.gov
571-272-7822

Paper 11
Entered: November 7, 2024

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

AMAZON.COM, INC. and AMAZON.COM SERVICES LLC,
Petitioner,

v.

NOKIA TECHNOLOGIES OY,
Patent Owner.

IPR2024-00605
Patent 10,536,714 B2

Before JAMESON LEE, STEVEN M. AMUNDSON,
and JASON M. REPKO, *Administrative Patent Judges*.

LEE, *Administrative Patent Judge*.

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

I. INTRODUCTION

Amazon.com, Inc. and Amazon.com Services LLC ("Petitioner") filed a Petition requesting an *inter partes* review of claims 9–14, 23–28, and 30 ("challenged claims") of U.S. Patent No. 10,536,714 B2 (Ex. 1001, "the '714 patent"). Paper 3 ("Pet."). Nokia Technologies Oy ("Patent Owner") filed a Preliminary Response. Paper 8 ("Prelim. Resp."). Petitioner filed a Preliminary Reply. Paper 9 ("Prelim. Reply"). Patent Owner filed a Preliminary Sur-reply. Paper 10 ("Prelim. Sur-reply").

We have authority to determine whether to institute an *inter partes* review. *See* 35 U.S.C. § 314 (2018); 37 C.F.R. § 42.4(a) (2024). An *inter partes* review may not be instituted unless the information presented in the Petition "shows that there is a reasonable likelihood that the petitioner would prevail with respect to at least 1 of the claims challenged in the petition." 35 U.S.C.§ 314(a). The "reasonable likelihood" standard is "a higher standard than mere notice pleading" but "lower than the 'preponderance' standard to prevail in a final written decision." *Hulu, LLC v. Sound View Innovations, LLC*, IPR2018-01039, Paper 29 at 13 (PTAB Dec. 20, 2019) (precedential).

Upon consideration of the contentions and the evidence of record before us, we conclude Petitioner has shown a reasonable likelihood that it would prevail in establishing unpatentability of at least one challenged claim of the '714 patent. Accordingly, we institute an *inter partes* review of all challenged claims of the '714 patent on all grounds set forth in the Petition.

II. BACKGROUND

A. Real Parties in Interest

Petitioner identifies itself as real party in interest. Pet. 88. Patent Owner identifies itself as real party in interest. Paper 5, 2.

B. Related Matters

The parties each identify the following litigations as related to the ’714 patent:

Nokia Corp. et al. v. Amazon.com, Inc. et al., No. 1:23-cv-01232 (D. Del.);

Nokia Techs. Oy v. HP Inc., No. 1:23-cv-01237 (D. Del);

In the Matter of Certain Video Capable Electronic Devices, Including Computers, Streaming Devices, Televisions, and Components and Modules Thereof, Inv. No. 337-TA-1380 (USITC).

Pet. 88; Paper 5, 2.

Petitioner also has filed another petition against other claims in the ’714 patent. IPR2024-00604, Paper 3.

C. The ’714 Patent

The ’714 patent issued from Application No. 16/356,733, filed March 18, 2019, which claims priority to Provisional Application No. 61/555,703, filed November 4, 2011. Ex. 1001, codes (21), (22), (60).

The ’714 patent relates to encoding and decoding video information. Ex. 1001, code (57). Generally, video information may be encoded in two phases. *Id.* at 1:40–43. The ’714 patent describes:

> In the first phase, pixel values in a certain picture area or “block” are predicted. The pixel values can be predicted for example, by motion compensation mechanisms, which involve finding and indicating an area in one of the previously encoded video frames (or a later coded video frame) that corresponds closely to the block being coded. Additionally, pixel values can be predicted

> by spatial mechanisms which involve finding and indicating a spatial region relationship, for example by using pixel values around the block to be coded in a specific manner.
>
> Prediction approaches using image information from a previous (or a later) image can also be called as Inter prediction methods, and prediction approaches using image information within the same image can also be called as Intra prediction methods.
>
> The second phase is one of coding the error between the predicted block of pixels and the original block of pixels.

Id. at 1:43–59. The decoder reconstructs the output video by applying a prediction mechanism similar to that used by the encoder and by applying prediction error decoding to recover the prediction error signal. *Id.* at 2:4–11. "After applying pixel prediction and error decoding processes the decoder combines the prediction and the prediction error signals (the pixel values) to form the output video frame." *Id.* at 2:12–15.

The '714 patent introduces a method for generating a motion vector prediction list for an image block. Ex. 1001, 4:18–19. The motion prediction candidate list is constructed in a way that reduces complexity of list construction. *Id.* at 2:19–22. The method performs only a limited number of motion information comparisons between candidate pairs to remove redundant candidates rather than perform a comparison for every available candidate pair, to construct the motion prediction candidate list. *Id.* at 2:19–25. "The decision of whether comparing two candidates may depend on the order of the candidates to be considered for the list and/or coding/prediction mode and/or location of the blocks associated with the candidates." *Id.* at 4:26–30. By this method, a list of motion prediction candidates is created from which one of the candidates is to be signaled as the motion information for the current coding or prediction unit. *Id.* at 4:30–34.

Figure 9 of the ’714 patent is reproduced below:

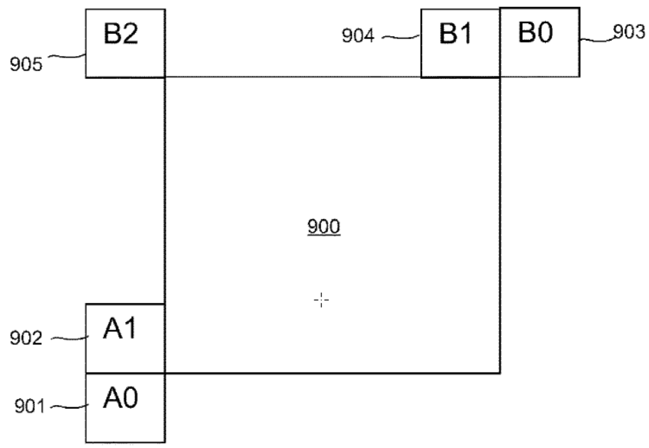


Fig. 9

Figure 9 illustrates an example of a coding unit and some neighboring blocks of the coding unit. Ex. 1001, 8:6–7. In this example the spatial motion prediction candidates are spatial neighboring blocks A0, A1, B0, B1, and B2. *Id.* at 14:64–65. These candidates for the current block being coded can be processed in a predetermined order, for example A1, B1, B0, A0, and B2. *Id.* at 15:15–16.

The ’714 patent describes that a coding unit may be vertically split into two rectangular prediction units or horizontally split into two rectangular prediction units. Ex. 1001, 15:50–16:5. Figures 11a and 11b are reproduced below:

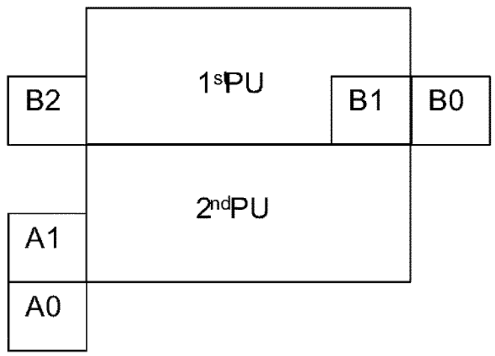


Fig. 11a

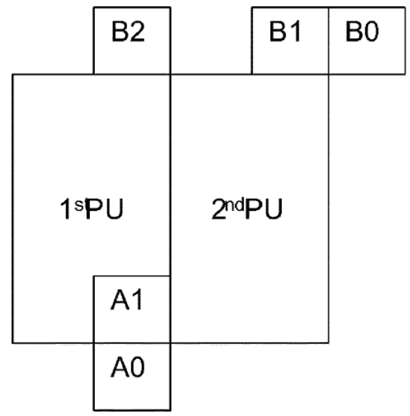


Fig. 11b

Figure 11a illustrates locations of five spatial neighbors A0, A1, B0, B1, and B2 for a prediction unit (PU) generated as the second prediction unit of a horizontally divided coding unit. Ex. 1001, 8:12–14. Figure 11b illustrates locations of five spatial neighbors for a prediction unit generated as the second prediction unit of a vertically divided coding unit. *Id.* at 8:15–17.

The ’714 patent describes that if the current coding unit is horizontally split into two rectangular prediction units and the current prediction unit is the second prediction unit in the coding/decoding order, then A1 is compared only with B1, and if A1 has the same motion information as B1, then A1 would not be included in the list being constructed. Ex. 1001, 15:61–16:1. In contrast, if the comparison indicates A1 does not have the same motion information as B1, then A1 would be included in the list as a spatial motion prediction candidate, assuming that the list does not already contain a maximum number of spatial motion prediction candidates. *Id.* at 15:18–29, 16:5–7.

The ’714 patent describes that if the current coding unit is horizontally split into two rectangular prediction units and the current prediction unit is the second prediction unit in the coding/decoding order, then B1 is not included in the list being constructed. Ex. 1001, 16:11–16. If the current coding unit is not horizontally split into two rectangular prediction units and if block B1 has the same motion information as block A1, then B1 is not included in the list. *Id.* at 16:16–21. Otherwise, B1 is included in the list as a spatial motion prediction candidate, assuming that the list does not already contain a maximum number of spatial motion prediction candidates. *Id.* at 15:18–29, 16:21–23.

The ’714 patent describes that if the spatial motion prediction candidate is block B0, then it is not included in the list if it has the same motion information as block B1. Ex. 1001, 16:24–27. The ’714 patent describes that, otherwise, if the number of spatial motion prediction candidates in the list is less than the maximum number of spatial motion prediction candidates, then block B0 is included in the list. *Id.* at 16:27–31.

The ’714 patent describes that if the spatial motion prediction candidate is block A0, then it is not included in the list if it has the same motion information as block A1. Ex. 1001, 16:32–35. The ’714 patent describes that, otherwise, if the number of spatial motion prediction candidates in the list is less than the maximum number of spatial motion prediction candidates, then block A0 is included in the list. *Id.* at 16:27–31.

The ’714 patent describes that if the spatial motion prediction candidate is block B2, then it is not included in the list if it has the same motion information as block A1. Ex. 1001, 16:45–49. The ’714 patent indicates that, otherwise, if the number of spatial motion prediction candidates in the list is less than the maximum number of spatial motion prediction candidates, then block B2 is included in the list. *See id.* at 15:22–29, 15:46–49.

Claims 9, 23, and 30 are independent. Claims 9 and 23 are representative and reproduced below:[1]

> 9. [pre] A method comprising:
>
> [a] selecting a first spatial motion vector prediction candidate from a set of spatial motion vector prediction candidates for an encoded block of pixels as a potential spatial motion vector prediction candidate to be included in a motion vector prediction list for a prediction unit of the encoded block of pixels, where the motion vector prediction list comprises motion information of the spatial motion vector prediction candidates;
>
> [b] determining a subset of spatial motion vector prediction candidates based on the location of the block associated with the first spatial motion vector prediction candidate;
>
> [c] comparing motion information of the first spatial motion vector prediction candidate with motion information of another spatial motion vector prediction candidate of the set of spatial motion vector prediction candidates without making a comparison of each possible candidate pair from the set of spatial motion vector prediction candidates;
>
> [d] determining to include or exclude the first spatial vector prediction candidate in the motion vector prediction list based on the comparing; and
>
> [e] selecting a spatial motion vector prediction candidate from the motion vector prediction list for use in decoding the encoded block of pixels, wherein the spatial motion vector prediction candidate is selected from the motion vector prediction list using information that was received identifying a respective spatial motion vector prediction candidate from the motion vector prediction list constructed by an encoder.

Ex. 1001, 33:17–48.

[1] The bracketed headings correspond to those used by Petitioner to reference the claim elements. *See* Pet. 63–74, 85–86. We use the same headings here for ease of reference, understanding, and consistency.

> 23. [pre] An apparatus comprising a processor and a memory including computer program code, the memory and the computer program code configured to, with the processor, cause the apparatus to:
>
> [a] select a first spatial motion vector candidate from a set of spatial motion vector prediction candidates for an encoded block of pixels as a potential spatial motion vector prediction candidate to be included in a motion vector prediction list for a prediction unit of the encoded block of pixels, where the motion vector prediction list comprises motion information of the spatial motion vector prediction candidates;
>
> [b] determine a subset of spatial motion vector prediction candidates based on the location of the block associated with the first spatial motion vector prediction candidate;
>
> [c] compare motion information of the first spatial motion vector prediction candidate with motion information of the spatial motion vector prediction candidate in the determined subset of spatial motion vector prediction candidates without making a comparison of each possible candidate pair from the set of spatial motion vector prediction candidates;
>
> [d] determine to include or exclude the first spatial motion vector prediction candidate in the motion vector prediction list based on comparison of the motion information of the first spatial motion vector candidate with motion information of the spatial motion vector prediction candidate; and
>
> [e] select a spatial motion vector prediction candidate from the motion vector prediction list for use in decoding the encoded block of pixels, wherein the spatial motion vector prediction candidate is selected from the motion vector prediction list using information that was received identifying a respective spatial motion vector prediction candidate from the motion vector prediction list constructed by an encoder.

Id. at 37:20–57.

D. *The Applied Prior Art and Declarations*

Petitioner relies on the following evidence:

Name	Patent Document/Publication	Exhibit
Rusert[2]	US Pat. Pub. No. 2011/0194609	1004
Karczewicz[3]	US Pat. Pub. No. 2011/0249721	1005
Lin[4]	US Pat. Pub. No. 2014/0092981	1006
Nakamura Document[5]	Nakamura et al., "Unification of derivation process for merge mode and MVP," Joint Collaborative Team on Video Coding (JCT-VC) of ITU-T SG16 WP3 and ISO/IEC JTC1/SC29/WG11, 6th Meeting, Torino, Italy, Jul. 14–22, 2011 (Document JCTVC-F419).	1007
Nakamura WD Description[6]	Nakamura et al., "WD Description of JCTVC-F419 Proposal 1" for "Unification of derivation process for merge mode and MVP," Joint Collaborative Team on Video Coding (JCT-VC) of ITU-T SG16 WP3 and ISO/IEC JTC1/SC29/WG11, 6th Meeting, Torino, Italy, Jul. 14–22, 2011 (Document JCTVC-F419).	1008
Nakamura Presentation[7]	Nakamura et al., "Unification of derivation process for merge mode and MVP," Joint Collaborative Team on Video Coding (JCT-VC) of ITU-T SG16 WP3 and ISO/IEC JTC1/SC29/WG11, 6th Meeting, Torino, Italy, Jul. 14–22, 2011 (Document JCTVC-F419).	1009
WD4	Bross et al., "WD4: Working Draft 4 of High-Efficiency Video Coding," Joint Collaborative Team on Video Coding (JCT-VC) of ITC-T SG16 WP3 and ISO/IEC JCT1/SC29/WG11, 6th Meeting: Torino, IT, Jul. 14–22, 2011 (Document JCTVC-F803).	1010

[2] Published August 11, 2011. Ex. 1004, code (43).
[3] Published October 13, 2011. Ex. 1005, code (43).
[4] Issued from Application No. 14/123,200, which claims priority to Provisional Application No. 61/500,903, filed June 24, 2011. Ex. 1006, codes (21), (60). Patent Owner does not dispute this priority date of Lin.
[5] Published July 2011.
[6] Published July 2011.
[7] Published July 2011.

Petitioner also relies on the Declaration of Charles D. Creusere, Ph.D. Ex. 1003. With regard to the status of Nakamura and WD4 as prior art printed publications, Petitioner additionally relies on the Declarations of Vivienne Sze, Ph.D. (Ex. 1014) and Clifford Reader, Ph.D. (Ex. 1050).[8] Patent Owner relies on the Declaration of Iain E. Richardson, Ph.D. (Ex. 2001).

E. The Asserted Grounds of Unpatentability

Petitioner asserts that the challenged claims of the ’714 patent are unpatentable based on the following grounds (Pet. 16):

Claims Challenged	35 U.S.C. §	Reference(s)/Basis
9, 10, 12–14, 23, 24, 26–28, 30	103(a)[9]	Rusert, Karczewicz
9–14, 23–28, 30	103(a)	Rusert, Karczewicz, Lin
9–14, 23–28, 30	103(a)	Nakamura,[10] WD4

[8] Patent Owner disputes that WD4 constitutes prior art as of the effective filing date of the ’714 patent. Prelim. Resp. 59–64. However, we need not reach the issue because, as discussed below, the alleged ground of unpatentability based on Nakamura and WD4 lacks sufficient substantive merit.

[9] The Leahy-Smith America Invents Act (“AIA”), Pub. L. No. 112–29, 125 Stat. 284, 287–88 (2011), amended 35 U.S.C. §§ 102 and 103. Because the ’714 patent claims priority to an application filed before March 16, 2013 (the effective date of the amendments), the pre-AIA version of § 103 applies.

[10] Petitioner uses the name “Nakamura” to refer to a collection of three files, i.e., the “Nakamura Document” (Ex. 1007), the “Nakamura WD Description” (Ex. 1008), and the “Nakamura Presentation” (Ex. 1009). Pet. 62–63. Petitioner asserts that “they were jointly presented in a single proposal, by the same author, packaged together in a single zip, and meant to be read together, teaching related aspects of Nakamura’s proposal.” *Id.*

III. ANALYSIS

A. Legal Standards

A claim is unpatentable under 35 U.S.C. § 103(a) "if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains." 35 U.S.C. § 103(a); *see 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) where in evidence, so-called secondary considerations of nonobviousness.[11] *See Graham v. John Deere Co.*, 383 U.S. 1, 17–18 (1966).

B. Level of Ordinary Skill in the Art

Citing testimony from Dr. Creusere, Petitioner asserts a person of ordinary skill in the art (hereinafter "POSITA") "would have had (1) a bachelor's degree in electrical engineering, computer engineering, computer science, or a comparable field of study such as physics, and (2) approximately two to three years of practical experience with video encoding/decoding." Pet. 21 (citing Ex. 1003 ¶¶ 57–59).

Patent Owner states that it "has applied Petitioner's POSITA for the sake of this Response." Prelim. Resp. 31.

On this record, we adopt Petitioner's statement of the level of ordinary skill in the art. It is supported by the testimony of Dr. Creusere and not

[11] The record does not include any evidence of secondary considerations of nonobviousness.

disputed by Patent Owner. Further, it appears consistent with what is reflected by the content of the applied prior art. *Cf. Okajima v. Bourdeau*, 261 F.3d 1350, 1354–55 (Fed. Cir. 2001) (the applied prior art may reflect an appropriate level of skill).

C. Claim Interpretation

We use the same claim construction standard that would be used to construe a claim 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). The claim construction standard set forth in *Phillips v. AWH Corp.*, 415 F.3d 1303 (Fed. Cir. 2005) (en banc) is applicable.

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 including expert and inventor testimony, dictionaries, and learned treatises, although extrinsic evidence is less significant than the intrinsic record. *Phillips*, 415 F.3d at 1312–17. Usually, the specification is dispositive, and it is the single best guide to the meaning of a disputed term. *Id.* at 1315.

The specification may reveal a special definition given to a claim term by the patentee, or the specification or prosecution history may reveal an intentional disclaimer or disavowal of claim scope by the inventor. *Id.* at 1316. "There are only two exceptions to this general rule: 1) when a patentee sets out a definition and acts as his own lexicographer, or 2) when the patentee disavows the full scope of a claim term either in the specification or during prosecution." *Thorner v. Sony Comput. Ent. Am. LLC*, 669 F.3d 1362, 1365 (Fed. Cir. 2012).

If an inventor acts as his or her own lexicographer, the definition must be set forth in the specification with reasonable clarity, deliberateness, and precision. *Renishaw PLC v. Marposs Societa' per Azioni*, 158 F.3d 1243, 1249 (Fed. Cir. 1998). The disavowal, if any, can be effectuated by language in the specification or the prosecution history. *Poly-Am., L.P. v. API Indus., Inc.*, 839 F.3d 1131, 1136 (Fed. Cir. 2016).

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

1. "spatial motion vector prediction candidate"

Petitioner construes the term "spatial motion vector prediction candidate" to mean "a candidate motion vector obtained from one or more previously-coded blocks in the current frame." Pet. 21. Because no dispute hinges on the meaning of this term, we do not find it necessary to construe this term expressly.

2. "subset of . . . candidates"

Petitioner construes the term "subset of . . . candidates" in limitation [9b] to mean a subset of one or more [spatial motion vector prediction] candidates. Pet. 22. Patent Owner does present any contrary position or argument. Because no dispute hinges on the meaning of this term, we do not find it necessary to construe this term expressly.

3. “the block”

Petitioner asserts:

> Limitation [9b] recites “*the* block,” which could be interpreted to refer to either (a) the “block of pixels” introduced in [9a], or (b) the block from which the first spatial motion vector candidate is obtained. During prosecution of the parent ’833 patent, the Examiner applied the first interpretation, with “the” block as the “current block” (Ex-1015, 000168), which the Applicant did not dispute (Ex-1015, 000241-244). For purposes of this IPR, Petitioner applies the Examiner’s interpretation, where “the block” finds antecedent basis in the “block of pixels” in [9a]. Ex-1003, ¶ 66.

Pet. 22.

Notably, Petitioner recognizes that there are two potential choices of what is referred to by “the block” in limitation [9b], one being the block of pixels recited in limitation [9a], i.e., the current block being processed, and the other being a block, not previously recited in the claim, but from which the first spatial motion vector candidate is obtained. Overlooked by Petitioner is that the words “the block” are a part of the bigger term “the block *associated with* the first spatial motion vector prediction candidate.” Ex. 1001, 33:28–30 (emphasis added).

That specific claim language of association indicates a relationship between “the block” and the first spatial motion vector prediction candidate, that is more than how every single prediction candidate broadly may be regarded in general as related to the current block being processed, the block for which a motion vector prediction list is being generated. The modifier “associated with the first spatial motion vector prediction candidate” clearly modifies “the block” at issue here and cannot be discarded or ignored.

Further, if “the block” refers to the block recited in limitation [9a], i.e., the current block being processed, then the modifying phrase "associated with the first spatial motion vector prediction candidate" would be superfluous and have no meaning, because "the block," without the modifying phrase, would already derive its antecedent basis from "a block of pixels" recited in limitation [9a]. We decline to adopt a construction that reads out "associated with the first spatial motion vector prediction candidate." Construing the claim according to what the claim language actually states, without excluding any part of the claim language recited, is more appropriate.

The Specification of the '714 patent is consistent with the plain reading of "the block associated with the first spatial motion vector prediction candidate." Each selected first candidate to evaluate for inclusion in a prediction list for the current block is compared with a subset of candidates associated with the first selected candidate. Ex. 1001, 15:18–29, 15:46–49, 16:1–49. Patent Owner correctly notes:

> The '714 patent makes clear that the candidate motion vectors for the current frame use either "one or more . . . neighbor blocks . . . of the current block in the same frame and/or co-located blocks . . . of the current block in one or more other frames[,]" i.e., *these are motion vectors associated with other blocks, rather than the current block*, to define a list of suitable motion vector candidates for the current block, as would be understood by a POSITA [person of ordinary skill in the art]. Ex-1001 at 12:51–56; Ex-2001 at 38.

Prelim. Resp. 50 (emphasis added) (alterations by Patent Owner). Patent Owner further correctly notes that if Petitioner's proposed construction is adopted, that would mean the "determining a subset" recitation of limitation [9b] is satisfied regardless of whether the location of the block is associated with a first spatial motion vector candidate, directly contrary to the recitation of limitation [9b]. We agree with Patent Owner that Petitioner's proposed construction improperly reads out the claim language “associated with the first spatial motion vector prediction candidate.” *Id.* at 51.

The reason Petitioner provided for its construction is that an Examiner had taken that interpretation during prosecution of a parent application of the ’714 patent. Pet. 22. However, Petitioner does not provide claim language that was construed in the parent application. Nor does Petitioner specifically compare that claim language with the claim language here. Even if the claim language is the same, that an Examiner had construed the language that way does not make it a proper construction if the Applicant did not dispute that construction during prosecution of the parent application. The Applicant might not have needed to present arguments in that regard to obtain allowance of its claims.

Claim construction is a question of law, and we are not bound by an earlier construction of an Examiner who applied a different standard for claim construction in a parent application for a similar claim term.

For the foregoing reasons, we disagree with Petitioner’s proposed construction of “the block” to mean “the block of pixels” in limitation [9a]. Rather, “the block” in limitation [9b] means “the block associated with the first spatial motion vector prediction candidate,” as limitation [9b] states.

D. Alleged Obviousness of Claims 9, 10, 12–14, 23, 24, 26–28, and 30 over Rusert and Karczewicz

1. Overview of Rusert (Exhibit 1004)

Rusert’s disclosure relates to a method of selecting predicted motion vector (PMV) candidates, a video coding apparatus, a video decoding apparatus, and a computer-readable medium. Ex. 1004 ¶ 1.

Figure 1 of Rusert is reproduced below:

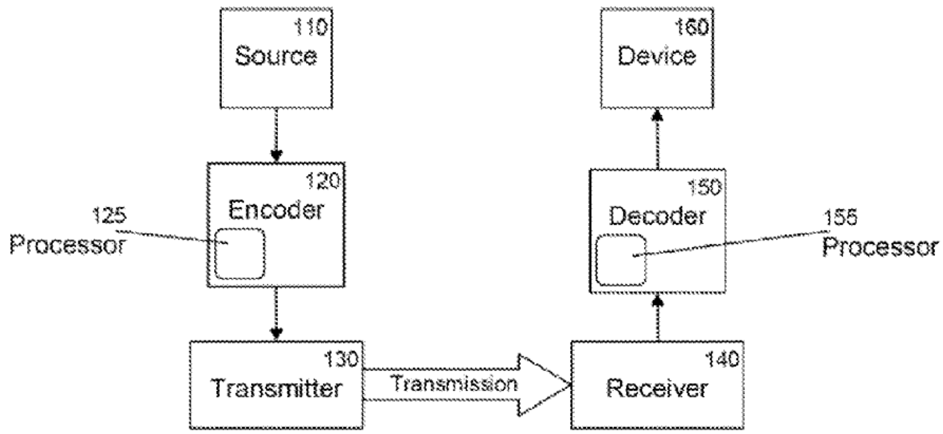


Fig. 1

Figure 1 illustrates a video coding and transmission system according to Rusert. Ex. 1004 ¶ 27.

In the illustrated coding system of Figure 1, a video signal from source 110 is ultimately delivered to device 160. Ex. 1004 ¶ 34. The video signal from source 110 is passed through encoder 120 containing processor 125. *Id.* Encoder 120 applies an encoding process to the video signal to create an encoded video stream, which is sent to transmitter 130. *Id.* Receiver 140 receives the transmitted encoded stream and passes it to decoder 150. *Id.* Decoder 150 contains processor 155 which is used to decode the encoded video stream. *Id.* The decoder outputs a decoded video stream to device 160.

Rusert describes:

> The methods disclosed herein are performed in the encoder during encoding, and also in the decoder during decoding. This is achieved even though the generation of the signaling bits is done in the encoder. During decoding the decoder parses the bits and mimics of the encoder in order to achieve encoder/decoder synchronization. Because the encoder and decoder follow the same rules for creating and modifying the set of PMV candidates, the respective lists of PMV candidates stored in the encoder and decoder maintain synchronization[.]

> Still, explicit signaling of PMV candidate lists may be performed under certain circumstances.
>
> The described method assume coding of a motion vector (MV) 210 using predictive coding techniques, where a predicted motion vector (PMV) 220 is used to predict a MV 210, and the prediction error or difference (DMV) 230 is found according to DMV=MV–PMV. DMV 230 is signaled from the encoder 120 to the decoder 150. Additionally, a code "index" 250 is sent to select a particular PMV candidate, in this case 242 from a list of PMV candidates, PMV_CANDS 240 as shown in FIG. 2a. The index 250 may be sent once together with each transmitted motion vector MV 210, i.e., per sub-block (e.g. 8x8 pixel block). Likewise, the index may be sent for groups of motion vectors, e.g. per macroblock (16x16 block).

Ex. 1004 ¶¶ 35–36. The list PMV_CANDS 240 is identically available at both the encoder and decoder. *Id.* ¶ 37. "Using the transmitted index, the decoder 150 can determine the PMV 220 as used in the encoder as shown in FIG. 2b, and thus may reconstruct MV= DMV+PMV." *Id.*

Rusert describes a method of selecting PMV candidates, wherein each PMV candidate corresponds to a motion vector used for coding of a previous block within an allowed distance from the current block. Ex. 1004 ¶ 11. The method comprises selecting a set of PMV candidates as a subset of the previously coded motion vectors that were used for previous blocks having an allowed distance from the current block. *Id.*

Rusert further describes:

> A PMV candidate list is created by selecting a subset of the motion vectors previously used for previous blocks. Restricting the previous blocks that are considered reduces the number of previous motion vectors that must be considered meaning that less computation is needed, improving the processor efficiency of the coding.

> Identifying allowed distance values means that certain distance values may not be allowed. These not allowed distance values result in skipped layers of blocks. The size of the PMV candidate list is limited because a very large list would require long code words to identify which PMV candidate to use[.] Skipping layers can provide increased coding efficiency by ensuring that not only the nearest neighbor previous blocks are considered, but also previous blocks. This allows a candidate list to be produced using motion vectors from a wide range of previous blocks, but that is not excessively long.

Ex. 1004 ¶¶ 12–13.

Rusert additionally describes:

> The PMV_CANDS list used for coding a motion vector associated with a current motion compensation block can be dynamically generated specifically for the current motion compensation block, i.e. without consideration of the PMV_CANDS lists used for coding of MVs associated with motion compensation blocks previously coded. In that case, before a block is processed, a PMV_CANDS list is initialized and then updated with a number of previously coded or predefined motion vectors.

Ex. 1004 ¶ 41.

Rusert also describes a way to reduce the number of candidates in the PMV_CANDS list:

> One measure for reducing the number of candidates is to avoid duplicate occurrences of the same motion vector in a given PMV_CANDS list. This ca[n] be done, when updating the list, by comparing the candidates already in the list with the new vector that could be added, and if a duplicate is found, either removing the duplicate vector or skipping the new vector. It is preferable to skip the new vector, otherwise a subsequent duplicate from a distant block may cause a candidate high in the order of the list to be put at the end of the list.

Ex. 1004 ¶ 71.

2. Overview of Karczewicz (Exhibit 1005)

Karczewicz discloses video coding techniques applicable to a coded block pattern of a coding unit (CU) of video data. Ex. 1005 ¶ 31. Karczewicz refers to a developing coding standard H.265 as follows:

> Efforts are currently in progress to develop a new video coding standard, currently referred to as High Efficiency Video Coding (HEVC). The emerging HEVC standard may sometimes be referred to as ITU-T H.265. The standardization efforts are based on a model of a video coding device referred to as the HEVC Test Model (HM).

Id. ¶ 32. Karczewicz states that "HM refers to a block of video data as a coding unit (CU)." *Id.* ¶ 33.

Karczewicz describes that a CU has a similar purpose as a macroblock in previous standard H.264, "except that a CU does not have the same size limitations associated with macroblocks." Ex. 1005 ¶ 33. Karczewicz also describes that "[s]yntax data within a bitstream may define a largest coding unit (LCU), which is a largest coding unit in terms of the number of pixels." *Id.*

Karczewicz describes that a CU may be split into sub-CUs, and that "[i]n general, references in this disclosure to a CU may refer to a LCU of a picture or a sub-CU of an LCU." Ex. 1005 ¶ 33. An LCU may be split into sub-CUs, and each sub-CU may be split into sub-CUs. *Id*. Karczewicz describes that a bitstream may also define a smallest coding unit (SCU). *Id.*

According to Karczewicz, a CU may be partitioned into one or more prediction units (PUs). Ex. 1005 ¶¶ 33, 35. "[A] CU may be broken into blocks, e.g., sub-CU and/or one or more PU or TU." *Id.* ¶ 41. In general, a PU represents all or a portion of the corresponding CU, and includes data for retrieving a reference sample for the PU. *Id.* ¶ 35. Karczewicz describes that "[d]ata for the CU defining the PU(s) may also describe, for example, partitioning of the CU into one or more PUs." *Id.* Karczewicz describes that "prediction operations may be performed using a PU based on a block size of PU." *Id.* ¶ 46. Further, Karczewicz describes that it uses the term "block" to refer to any one of LCU, SCU, CU, PU, or transform unit (TU). *Id.* ¶ 33.

3. Claim 9

a. Preamble recitation 9[pre]

The preamble recites: "A method comprising:" Ex. 1001, 33:17. Petitioner asserts that its "Ground 1 teaches [9pre]," citing Rusert's Abstract and paragraphs 1 and 11. Pet. 27. Patent Owner does not dispute the assertion. Petitioner sufficiently accounts for the preamble of claim 9, even assuming that the preamble is limiting.

b. Limitation 9[a]

Limitation 9[a] recites:

> selecting a first spatial motion vector prediction candidate from a set of spatial motion vector prediction candidates for an encoded block of pixels as a potential spatial motion vector prediction candidate to be included in a motion vector prediction list for a prediction unit of the encoded block of pixels, where the motion vector prediction list comprises motion information of the spatial motion vector prediction candidates;

Ex. 1001, 33:18–26.

To account for "selecting a first spatial motion vector prediction candidate from a set of spatial motion vector prediction candidates for an encoded block of pixels," Petitioner explains: "Rusert teaches 'selecting . . . PMV [prediction motion vector] candidates' for a current block from a '*set* of previously coded motion vectors that were used for previous blocks.'"

Pet. 27 (citing Ex. 1004 ¶¶ 11–12, 15, 24–25, 39, 44, 51–66, 113, Fig. 6) (emphasis added, first alteration by Petitioner).

Petitioner further explains: "As Rusert iterates through blocks of pixels in a frame, each block will have its own unique set of previously-coded motion vectors from which to select a PMV candidate because after a block is encoded/decoded, the set of previously-coded motion vectors increases." Pet. 27–28 (citing Ex. 1004 ¶¶ 2, 11–12, 36, 59, Fig. 3g; Ex. 1003 ¶¶ 102, 104). Petitioner further explains: "Rusert's predicted motion vector ('PMV') (Ex-1004, ¶3) candidates comprise spatial motion vector prediction candidates obtained from previously-encoded blocks in the current frame," include spatially neighboring motion vectors, and are included in "PMV_CANDS, which 'comprise[s] *spatial* . . . *neighbors* of the current block' in the current frame." *Id.* at 28–29 (citing Ex. 1004 ¶¶ 4–6, 67; Ex. 1003 ¶ 103) (alterations by Petitioner).

Patent Owner does not dispute these assertions. Petitioner's assertions are supported by the cited evidence. Petitioner sufficiently accounts for this portion of limitation 9[a]: "selecting a first spatial motion vector prediction candidate from set of spatial motion vector prediction candidates for an encoded block of pixels."

Regarding the portion of limitation 9[a] that states "[selecting a first . . . candidate . . .] as a potential spatial motion vector prediction candidate to be included in a motion vector prediction list for a prediction unit of the encoded block of pixels," Petitioner explains that Rusert teaches search patterns for an outwards going scan around the current block for "selecting PMV candidates to potentially be included in PMV_CANDS." Pet. 29 (citing Ex. 1004 ¶¶ 44, 51–56, Figs. 3a–3n ("showing numerical scan order around current block '.' from block 1 onwards"). *Id.* Petitioner presents on page 29 of the Petition the following annotated Figure 3n of Rusert:

Fig. 3n

Annotated Figure 3n illustrates a possible scan pattern and distance measurements for a plurality of blocks surrounding a current block, to which Petitioner has added directional scanning order in red. *Id.* at 29; Ex. 1004 ¶ 30.

Petitioner explains that following the search pattern sequences, of which Figure 3n is an example, Rusert visits a previously coded block and selects the motion vector for that block as a candidate for potential inclusion in PMV_CANDS. Pet. 29–30 (citing Ex. 1004 ¶¶ 44, 51–56; Ex. 1003 ¶ 107). Petitioner further explains:

> PMV_CANDS is a **motion vector prediction list for a prediction unit of the block of pixels**. It is a list of predicted motion vectors "used for coding a motion vector associated with

> a current . . . block." Ex-1004, ¶41, ¶4, ¶¶39–42. PMV_CANDS is "dynamically generated specifically for the current . . . block[.]" EX-1004, ¶41. "[B]efore a block is processed, a PMV_CANDS list is initialized and then updated with . . . motion vectors." *Id.* When PMV_CANDS is updated, i.e., when "one or more motion vectors are added" (Ex-1004, ¶39), it comprises a subset of the set of previously-coded motion vectors that have been included in PMV_CANDS to that point. Ex-1004, ¶¶4-5, ¶¶36–39, ¶¶43–44, ¶¶51–66. When PMV_CANDS is complete, a "predicted motion vector (PMV) that "is used to predict a [motion vector]. . . is signaled" using an index "to select a particular PMV candidate . . . from PMV_CANDS[.]" Ex-1004, ¶36; Ex-1003, ¶108.
>
> *The prediction unit of Rusert's encoded block of pixels is the encoded block itself* because that is the unit for which a motion vector is assigned for motion prediction. Ex-1004, ¶¶2–4, ¶43. Rusert provides a motion vector for each "8X8 pixel block," also called a "sub-block" because it is a portion of a "macroblock." Ex-1004, ¶36. Rusert scans neighboring blocks because motion vectors are assigned based on encoded blocks, which are the PUs in Rusert's teachings. *See* Ex-1004, ¶¶50–67, Figs. 3a-3n; Ex-1003, ¶109.

Pet. 30–31 (emphasis added, alterations by Petitioner).

Patent Owner does not dispute these assertions. Petitioner's assertions are supported by the cited evidence. Petitioner sufficiently accounts for this portion of limitation 9[a]: "[selecting a first . . . candidate . . .] as a potential spatial motion vector prediction candidate to be included in a motion vector prediction list for a prediction unit of the encoded block of pixels."

Alternatively, Petitioner relies on Karczewicz to account for a "prediction unit." Pet. 31–32. Petitioner explains:

> Additionally, Ground 1 combines Rusert's "block" teaching (following H.264 terminology) to PUs (in H.265 terminology). *Supra* §VI.A.1; Ex-1004, 116. As Karczewicz explains, H.265 introduced terminology for a type of block called

> "prediction unit[s.]" Ex-1005, ¶¶33-36; *supra* §I. "In general, a CU has a similar purpose to a macroblock of H.264" (Ex-1005, ¶33), which in its simplest case is commensurate with a PU but may also be divided into multiple PUs. Ex-1005, ¶35. "[T]he PU may include data defining a motion vector for the PU" that is used for "prediction using a PU[.]" Ex-1005, ¶¶35-36, ¶66; Ex-1003, ¶¶110-111. In short, Karczewicz explains that H.265 assigned motion vectors based on a type of block called a PU. Ex-1005, ¶¶33-36, ¶64. Rusert explained its teachings based on the blocks for which motion vectors were assigned (Ex-1004, ¶¶2-5, ¶36, ¶43). Both Karczewicz and Rusert teach the encoder and decoder use "reciprocal. . . techniques[,] which confirms these teachings are applicable to both encoding and decoding. Ex-1005, ¶50; Ex-1004, ¶35, ¶¶24-25. Therefore, it would have been obvious to apply Rusert's teachings to PUs, with PMV_CANDS being a motion vector prediction list for a PU of the encoded block of pixels. Ex-1005, ¶¶33-36, ¶66; Ex-1003, ¶110-112.
>
> A decoder using PMV_CANDS for decoding an encoded block of pixels would "follow the same rules" as the encoder that encoded the block of pixels to "maintain synchronization" of "the respective lists of PMV candidates stored in the encoder and decoder[.]" Ex-1004, ¶35, ¶¶24-25; Ex-1003, ¶112.

Id. (alterations by Petitioner). These assertions are supported by the cited evidence and not disputed by Patent Owner.

Regarding motivation to combine the teachings of Rusert and Karczewicz, and reasonable expectation of success, Petitioner presents cogent reasoning on pages 23–27 of the Petition.

Petitioner asserts that in light of Karczewicz's teachings about H.265, "[a] POSITA would have been motivated to apply Rusert's teachings to H.265 PUs." Pet. 23. Petitioner explains:

> Rusert does not itself use H.265 terminology. Nonetheless, Rusert explains that, while its examples were "given in the context of H.264/AVC, the principles disclosed

> herein can also be applied to . . . other coding standard[s], and indeed any coding system which uses predicted motion vectors." Ex-1004, ¶116. Karczewicz teaches the concept of PUs in H.265, which was emerging as the successor standard to H.264—both were drafted by ITU-T—sharing the same concepts of block-based video encoding with predicted motion vectors. Ex-1005, ¶32, ¶¶35-37, ¶66, ¶71; Ex-1006, ¶5. Karczewicz teaches H.265 concepts including PUs. Therefore, the art provides express motivation to apply Rusert's teachings to other standards including H.265, as taught by Karczewicz. Ex-1003, ¶¶71-74.
>
> This would have combined prior art elements according to known methods to yield predictable results, e.g., combining Rusert's teachings for generating/de-duplicating MVP candidate lists with H.265 concepts, including PUs and related information for motion vectors. In Rusert's H.264 examples, motion vectors and motion prediction operate on blocks. Ex-1004, ¶¶2-5, ¶36, ¶43. As Karczewicz explains, for H.265 drafts, motion vectors and motion prediction operated on blocks called PUs. Ex-1005, ¶¶33-36, ¶¶64-66. Karczewicz also teaches types of information conveyed by motion vectors. Ex-1005, ¶35. A POSITA would have been motivated to apply Rusert's known techniques for selecting PMV candidates to PUs, to improve the similar draft H.265 standard in the same way that Rusert explained for H.264. This application would have been a simple substitution of Karczewicz's PU teachings for Rusert's block teachings, which would have yielded several advantages, including improved coding efficiency as taught by both references. Ex-1004, ¶7; Ex-1005, ¶6; Ex-1003, ¶¶75-79.

Id. at 23–24.

Regarding predictable results, Petitioner asserts:

> The combination would have had predictable results. Rusert already applies its teachings to block-based encoding/decoding. Ex-1004, ¶2, ¶11. A PU is a type of block. Ex-1005, ¶35. Rusert's concepts were readily applicable to PUs, and the combination would have had the predictable result of selecting PMV candidates (as Rusert teaches) for PUs (as Karczewicz teaches). Ex-1004, ¶116; Ex-1003, ¶83. Therefore, the combination would not have changed the principle of

> operation for Rusert or Karczewicz because it applies their teachings in the manner taught by each. Applying H.265 teachings to Rusert, and vice versa, was consistent with Rusert's statement that its principles are applicable to other standards. Ex-1004, ¶116; Ex-1003, ¶84.

Pet. 25.

Regarding reasonable expectation of success, Petitioner asserts:

> A POSITA would have had a reasonable expectation of success combining Rusert and Karczewicz. As explained above, the combination applies teachings according to their known purposes, in a conventional manner. The teachings are complementary aspects of block-based video encoding from H.264 and H.265. Ex-1004, ¶116. Karczewicz complements Rusert by teaching terminology and concepts from H.265. Ex-1005, ¶32. Ground 1 does not modify Rusert or Karczewicz in a way that would render either inoperative. To the contrary, the similarities of the architectures would have given a POSITA a reasonable expectation of success in combining their teachings. Ex-1004, ¶11; Ex-1005, ¶2; Ex-1003, ¶¶85-86.

Pet. 26.

Petitioner's assertions regarding motivation to combine, predictable results, and reasonable expectation of success are supported by the cited evidence and not disputed by Patent Owner. We are sufficiently persuaded that the teachings of Rusert and Karczewicz properly may be combined in the manner proposed by Petitioner.

Regarding the portion of limitation 9[a] that states "where the motion vector prediction list comprises motion information of the spatial motion vector prediction candidates," Petitioner explains:

> PMV_CANDS is a "list of PMV candidates." Ex-1004, ¶37. Each candidate is a motion vector (Ex-1004, ¶11, ¶¶24-25, ¶¶39-41) including "x and y components" (Ex-1004, ¶106, ¶36, ¶¶91-94, ¶100). Therefore, Rusert's PMV_CANDS includes motion information, including motion vectors and their x and y

> components, of the PMV candidates. Ex-1004, ¶¶2-3; Ex-1003, ¶113.
>
> Additionally, Karczewicz teaches "the PU may include data defining a motion vector[,]" which includes "a horizontal component" (e.g., x-component), "a vertical component" (e.g., y-component), "a resolution. . . , a reference frame . . . and/or a reference list[.]" Ex-1005, ¶35. It would have been obvious to include this PU information in PMV_CANDS because the combination relies on Karczewicz's PU teachings. *Supra* §VI.A.1; Ex-1003, ¶¶114-115.

Pet. 32 (alterations by Petitioner).

Petitioner's assertions are supported by the cited evidence and not disputed by Patent Owner. Petitioner sufficiently accounts for this portion of limitation 9[a]: "where the motion vector prediction list comprises motion information of the spatial motion vector prediction candidates."

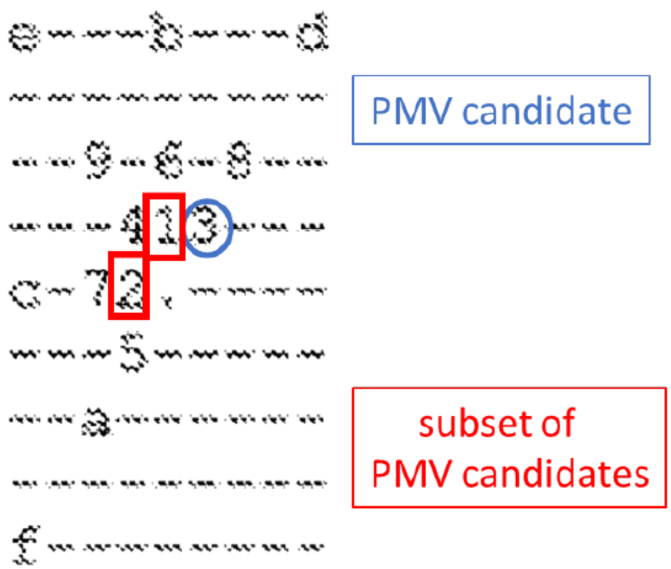
For the foregoing reasons, Petitioner sufficiently has shown that Rusert discloses limitation 9[a] and that Rusert and Karczewicz as combined by Petitioner also discloses limitation 9[a].

c. Limitation 9[b]

Limitation 9[b] recites: "determining a subset of spatial motion vector prediction candidates based on the location of the block associated with the first spatial motion vector prediction candidate." Ex. 1001, 33:27–30.

Petitioner asserts that Rusert selects a set of PMV candidates as a "subset" of the set of previously coded motion vectors that were used for previous blocks, and that the subset members have an allowed distance from the current block and an allowed position. Pet. 33 (citing Ex. 1004 ¶¶ 11–12, 15, 24–25, 37, Figs. 2a–2b; Ex. 1003 ¶¶ 117–118).

Regarding "determining a subset of spatial motion vector prediction candidates," Petitioner explains:

> Rusert implements the subset of PMV candidates using an outward scan of blocks having previously-coded motion vectors, starting from the current block and staying within an allowed distance. Ex-1004, ¶¶4-5, ¶¶36-39, ¶¶43-44, ¶¶51-66. As the scan progresses outwards, the subset includes the previously-coded PMV candidates obtained from blocks in previous locations of Rusert's scan. Ex-1004, ¶44, ¶¶51-66, Figs. 3a-3n. For example when the selected first spatial motion vector prediction candidate is obtained from the third block in Rusert's scan sequence, the subset of spatial motion vector prediction candidates comprises the candidates from previous scan locations (the first and second blocks). *Id.*
>
> 
>
>
> Fig. 3n
>
> [The figure is an annotated version of Rusert's Figure 3n (a scan pattern around the current block), in which the subset of PMV candidates is identified in red and the selected first PMV candidate is identified in blue]
>
> Ex-1003, ¶¶119-120.

Pet. 33–34. Petitioner further explains:

> Additionally, Rusert terminates the scan "as soon as a predefined number of unique PMV candidates have been

> found." Ex-1004, ¶48. Even PMV candidates that are within "a certain distance" and part of "a predetermined scan pattern" are not considered if the "pre-defined number of unique PMV candidates have been found." Ex-1004, ¶¶44-49. Rusert improves coding efficiency by using subsets. Ex-1004, ¶¶12-13. Therefore, Rusert's scan of previously-coded motion vectors is further cabined into a subset because it is limited to this predefined number of PMV candidates.

Id. at 34. Petitioner asserts: "As the scan progresses outwards and the subset of PMV candidates is updated, the subset is stored as a list of PMV candidates called PMV_CANDS." *Id.* at 35 (citing Ex. 1004 ¶¶ 37–41, 44–49, 51–66).

Regarding the "based on the location of the block associated with the first spatial motion vector prediction candidate" requirement of limitation 9[b], Petitioner explains:

> Here, "the block" refers to the "block of pixels" in [9a] and therefore refers to the current block for which candidates are being analyzed,. Supra §V.B. Because the subset of PMV candidates is based on "an outwards going scan . . . around the current block" (Ex-1004, ¶¶43-44), the subset of blocks that are scanned and the corresponding subset of spatial motion vector prediction candidates from those blocks are based on the location of the current block. Ex-1004, ¶44; Ex-1003, ¶¶122-123.
>
> Furthermore, the subset of PMV candidates is based on "an allowed distance from the current block and an allowed position." Ex-1004, ¶15, ¶¶11-13, ¶17, ¶¶24-25, ¶113, Fig. 6. The distance and position are relative to and therefore based on the location of the current block. Ex-1004, ¶¶11-17, ¶¶24-25, ¶¶43-44, ¶¶51-56, Figs. 3a-3n.

Pet. 35–36. Petitioner further explains: "Only candidates from blocks with allowed positions relative to the current block are included. Ex-1004, ¶¶15-16, ¶59 (excluding 'blocks to the right and below the current block'), ¶65; Ex-1003, ¶¶124-126." *Id.* at 36.

The above-quoted explanations of Petitioner on why Rusert discloses the "based on the location of the block associated with the first spatial motion vector prediction candidate" requirement of limitation 9[b] are unpersuasive because, as we determined above, "the block associated with the first spatial motion vector prediction candidate" language does not refer to the current block as Petitioner contends. Rather, it refers to the block with which the first selected spatial motion vector prediction candidate is associated, which in the example provided by Petitioner would be block 3.

However, Petitioner presents an alternative contention, in case we disagree with its primary position noted above. Pet. 36–37. The alternative contention is as follows:

> Even if "the" block was the block from which the selected first candidate is obtained, Rusert also teaches this. §V.B. A "position" of a block of a PMV candidate is represented as (xpos, ypos), i.e., a location of the block associated with the first spatial motion vector prediction candidate. Ex-1004, ¶¶51-52. Based on the block's location, the subset of PMV candidates with which the PMV candidate is compared includes the candidates of blocks located in the scan pattern up to the PMV candidate. Ex-1004, ¶44. For example, in Fig. 3n, the PMV candidate for block "3" is compared with a subset of PMV candidates for blocks "1" and "2." Ex-1004, ¶44, ¶¶65-66, Fig. 3n:

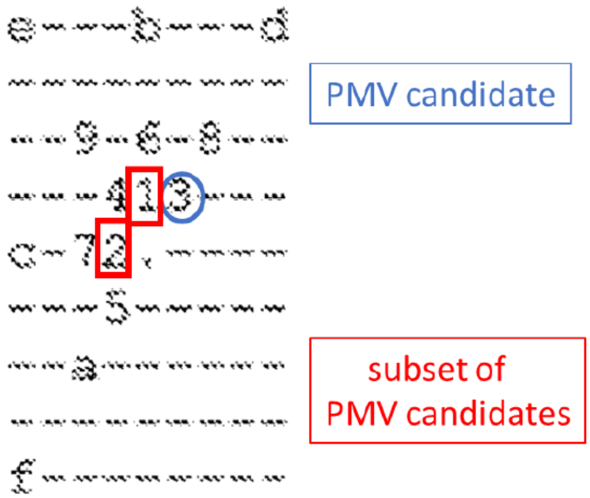


Fig. 3n

[The figure is an annotated version of Rusert's Figure 3n (a scan pattern around the current block), in which the subset of PMV candidates is identified in red and the selected first PMV candidate is identified in blue]

Ex-1003, ¶ 127.

Pet, 36–37.

Notwithstanding Patent Owner's argument to the contrary (Prelim. Resp. 51–52), we are persuaded by Petitioner's alternative contention. Patent Owner argues:

> But, unlike the '714 Patent, the subset (subset of PMV candidates for blocks "1" and "2") does not actually depend in any way on the location of the first candidate (PMV candidate for block "3"). Under Rusert's method, the list of candidates (1, 2, 3, 4, etc.) is always constructed according to the same rules and the same order. Ex-1004. For example, when candidate 3 is reached, it will always be compared with 1 and 2, regardless of the location of the first candidate. Ex-2001 at 39-40.

Prelim. Resp. 51–52. Patent Owner asserts:

> [A[t the time that neighboring block 2 has finished being considered, the content of PMV_CANDS for block 3 is already

> known: it will be the set of candidates 1 and 2 (assuming that 1 and 2 are dissimilar). The location of, and indeed any information related to, block 3 is irrelevant to the contents of PMV_CANDS at the time that block 3 is under consideration. Ex-2001 at 45.

Id. at 57–58. Patent Owner further asserts:

> [R]ather than being based on the location of a PMV candidate under consideration, the set of PMV candidates used for comparison in Rusert is determined based on the value of each PMV candidate that has already been considered and added to the list. Ex-1004. If candidate 3 is compared to candidates 1 and 2, this is not because candidate 3 is located in the top right, but because candidates 1 and 2 are dissimilar and thus neither is excluded from being added to PMV_CANDS. *See* 1004 at ¶¶ 70-72; Ex-2001 at 45.

Id. at 58.

Patent Owner's argument is misplaced and misunderstands Petitioner's position. The first selected spatial motion vector prediction candidate is not restricted to the third block in the scanning sequence. It can be any block along the outwardly expanding spiraling path.

Petitioner is correct that the determined subset depends on the location of the first selected spatial motion vector prediction candidate. For example, if the first selected candidate is at the location of block 5, then the subset would be the four members 1, 2, 3, and 4, and if the first selected candidate is at the location of block 3, then the subset would be the two members 1 and 2. Thus, the members of the determined subset depend on the location of the block associated with the first selected spatial motion vector prediction candidate as Petitioner contends.

For the foregoing reasons, petitioner sufficiently has shown that Rusert discloses limitation 9[b].

d. Limitation 9[c]

Limitation 9[c] recites:

> comparing motion information of the first spatial motion vector prediction candidate with motion information of another spatial motion vector prediction candidate of the set of spatial motion vector prediction candidates without making a comparison of each possible pair from the set of spatial motion vector prediction candidates;

Ex. 1001, 33:31–37.

Petitioner identifies three such comparisons disclosed by Rusert. Pet. 40–41. Petitioner explains:

> First, Rusert compares whether "the PMV candidate is a duplicate of *another* PMV candidate" in the subset of PMV candidates, which is stored as a list in PMV_CANDS. Ex-1004, ¶21, ¶71. "This ca[n] be done, when updating the list, by comparing the candidates already in the list with the new vector that could be added, and if a duplicate is found. . . [i]t is preferable to skip the new vector" thus "reducing the number of candidates[.]" Ex-1004, ¶71, ¶62. A potential PMV candidate is selected and compared with each PMV candidate in the subset of preceding PMV candidates in Rusert's scan sequence, which are stored in PMV_CANDS. *Supra* §VI.A.2[9b]. If the x and y components of two motion vectors are the same, they are duplicates and the potential candidate is excluded. *Id.*; Ex-1003, ¶131.
>
> Second, Rusert compares whether "the PMV candidate is . . . within a threshold distance of an existing PMV candidate" in the subset of candidates stored in PMV_CANDS, e.g., using "a similarity measure" such as Euclidean distance to calculate whether the difference between the x and y components of their motion vectors is "smaller than a pre-defined threshold"; if so, the potential candidate is removed/skipped. Ex-1004, ¶21, ¶72, ¶87. The distance between duplicate PMV candidates is zero. Ex-1003, ¶132, ¶132n.4.
>
> Third, Rusert compares whether "at least one alternative PMV candidate will allow motion vectors to be coded using

> fewer bits" (Ex-1004, ¶21) thereby "removing PMV candidates" that "will never be used" because another PMV candidate in the subset stored in PMV_CANDS facilitates "a bit sequence that is shorter or of the same length compared for all possible motion vectors." Ex-1004, ¶¶90-94. When the x and y values of an existing candidate's motion vector can be added to the x and y values of a difference motion vector ("DMV") to yield the x and y values of the selected candidate while using fewer overall bits, Rusert excludes the selected candidate. Ex-1004, ¶95 (teaching exemplary PMV/DMV combinations requiring fewer bits); Ex-1003, ¶¶133-134.

Pet. 38–39 (footnote omitted) (alterations by Petitioner). Petitioner further explains:

> All three teachings compare a potential candidate with at least one other candidate from the subset of preceding candidates in Rusert's scan sequence. Since preceding candidates have smaller index values, they would be signaled more efficiently than later duplicates, and Rusert improves efficiency by determining this subset and comparing potential new candidates to the subset. Ex-1004, ¶¶88-98; Ex-1003, ¶135.

Id. at 39.

Petitioner's assertions are supported by the cited evidence and not disputed by Patent Owner. Petitioner sufficiently accounts for limitation 9[c].

e. Limitation 9[d]

Limitation 9[d] reads: "determining to include or exclude the first spatial motion vector prediction candidate in the motion vector prediction list based on the comparing." Ex. 1001, 33:38–40.

Petitioner explains:

> As explained above, Rusert determines whether to include or exclude the selected first PMV candidate in PMV_CANDS, which stores the subset of PMV candidates based on each of the three comparisons explained for [9c]. Rusert removes

> "unnecessary PMV candidates" to "ensure[] the length of the [PMV_CANDS] list is not unnecessarily long, which would reduce coding efficiency." Ex-1004, ¶¶20–21. Rusert explains that "[a] PMV candidate *may be determined to be unnecessary*" and be therefore excluded if at least one of the three comparisons is fulfilled. Ex-1004, ¶21; *supra* § VI.A.2[9c]. "Unnecessary PMV candidates are removed . . . because it may happen that some candidates in the list will never be used." Ex-1004, ¶90. A shorter PMV_CANDS "allows the remaining PMV candidates to be signaled using shorter codes and so fewer bits[.]" Ex-1004, ¶22, ¶90; Ex-1003, ¶¶143-144.
>
> Rusert excludes unnecessary candidates when deciding whether to add a new candidate to the subset of PMV candidates stored in PMV_CANDS. Ex-1004, ¶21, ¶¶71-72; *supra* §VI.A.2[19c]. As part of the "update" process whereby new candidates are added, Rusert determines whether a selected PMV candidate should be included or skipped, meaning it is excluded based on any of the three comparisons from [9c]. Ex-1004, ¶¶71-72. Additionally, this would have been obvious because Rusert teaches the advantages of reducing the number of candidates in PMV_CANDS using the three comparisons from [9c] (Ex-1004, ¶12, ¶21, ¶70, ¶84, ¶90), and the natural time to perform the comparisons would have been when evaluating whether or not to add a candidate to the subset of PMV candidates stored in PMV_CANDS. As Rusert teaches, performing this check when PMV_CANDS is updated will prevent "unnecessary" candidates from being added, "because it may happen that some candidates . . . will never be used[.]" Ex-1004, ¶90; Ex-100[3], ¶145.

Pet. 42–43 (alterations by Petitioner).

These assertions are supported by the cited evidence and not disputed by Patent Owner. Petitioner sufficiently has shown that Rusert discloses limitation 9[d].

f. Limitation 9[e]

Limitation 9[e] recites:

> selecting a spatial motion vector prediction candidate from the motion vector prediction list for use in decoding the encoded

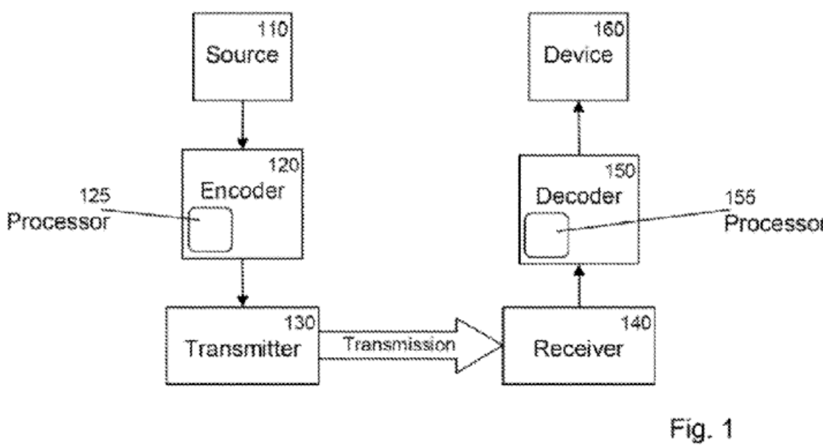
> block of pixels, wherein the spatial motion prediction candidate is selected from the motion vector prediction list using information that was received identifying a respective spatial motion vector prediction candidate from the motion vector prediction list constructed by an encoder.

Ex. 1001, 33:41–48.

Petitioner explains:

> Rusert teaches "a code 'index' . . . to select a particular PMV candidate . . . from . . . PMV_CANDS" and "[u]sing the transmitted index" to "determine the PMV" and reconstruct the motion vector. Ex-1004, ¶¶36–37. These techniques are "for video decoding . . . the current block[.]" Ex-1004, ¶23,¶35. The current block is in an "encoded video stream" that is "passe[d] to a decoder . . . employed in decoding the encoded video stream." Ex-1004, ¶34; Ex-1003, ¶148.

Pet. 44 (alterations by Petitioner). Petitioner further explains:

> Rusert teaches "a particular PMV candidate" is selected "from a list of PMV candidates, PMV_CANDS[,]" using "a code 'index'" sent "from the encoder" and received by the decoder. Ex-1004, ¶¶36-37, Fig. 1:
>
> 
>
>
> [Figure 1 illustrates a video coding and transmission system according to Rusert. Ex. 1004 ¶ 27.]
>
> The received index is information that identifies a respective PMV candidate from PMV_CANDS by pointing to a particular candidate based on its position in PMV_CANDS. In this way,

> it is an index into PMV_CANDS. Rusert teaches zero-based indexing examples, starting with zero for the first candidate and ending with n-1 for a list of n candidates. Ex-1004, ¶¶88-95; Ex-1003, ¶149.
>
> PMC_CANDS is constructed by an encoder, and the decoder "mimics the encoder" to construct the same PMV_CANDS. Ex-1004, ¶¶35-39. From PMV_CANDS. the decoder uses the index "signaled from the encoder" to "select a particular PMV candidate[.]" Ex-1004, ¶36. "Using the transmitted index, the decoder . . . can determine the PMV 220" to "reconstruct [the motion vector.]" Ex-1004, ¶27.

Pet. 44–45 (alteration by Petitioner).

These assertions are supported by the cited evidence and not disputed by Patent Owner. Petitioner sufficiently has shown that Rusert discloses limitation 9[e].

g. Patent Owner's Assertion that Petitioner Improperly Equates Prediction List and Subset

Patent Owner asserts that Petitioner improperly "relies on the same evidence in Rusert to show both the 'motion vector prediction list' limitation and the 'subset' limitation" recited in claim 9. Prelim. Resp. 47. Patent Owner explains its argument as follows:

> In order to show the limitation "motion vector prediction list," Petitioner relies on the "PMV_CANDS" list of Rusert, asserting that "Rusert's PMV_CANDS is the claimed 'motion vector prediction list.'" Pet. 30. At the same time, however, Petitioner relies on Rusert's "PMV_CANDS" in order to show the "subset" limitation. *Id.* at 35. Petitioner further contends that "the subset is stored as a list of PMV candidates called PMV_CANDS." Pet. at 37; Ex-2001 at 36-37.

Id. at 47–48. According to Patent Owner, Petitioner's meeting both the "motion vector prediction list" and the "subset of spatial motion vector prediction candidates" by the same structure PMV_CANDS "renders these distinct claim elements functionally meaningless." *Id.* at 48. In essence, Patent Owner's argument is that the "subset" corresponds to motion vector prediction candidates with which a selected candidate is compared to determine whether the selected candidate should be included in the prediction list, and thus the subset and the prediction list cannot be the same. *See id.* at 49 ("The subset cannot, therefore, be the distinct 'motion vector prediction list' being constructed").

Patent Owner's argument has facial appeal but does not withstand closer scrutiny. It is misplaced in the context of Rusert's parameter PMV_CANDS.

PMV_CANDS is a name for a variable and its content changes dynamically during the prediction list building process, as explained by Petitioner in the context of various limitations of claim 9 as discussed above. At the end of the dynamic process for constructing a prediction list, PMV_CANDS holds the complete prediction list. During the list building process, PMV_CANDS holds those candidates which have been determined to be included, thus far, in the prediction list, and those members constitute the subset with which a selected candidate being evaluated for inclusion in the prediction list is compared. The subset gets larger, incrementally, as more candidates are determined for inclusion in the prediction list.

There is no conflict or inconsistency in Petitioner's referring to PMV_CANDS as the "subset" and also as the "prediction list," given the dynamic process of constructing a prediction list by comparing a candidate being evaluated with candidates which have already been determined as good for inclusion in the list. At the end of the list construction process, PMV_CANDS holds all members of the prediction list. Prior to the end of the list construction process, PMV_CANDS holds the claimed subset.

h. Preliminary Conclusion for Claim 9

Petitioner has shown a reasonable likelihood that it would prevail in establishing the obviousness of claim 9 over Rusert and Karczewicz.

4. Dependent Claims 10 and 12–14

Claims 10 and 12–14 each depend, directly or indirectly, from claim 9. Ex. 1001, 31:51–61, 32:1–33:16. Petitioner addresses claims 10 and 12–14 on pages 46–47 and 52–59 of the Petition. Pet. 46–47, 52–59. Petitioner's assertions are supported by the cited evidence and also not disputed by Patent Owner. We have already addressed, above, Patent Owner's argument directed to Petitioner's alternative argument regarding limitation 9[b].

Petitioner has shown a reasonable likelihood that it would prevail in establishing obviousness of claims 10 and 12–14 over Rusert and Karczewicz.

5. Independent Claims 23 and 30

The preamble of claim 23 reads: "An apparatus comprising a processor and a memory including computer program code, the memory and the computer program code configured to, with the processor, cause the apparatus to." Ex. 1001, 37:20–23.

The preamble of claim 30 reads: "A non-transitory computer readable medium having stored thereon a computer executable program code for use by an encoder, said program codes comprising instructions for." Ex. 1001, 40:10–13.

Petitioner asserts:

> Beyond the preambles, claims 23 and 30 are nearly identical to claim 9, with limitations [23a]-[23e]/[30a]-[30e] having only minor differences with [9a]-[9e], respectively, and being satisfied for reasons stated above. *Supra* §§VI.A.2[9a]-[9e]. Limitations [23c]/[30c] recite "the . . . candidate in the determined subset" where [9c] recites "another . . . candidate of the subset"; Rusert satisfies both by teaching a candidate in he subset (explained for [9b]), which is also another candidate in the larger set of previously-coded motion vectors. Limitation [23d] repeats language from [23c], which Ground 1 teaches as explained for [23c] and [9c]. Ex-1003, ¶¶210-222, ¶¶234-239.

Pet. 59 (alterations by Petitioner). Petitioner further asserts: "Ground 1 teaches [23pre] and [30pre], e.g., with a video encoding/decoding 'apparatus' comprising 'a processor' and 'computer-readable medium, carrying instructions, which when executed[,]. . . causes [the processor] to carry out any of the methods disclosed herein.' Ex-1004, ¶1, ¶¶24-27, ¶114, ¶116, claims 17-19; Ex-1003, ¶¶207-209, ¶¶230-233." *Id.* at 60 (alterations by Petitioner).

Petitioner additionally asserts: "[30pre] recites 'an encoder' but should recite 'a decoder' consistent with the rest of the claim. Ex-1003, ¶¶231-232." Pet. 60. In effect, Petitioner is asserting that claim 30's preamble includes a drafting error in reciting "encoder" where "decoder" is intended, and asks the Board simply to read "encoder" as "decoder." We decline to do so, because on this record the noted discrepancy appears substantive and is beyond patent recognition as mere spelling or typographical error. Nonetheless, the discrepancy is inconsequential here, because the body of claim 23 recites no execution of an encoding function or step. Thus, we find the recitation of "for use by an encoder" in claim 30's preamble to be non-limiting.[12]

Petitioner's other assertions regarding the preambles of claims 23 and 30 and regarding the limitations of claims 23 and 30 as compared to the limitations of claim 9 are supported by the cited evidence and not disputed by Patent Owner. Based on our reasoning discussed above for claim 9, we determine that Petitioner has shown a reasonable likelihood that it would prevail in establishing obviousness of claims 23 and 30 over Rusert and Karczewicz.

6. Dependent Claims 24 and 26–28

Claims 24 and 26–28 each depend, directly or indirectly, from claim 23. Ex. 1001, 37:58–63, 38:4–39:21. Petitioner asserts that other than the preambles, these claims are identical to claims 10 and 12–14. Pet. 60. Petitioner asserts that the preambles are accounted for by reference to the discussion of the preamble of claim 23. *Id.* For the rest of these claims, Petitioner relies on the same arguments and evidence submitted for claims 10 and 12–14. *Id.*

We have already addressed Petitioner's accounting for claims 10, 12–14, and 23. For substantially the same reasons as we have provided for claims 10, 12–14, and 23, Petitioner has shown a reasonable likelihood that it would prevail in establishing obviousness of claims 24 and 26–28 over Rusert and Karczewicz.

[12] We invite the parties to address the discrepancy noted by Petitioner, in Patent Owner's Response and in Petitioner's Reply, after institution of *inter partes* review.

E. Alleged Obviousness of Claims 9–14 and 23–28 over Rusert, Karczewicz, and Lin

1. Overview of Lin (Exhibit 1006)

As background, Lin describes:

> In video coding systems. spatial and temporal redundancy is exploited using spatial and temporal prediction to reduce the information to be transmitted. The spatial and temporal prediction utilizes decoded pixels from the same picture and reference pictures respectively to form prediction for current pixels to be coded. In a conventional coding system, side information associated with spatial and temporal prediction may have to be transmitted, which will take up some bandwidth of the compressed video data. The transmission of motion vectors for temporal prediction may require a noticeable portion of the compressed video data, particularly in low-bitrate applications. Accordingly, motion vector prediction has been widely used in the field to reduce bitrate corresponding to the motion vector coding.
>
> High-Efficiency Video Coding (HEVC) is a new international video coding standard that is being developed by the Joint Collaborative Team on Video Coding (JCT-VC). HEVC is based on the hybrid block-based motion-compensated DCT-like transform coding architecture. The basic unit for compression, termed Coding Unit (CU), is a 2Nx2N square block, and each CU can be recursively split into four smaller CUs until a predetermined minimum size is reached. Each CU contains one or multiple Prediction Units (PUs). The PU sizes can be 2Nx2N, 2NxN, 2NxnU, 2NxnD, Nx2N, nLx2N, nRx2N, or NxN, where 2NxN, 2NxnU, 2NxnD and Nx2N, nLx2N, nRx2N correspond to horizontal and vertical partition of a 2Nx2N PU with symmetric or asymmetric PU size division respectively.

Ex. 1006 ¶¶ 3–4. Lin further describes: "When a PU is coded in either Skip or Merge mode, no motion information is transmitted except for the index of the selected candidate." *Id.* ¶ 7.

Lin discloses a method and apparatus of deriving a motion vector predictor (MVP) for a current block in an Inter, Merge, or Skip mode. Ex. 1006 ¶ 25. The method determines redundant MVP candidates according to a non-MV-value based criterion. *Id.* The redundant MVP candidates are then removed from the MVP candidate set. *Id.*

Lin describes an embodiment which identifies and removes redundant MVP candidates to avoid "imitation of Merge," a scenario in which multiple partitioned PUs from an original PU are merged back to form the original PU. Ex. 1006 ¶ 44. "Consequently, the MVP candidates of a current PU that may cause the current PU to be merged with other PUs to cause imitation of Merge is considered redundant and can be removed with9ut comparing the MV values." *Id.*

2. Claims 9, 10, 12–14, 23, 24, and 26–28

Petitioner relies on Lin only to account for features added in claims 11 and 25. Pet. 47–52, 60. For claims 9, 10, 12–14, 23, 24, and 26–28, Petitioner's analysis is the same as its analysis for these same claims as unpatentable over Rusert and Karczewicz. *Id.* at 27–60.

Accordingly, for the same reasons we discussed above why Petitioner has made an adequate showing for claims 9, 10, 12–14, 23, 24, and 26–28, as obvious over Rusert and Karczewicz, Petitioner has shown a reasonable likelihood that it would prevail in establishing the alleged obviousness of claims 9, 10, 12–14, 23, 24, and 26–28 as obvious over Rusert, Karczewicz, and Lin, with no teaching stemming from Lin.

3. Dependent Claims 11 and 25

Claim 11 depends directly from claim 9 and further recites: "examining whether the received encoded block of pixels is divided into a first prediction unit and a second prediction unit; and if so, excluding the potential spatial motion vector candidate from the motion vector prediction list if the prediction unit is the second prediction unit." Ex. 1001, 33:55–60.

Claim 25 depends directly from claim 23 and further recites: "wherein the apparatus is further caused to examine whether the received encoded block of pixels is divided into a first prediction unit and a second prediction unit; and if so, exclude the potential spatial motion vector candidate from the motion vector prediction list if the prediction unit is the second prediction unit." Ex. 1001, 37:64–38:3.

The added features of claims 11 and 25, relative to the independent claims from which they each depend, are essentially the same, with claim 11 reciting a function performed as a method step and claim 25 reciting the function as performed by the claimed apparatus.

Petitioner relies on the disclosure of Lin for the added features of claims 11 and 25. Pet. 47–52, 60. Petitioner explains:

> Lin examines whether such blocks are divided. As Lin explains, in H.265/HEVC, "[t]he basic unit for compression, termed Coding Unit (CU), is a 2Nx2N square block, and . . . [e]ach CU contains one or multiple Prediction Units (PUs)" with divisions "correspond[ing] to horizontal and vertical partition[s.]" Ex-1006, ¶4; Ex-1013, 000007, 000017. Horizontally-divided CUs have PUs of size 2NxN; vertically-divided CUs have Nx2N PUs. *Id.* Lin explains that a block of pixels can be divided into a first PU ("PU1") and second PU ("PU2"). Ex-1006, ¶6, ¶25, ¶44, Figs. 7A-7D; Ex-1013, 000007, 000010, 000017; Ex-1003, ¶159.

Id. at 47–48 (alterations by Petitioner). Petitioner further explains:

> Lin examines whether the block is divided into two PUs horizontally (having 2NxN PUs) or vertically (Nx2N). Lin "identifies and removes redundant candidates" by examining the CU for "scenario[s] that . . . may cause the current PU to be . . .

> considered redundant and can be removed[,] including where "for the second 2NxN, . . . Nx2N . . . PU, one or more of the MVP candidates are redundant and removed if said one or more of the MVP candidates [are] located within the previous (first) 2NxN, . . . Nx2N . . . PU." Ex-1006, ¶25, ¶44; Ex-1013, 000009-11, 000017. These teachings apply to an encoded block of pixels received by a decoder, which "mimics the encoder in order to achieve encoder/decoder synchronization." Ex-1004, ¶35, ¶¶24–35; Ex-1005, ¶50; Ex-1006, ¶22, ¶47; Ex. 1013, 000008; Ex-1003, ¶160.

Id. at 48–49 (alterations by Petitioner). Petitioner additionally explains: "Lin examines whether (i) the current block is divided into two PUs and (ii) the spatial motion vector prediction candidate is from the other PU; if so, Lin excludes the candidate from the MVP list because it is redundant. Ex-1006, ¶44, ¶25, Figs. 7A-7D; Ex-1013, 000010, 000017." *Id.* at 49.

The above assertions of Petitioner are supported by the cited evidence and not disputed by Patent Owner.

Regarding motivation to combine, Petitioner explains:

> [A] CU comprises one PU when it has uniform motion and is only divided if different parts are moving in different directions, as Karczewicz explains. *See* Ex-1006, ¶4; Ex-1013, 000007; Ex-1005, ¶35. Therefore, for a divided block, the motion vector for one PU is not a good predictor for the other. Lin teaches what Karczewicz suggests, that the motion vector from one half can be removed as a candidate for the other, thereby reducing the number of candidates. Ex-1006, ¶25, ¶44; Ex-1013, 000010; Ex-1003, ¶¶163-164. This would have had the predictable result of excluding such candidates, consistent with the reason why a block was divided to begin with. Ex-1013, ¶94.
>
> Accordingly, a POSITA would have been motivated to apply Lin's teachings to the Rusert/Karczewicz combination because Lin provides a straightforward teaching for reducing redundant candidates when blocks are divided. This would have furthered Rusert's goal of "reduc[ing] the number of previous

> motion vectors that must be considered[.]" Ex-1004, ¶12, ¶7; Ex-1003, ¶¶88-90. Ground [2] combines Lin's known technique to improve similar H.265 PU-based methods in the same way, which were ready for improvement to reduce the number of previous motion vectors that must be considered. Ex-1004, ¶12; Ex-1003, ¶¶90-92.

Pet. 50–51 (second and third alterations by Petitioner). Petitioner further explains: "The combination would not have changed the principle of operation for any reference, in the manner taught by each reference. Ex-1006, ¶44; Ex-1013, 000010. Ground 2 simply applies Lin's exclusion of PUs in certain scenarios. Ex-1003, ¶95." *Id.* at 51.

Regarding a reasonable expectation of success in applying the teachings of Lin to the combination of Rusert and Karczewicz, Petitioner asserts:

> As with Ground 1, all references teach aspects of block-based video encoding for H.264/H.265 to reduce PMV candidates. Ex-1004, ¶25, ¶39, ¶¶42-44; Ex-1005, ¶3, ¶5, ¶38; Ex-1006, ¶4, ¶25; Ex-1013, 000009-11. The combination does not modify Rusert, Karczewicz, or Lin in a way that would render any reference inoperative. Indeed, many of the same reasons explained for Ground 1 likewise apply to Ground 2. Ex-1003, ¶¶96-98.

Pet. 51.

The above assertions of Petitioner are supported by the cited evidence and not disputed by Patent Owner. Petitioner has shown a reasonable likelihood that it would establish obviousness of claims 11 and 25 over Rusert, Karczewicz, and Lin.

F. Alleged Obviousness of Claims 9–14, 23–28, and 30 over Nakamura and WD4

1. Overview of Nakamura (Exhibits 1007, 1008, and 1009)

As noted above, Petitioner uses the name "Nakamura" to refer to a collection of three files, i.e., the "Nakamura Document" (Ex. 1007), the "Nakamura WD Description" (Ex. 1008), and the "Nakamura Presentation" (Ex. 1009). Pet. 65. Petitioner asserts that "they were jointly presented in a single proposal, by the same author, packaged together in a single zip, and meant to be read together, teaching related aspects of Nakamura's proposal." *Id.* at 62–63. Here, we focus on the Nakamura document (Ex. 1007).

In its introduction paragraph, the Nakamura document states: "This proposal is for the improvement of derivation method of the candidates for merge mode and motion vector predictor (MVP)." Ex. 1007 § 1. It unifies the location of spatial neighbors for merge mode and MVP by proposing that "the positions of the spatial neighbors that can be used as merging candidates are as same as the positions of the spatial MVP candidates." *Id.* It also proposes to unify the derivation process for merge mode and for MVP. *Id.* The proposal "tries to reduce the number of candidates in the spatial derivation process to reduce the number of times of comparison in the removal process." *Id.* at Abstr. It states: "The proposed techniques simplify the derivation process for merge mode and MVP." *Id.* § 2.2.

Section 2.2.1 of the Nakamura document describes its proposed technique for merge mode and is reproduced below:

> 2.2.1 Proposal 1: Proposed technique for merge mode
>
> Changes of our proposal for merge modes from HM3.0 are as follows:
>
> – The positions of the spatial neighbors hat can be used for merging candidates are as same as the positions of

the spatial MVP candidates. That is unification of the location of spatial neighbor for merge mode and MVP.

– Two spatial merging candidates are derived in the spatial derivation process.

– The merging candidate list is constructed of two spatial merging candidates and a temporal merging candidate.

Figures 2 (a) and (b) illustrate the position of the spatial neighbors A, B, C, D and E relative to the current prediction unit in the HM3.0 and the proposed technique, respectively.

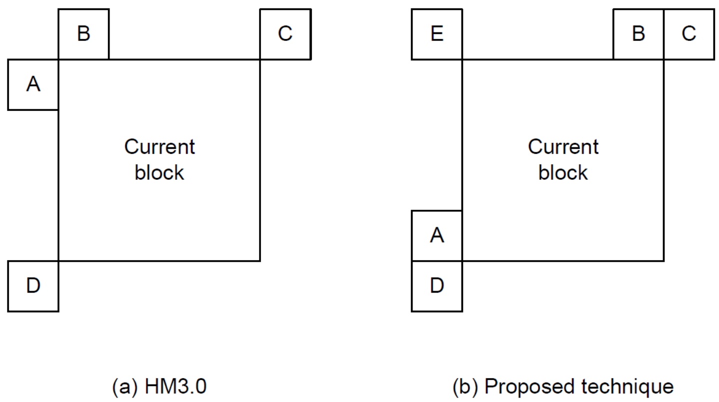


Figure 2 Spatial neighbors that can be used as merging candidates.

[Figure 2(a) shows spatial neighbors that can be used as merging candidates in existing HM3.0, and Figure 2(b) shows spatial neighbors that can be used as merging candidates in Nakamura's proposed technique]

In this proposal, two spatial candidates and a temporal candidate are derived. The number of candidates is reduced in the spatial derivation process to reduce the number of times of comparison in the removal process. Table 1 presents the number of times of comparison in the removal process in each the number of candidates. The number of times of comparison in the removal process in HM3.0 is ten times. On the other hand, the number of times of comparison in the removal process in the proposed technique is three times.

Table 1 The number of comparison in the removal process

The number of candidates in the spatial and temporal derivation process	The number of times of comparison in the removal process	Notes
3 (=2+1)	3 [times]	Proposed technique
4 (=3+1)	6 [times]	-
5 (=4+1)	10 [times]	HM3.0
6 (=5+1)	15 [times]	-

[Table 1 shows the number of comparisons in the removal process]

Table 2 presents the comparison between HM3.0 and proposed technique for merge mode:

Table 2 Comparison between HM3.0 and proposed technique for merge mode

	HM3.0	Proposal 1
The number of spatial candidates	4 in 4 [positions]	2 in 5 [positions]
Spatial derivation order	A, B, C, D	A, B, C, D, E
The number of times of comparison of redundant candidates in the spatial derivation process	0 [time]	0 [time]
The number of temporal candidates	1	1
Merging candidate list order	A, B, Col, C, D	S_0, S_1, Col
The number of times of comparison in the removal process	10 [times] (A vs B, Col, C, D, B vs Col, C, D, Col vs C, D, and C vs D)	3 [times] (S_0 vs S_1, S_0 vs Col, and S_1 vs Col)

[Table 2 shows the comparison between HM3.0 and proposed technique for merge mode]

Notes:

S_0: The first spatial candidate found in the spatial derivation process.

S_1: The second spatial candidate fond in the spatial derivation process.

Ex. 1007, 2–4.

2. WD4 (Exhibit 1010)

WD4 is a 222-page document titled "WD4: Working Draft 4 of High-Efficiency Video Coding." Ex. 1010, i. It bears the following header on its title page:

> Joint Collaborative Team on Video Coding (JCT-VC)
> of ITU-T SG16 WP3 and ISO/IEC JTC1/SC29/WG11
> 6th Meeting: Torino, IT, 14-22 July, 2011

Id.

WD4 defines a merge index, merge_idx, that "specifies the merging candidate index of the merging candidate list." Ex. 1010 § 7.4.7. This merge index appears in "Prediction unit syntax" corresponding to information encoded for a prediction unit. *Id.* § 7.3.7. In this prediction unit syntax, the merge_idx for a prediction unit is encoded into the bitstream that is received by a decoder. *Id.*; *see also id.* §§ 0.2, 3.11, 3.12, 3.34, 3.38. Based on the merge_idx, one spatial candidate in the merging candidate list mergeCandList is assigned as the spatial candidate to use in decoding the encoded block of pixels. *Id.* § 8.4.2.1.1. Merge_idx points to a specific spatial motion vector prediction candidate in the merge list that is used for predicting the motion vector for the current block. *Id.* §§ 7.3.7, 7.4.7, 8.4.2.1.1.

3. Claims 9, 23, and 30

a. Claim 9

At the outset, Petitioner notes:

> Nakamura satisfies claim 9 with independently sufficient teachings for H.265 merge mode (optimal for areas of uniform motion) and MVP mode (more versatile but requiring more bits). Generally, merge mode saved bits by utilizing predicted motion vectors without signaling difference vectors and other information used by MVP mode. The granular differences are

> not relevant here because the claims do not require one mode or the other. Ex-1003, ¶258.

Pet. 63. Patent Owner does not present any argument based on differences between the merge mode and MVP mode disclosures of Nakamura.

(1) Preamble [9pre]

With regard to the preamble "A method," Petitioner asserts: "Ground 3 teaches [9pre], e.g., an 'improvement of derivation method of the candidates for merge mode and motion vector predictor (MVP)' comprising the below-described steps. Ex-1007, §1, Abstract, §2.1, Fig. 1; Ex-1010, §8.4.2.1.2, §8.4.2.1.8; *infra* §VI.B.2[9pre]-[9e]. Ex-1003, ¶¶255-258." Pet. 63. These assertions are supported by the cited evidence and not disputed by Patent Owner.

(2) Limitation 9[a]

Limitation 9[a] recites:

> selecting a first spatial motion vector prediction candidate from a set of spatial motion vector prediction candidates for an encoded block of pixels as a potential spatial motion vector prediction candidate to be included in a motion vector prediction list for a prediction unit of the encoded block of pixels, where the motion vector prediction list comprises motion information of the spatial motion vector prediction candidates;

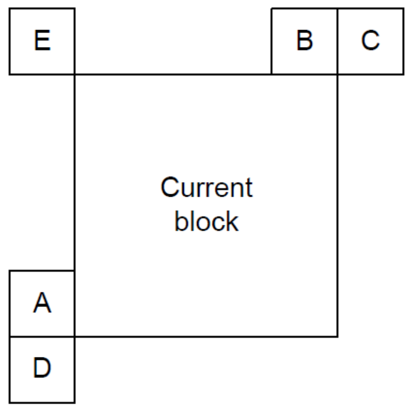
Ex. 1001, 33:18–26.

Regarding "selecting a first spatial motion vector prediction candidate from a set of spatial motion vector prediction candidates for an encoded block of pixels," Petitioner asserts:

> For merge mode, Nakamura teaches identifying two spatial motion vector prediction candidates for a merge list, i.e., "spatial candidate[s]" S_0 and S_1, from "the position[s] of the spatial neighbors A, B, C, D and E relative to the current prediction unit" which "can be used for . . . candidates[.]" Ex-1007, §2.2.1, Abstract, §1, Tables 2, 4, Fig. 1; Ex-1009, 000008, 000010,

000012-14. The selection of a candidate from a spatial neighbor for S_1 satisfies the claimed step for selecting a first spatial motion vector prediction candidate. Ex-1003, ¶¶260-261.

S_0 and S_1 are spatial motion vector prediction candidates because each is a candidate motion vector obtained from one or more previously-encoded blocks in the current frame (A-E). *Supra* §V.A; Ex-1007, §2.2.1, Fig. 2(b):



(b) Proposed technique

[The figure shows spatial neighbors that can be used as merging candidates in Nakamura's proposed technique. Ex. 1007, 3]

Ex-1003, ¶¶262-264.

Pet. 64–65 (alterations by Petitioner) (footnote omitted).

Petitioner further asserts:

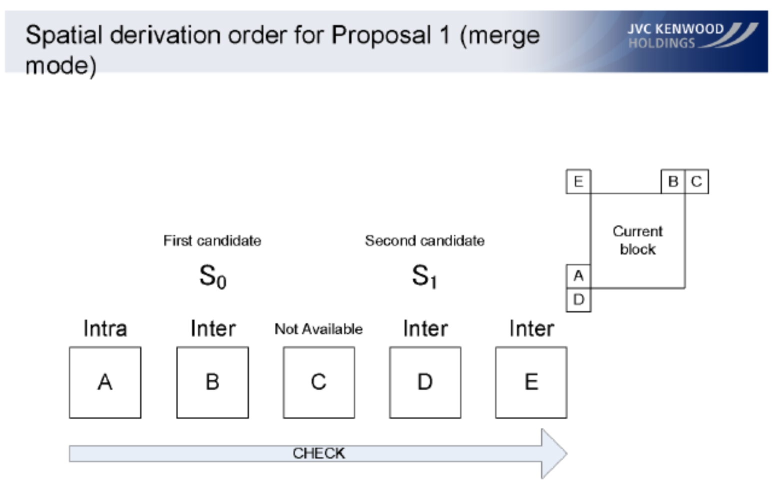
Nakamura's teachings are applied to decode an encoded block of pixels (the "current block") received from the encoder. Ex-1007, §2.2.1, Fig. 2; Ex-109, 000005, 000007-8; Ex-1010, §§8.4.2.1.1-8.4.2.1.2. WD4 explains that these techniques are used for encoding and decoding video bitstreams. Ex-1010, §3.34, §3.38. Those bitstreams are "transmitted and received" and include encoded blocks that are decoded according to the teachings of Nakamura and WD4. Ex-1010, §0.2, §3.11, §3.12, §3.34, §3.38, §§8.4.2.1.1-8.4.2.1.2; Ex-1007, §2.2.1, Fig. 2; Ex-1003, ¶265.

Pet. 65.

These assertions are supported by the cited evidence and not disputed by Patent Owner.

Regarding selection of that first candidate "as a potential spatial motion vector prediction candidate to be included in a motion vector prediction list," Petitioner explains:

> Nakamura teaches that a "merging candidate list is constructed of two spatial merging candidates" (S_0 and S_1) selected in a "[s]patial derivation order" from the five spatial neighbor candidates "relative to the current prediction unit[.]" Ex-1007, §2.2.1, Tables 2-4; Ex-1008, 8.4.2.1.1; Ex-1009, 000008, 000010, 000012-14. Following the spatial derivation order, Nakamura steps through blocks A-E until two spatial candidates (S_0 and S_1) are selected for potential inclusion in the merging candidate list. Ex-1009, 000008; Ex-1007, §2.2.1, Table 2; Ex-1003, ¶266-268.



[The illustration shows "Spatial derivation order for Proposal 1 (merge mode)"]

Pet. 65–66 (alteration by Petitioner). The above assertions are supported by the cited evidence and not disputed by Patent Owner.

Regarding the prediction list being for "a prediction unit of the block of pixels," Petitioner explains:

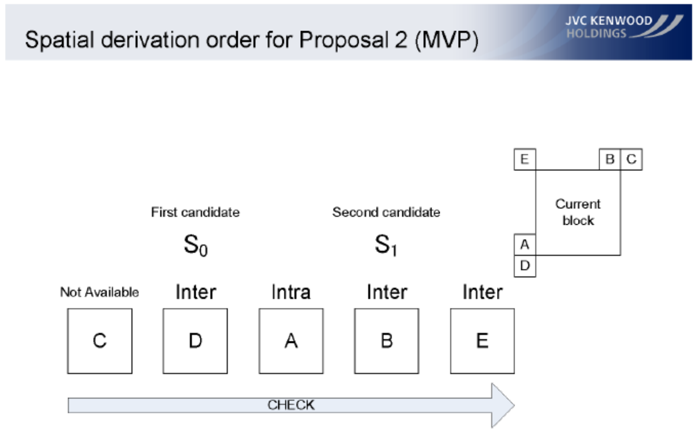
> Nakamura teaches "[t]he merging candidate list, mergeCandList," (Ex-1008, §8.4.2.1.1; Ex-1010, §8.4.2.1.1) comprises "spatial merging candidates" found from "the position[s] of the spatial neighbors. . . relative to the current prediction unit" of the current block, with one assigned as the motion vector predictor for the current prediction unit. Ex-1007, §2.2.1, Tables 2, 4, Fig. 2(b); Ex-1008, §8.4.2.1.1; Ex-1010, §7.4.7, §8.4.2.1.1, 000049, 000174; Ex-1003, ¶¶269-270.

Pet. 66–67 (alterations by Petitioner). The assertions are supported by the cited evidence and not disputed by Patent Owner.

Regarding the prediction list comprising "motion information of the spatial motion vector prediction candidates," Petitioner asserts: "The 'merging candidate list is constructed of' spatial candidates (Ex-1007, §2.2.1) and includes information of those candidates in the list, including 'availability flags. . . reference indices. . . prediction list utilizing flags. . .' and 'motion vectors[.]' Ex-1008, §8.4.2.1.2; Ex-1010, §8.4.2.1.2; Ex-1003, ¶263, ¶271." Pet. 67 (alterations by Petitioner).

Petitioner further asserts:

> Ground 3's MVP Mode teachings satisfy [9a] in a similar manner but with an "MVP list" instead of a merge list, mvp_idx_1X instead of mergeIdx, and a different spatial derivation order for selecting S_0 and S_1. Ex-1007, Abstract, §2.2.2, Tables 3-4, Fig. 3(b); Ex-1010, §7.4.7, §8.4.2.1.1, §8.4.2.1.7, §8.4.2.1.8, §8.4.2.1.10, 000049-50, 000174; Ex-1009, 000005, 000008, 000011-14:



[The illustration shows "Spatial derivation order for Proposal 2 (MVP)"]

Ex-1003, ¶¶272-280.

Pet. 67–68 (footnote omitted).

Petitioner's assertions are supported by the cited evidence and not disputed by Patent Owner.

(3) Limitation 9[b]

Limitation 9[b] recites: "determining a subset of spatial motion vector prediction candidates based on the location of the block associated with the first spatial motion vector prediction candidate." Ex. 1001, 33:27–30.

Regarding "determining a subset of spatial motion vector prediction candidates," Petitioner explains:

> For merge mode, Nakamura teaches "[t]wo spatial merging candidates" (S_0 and S_1) "are derived in the spatial derivation process[]" from five "spatial neighbors A, B, C, D and E relative to the current prediction unit[.]" Ex-1007, §2.2.1, Tables 1, 2, 4; Ex-1009, 000008, 000010, 000014; *supra* §V.C. For S_1, Nakamura teaches a subset (S_0) with which S_1 is compared to determine whether to include or exclude S_1. Ex-1007, Tables 2, 4; Ex-1008, §8.4.2.1.1; Ex-1009, 000010, 13; Ex-1010, §8.4.2.1.1; Ex-1003, ¶¶284-285.

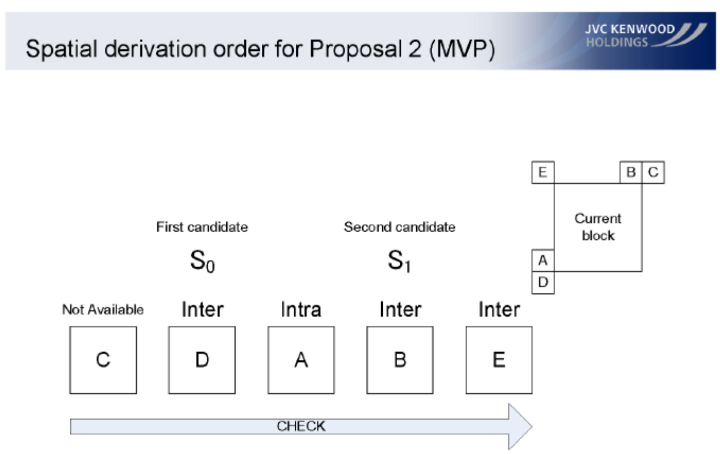
Pet. 68 (alterations by Petitioner).

Regarding determining a subset of spatial motion vector prediction candidates "*based on the location of the block associated with the first spatial motion vector prediction candidate*," Petitioner explains:

> The subset is determined from a set of "spatial neighbors A, B, C, D and E relative to the current prediction unit" for the current block. Ex-1007, §2.2.1, Fig. 2(b); Ex-1009, 000008. The subset (S_0) is based on the location of S_1 following Nakamura's spatial derivation order, which is relative to the current block. Ex-1007, §2.2.1, Fig. 2; Ex-1008, §8.4.2.1.2, Fig. 8-3; Ex-1009, 000008, 000010; Ex-1003, ¶¶287-290.

Pet. 69.

Petitioner further asserts:

> Ground 3's MVP mode teachings satisfy [9b] in a similar manner but with an "MVP list" instead of a merge list and a different spatial derivation order. Ex-1007, Abstract, §2.2.2, Tables 1, 3, 4, Fig. 3(b); Ex-1009, 000005, 000008, 000010-14, 000020.
>
> 
>
>
> [The illustration shows "Spatial derivation order for Proposal 2 (MVP)"]
>
> Ex-1003, ¶¶290-298.

Pet. 69–70.

Petitioner's explanation is unpersuasive. There is inadequate explanation as to why S_0 is determined on the basis of the location of S_1, where S_0 and S_1 are selected in a "spatial derivation order" from the five spatial neighbor candidates relative to the current prediction unit. Ex. 1007, § 2.2.1; Ex. 1009, 00008, 00001. As Patent Owner notes, S_0 is already selected regardless of what the selection of S_1 thereafter might be. Prelim. Resp. 71. The subset S_0 does not change depending on the later choice of S_1.

On this record, the subset S_0 has not been sufficiently shown as based on a location of the block associated with the first spatial motion vector prediction candidate, S_1. As we explained above in Section III.C.3, "the block associated with the first spatial motion vector prediction candidate" does not refer to the current block, but refers to "the block associated with the first spatial motion vector prediction candidate." Petitioner has not adequately shown the satisfaction of limitation 9[b].

(4) Motivation to Combine Nakamura and WD4

The deficiency discussed above relating to limitation 9[b] and the disclosure of Nakamura already alone undermines the alleged unpatentability of claim 9 over Nakamura and WD4. Additionally, we have concerns regarding Petitioner's stated motivation for one of ordinary skill in the art to combine the teachings of Nakamura with the teachings of WD4.

With regard to motivation to combine the teachings of Nakamura and WD4, Petitioner explains:

> Nakamura is an H.265 proposal for "reduc[ing] the number of candidates in the spatial derivation process to reduce the number of. . . comparison[s] in the removal process." Ex-1007, Abstract. When applied to WD4, Nakamura's teachings satisfy the challenged claims. Ex-1003, ¶241.
>
> A POSITA would have been motivated to apply Nakamura's teachings to the draft H.265 standard because that was its express purpose. Nakamura was proposed at the 6th JCT-VC meeting for inclusion into the standard. WD4 was the output

> of that meeting, reflecting the state of the draft H.265 standard at that time. Nakamura proposed "simplifications" and "improvement[s]" to H.265. Ex-1007, 000001, §6. WD4 "[i]ncorporated spatial merge candidate positions unification" from Nakamura. Ex-1010, Abstract. There was clear motivation to apply Nakamura to WD4. Ex-1004, ¶¶241-243. This was a combination of prior art elements according to known methods to yield predictable results. Ex-1003, ¶245.
>
> Ground 3 applies Nakamura's known techniques to a known method (WD4) ready for improvement to yield predictable results. Nakamura teaches its "proposed technique is implemented into" the H.265 model software. Ex-1007, §2.3.1. Nakamura measured actual improvements from the combination. Ex-1007, §3; Ex-1003, ¶¶243-244, ¶248.
>
> A POSITA would have been motivated by the references' striking similarities and common purpose. Both are directed to H.265. Both derive motion vector prediction candidates, while seeking to reduce the number of candidates, for block-based inter prediction. Ex-1010, §0.1, §0.6, §§8.4.2.1.1-8.4.2.1.3; Ex-1007, Abstract. WD4 provides context for Nakamura's teachings. Ex-1010, ¶3, §8; Ex-1003, ¶¶246-248.

Pet. 61–62 (alterations by Petitioner).

On motivation to combine, Petitioner does not address the particular teachings sought to be combined. Rather, according to Petitioner, anything in Nakamura properly can be combined with anything in WD4 simply because Nakamura is a proposal for the next draft version of new standard H.265, i.e., version 4, and WD4 is the resulting draft version 4 of H.265 after all the proposals had been considered. Pet. 60–62. Petitioner's reasoning is flawed and based on mere speculation.

Nakamura is not a proposal to revise or modify WD4. WD4 did not yet exist at the time the Nakamura proposal was made. Even if some suggestions of Nakamura made it into WD4, as Petitioner asserts (Pet. 61), i.e., spatial merge candidate positions unification, that does not mean one of ordinary skill in the art would have had reason to combine other teachings of Nakamura with particular disclosures of WD4. Even assuming Nakamura and WD4 have striking similarities in some way and also a common purpose to some general extent, that still does not mean everything in one is combinable with everything in the other, without specific consideration of what are proposed to be combined and in what manner.

(5) Preliminary Conclusion for Claim 9

Petitioner has not shown a reasonable likelihood that it would prevail in establishing obviousness of claim 9 over Nakamura and WD4.

b. Independent Claims 23 and 30

Claims 23 and 30 are largely the same as claim 9 except for their preambles. Claim 23 is directed to an apparatus comprising a processor and a memory including computer program code, where the processor, memory, and computer program code are configured to cause the apparatus to perform functions essentially corresponding to the steps in claim 9. Ex. 1001, 37:20–23. Claim 30 is directed to a non-transitory computer readable medium having stored thereon a computer executable program code, where the "program codes comprising instructions for" actions largely corresponding to the steps in claim 9. *Id.* at 40:10–13.

Similar to claim 9, claim 23 includes the limitation "determine a subset of spatial motion vector prediction candidates based on the location of the block associated with the first spatial motion vector prediction candidate." Ex. 1001, 37:33–36. Similar to claim 9, claim 30 includes the limitation "determining a subset of spatial motion vector prediction candidates based on the location of the block associated with the first spatial motion vector prediction candidate." *Id.* at 40:23–26.

The same deficiency discussed above regarding Petitioner's showing for claim 9's "determining a subset of spatial motion vector prediction candidates based on the location of the block associated with the first spatial motion vector prediction candidate" applies to claims 23 and 30. Additionally, we also have the same concerns regarding Petitioner's stated motivation to combine the teachings of Nakamura and WD4, as discussed above in the context of claim 9.

Petitioner has not shown a reasonable likelihood that it would prevail in establishing obviousness of claims 23 and 30 over Nakamura and WD4.

c. Dependent Claims 10–14 and 24–28

Claims 10–14 each depend, directly or indirectly, from claim 9. Ex. 1001, 33:49–35:8. Claims 24–28 each depend, directly or indirectly, from claim 23. *Id.* at 37:59–39:21.

The deficiency of Petitioner's accounting for claim 9 equally applies to claims 10–14. The deficiency of Petitioner's accounting for claim 23 equally applies to claims 24–28.

Petitioner has not shown a reasonable likelihood that it would prevail in establishing obviousness of claims 10–14 and 24–28 over Nakamura and WD4.

G. Discretionary Denial Under § 325(d)

Patent Owner contends that we should exercise discretion to deny institution under 35 U.S.C. § 325(d) based on the framework set forth in *Advanced Bionics, LLC v. Med-El Elektromedizinische Geräte GmbH*, IPR2019-01469, Paper 6 (PTAB Feb. 13, 2020) (precedential). Prelim. Resp. 32.

1. Analytical Framework

Section 325(d) provides that "[i]n determining whether to institute" an *inter partes* review, "the Director may take into account whether, and reject the petition or request because, the same or substantially the same prior art or arguments previously were presented to the Office." 35 U.S.C. § 325(d).

When deciding whether to exercise our discretion under § 325(d), we follow the two-part framework set forth in *Advanced Bionics.* Specifically, we must first determine "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." *Advanced Bionics*, Paper 6 at 8. That determination involves "two separate issues":

(1) "whether the petition presents to the Office the same or substantially the same art previously presented to the Office"; and

(2) "whether the petition presents to the Office the same or substantially the same arguments previously presented to the Office."

Id. at 7. "Previously presented art includes art made of record by the Examiner, and art provided to the Office by an applicant," e.g., with an information-disclosure statement. *Id.* at 7–8.

If "either condition of first part of the framework is satisfied," we must then determine "whether the petitioner has demonstrated that the Office erred in a manner material to the patentability of challenged claims." *Advanced Bionics*, Paper 6 at 8. "An example of a material error may include misapprehending or overlooking specific teachings of the relevant prior art where those teachings impact patentability of the challenged claims." *Id.* at 8 n.9.

When deciding whether to exercise our discretion under § 325(d) in view of the *Advanced Bionics* framework, we weigh the following nonexclusive factors:

> (a) the similarities and material differences between the asserted references and the prior art involved during prosecution;
>
> (b) the cumulative nature of the asserted references and the prior art evaluated during prosecution;
>
> (c) the extent to which the asserted references were evaluated during prosecution, including whether a rejection rested on any reference;
>
> (d) the extent of overlap between the arguments made during prosecution and Petitioner's reliance on the asserted references or Patent Owner's contentions concerning them;
>
> (e) whether Petitioner has pointed out sufficiently how the Examiner erred in analyzing the asserted references; and
>
> (f) the extent to which additional evidence and facts presented in the petition warrant reconsideration of the asserted references or arguments.

See Becton, Dickinson & Co. v. B. Braun Melsungen AG, IPR2017-01586, Paper 8 at 17–18 (PTAB Dec. 15, 2017) (precedential as to § III.C.5, first paragraph) ("*Becton*").

Under the *Advanced Bionics* framework, *Becton* factors (a), (b), and (d) relate to "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." *Advanced Bionics*, IPR2019-01469, Paper 6 at 8, 10. *Becton* factors (c), (e), and (f) relate to "whether the petitioner has demonstrated that the Office erred in a manner material to the patentability of challenged claims." *See id.* at 7–8, 10.

2. Analysis

It is not in dispute that neither Rusert nor Karczewicz was in the prosecution record of the application which issued as the ’714 patent. However, Patent Owner asserts that Rusert is cumulative of three references which were in the prosecution record of the ’714 patent: (1) Han (Ex. 2006);[13] (2) Tai (Ex. 2007);[14] and (3) Huang (Ex. 2008).[15] Patent Owner explains:

> Even though Rusert was not cited during prosecution of the application that resulted in the ’714 patent, PO disputes that this arrangement satisfies the claims, because Rusert is largely cumulative of Han, Tai, and Huang. *See* Ex-2006–Ex-2008. Both Rusert and Han disclose a hierarchy of block unit representation, while both Rusert and Tai disclose a correlation between the current block position and neighboring blocks to reduce the number of PMV predictors to be evaluated, and both Rusert and Huang disclose constructing a candidate list based on motion information. *Id.*; Ex-2001 at 31.

Prelim. Resp. 36–37.

Based on the foregoing arguments, which lack specifics and do not sufficiently map the particular teachings from Rusert relied on by Petitioner to the disclosures of Han, Tai, and Huang, we do not find Rusert to be cumulative of these references. Further, even if all of Rusert’s teachings

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[13] Han, Woo-Jin, et al., *Improved Video Compression Efficiency Through Flexible Unit Representation and Corresponding Extension of Coding Tools*, 20 IEEE Transactions on Circuits and Systems for Video Technology 1709 (2010).
[14] Tai, Shen-Chuan, et al., *A Multi-Pass True Motion Estimation Scheme with Motion Vector Propagation for Frame Rate Up-Conversion Applications*, 4 Journal of Display Technology 188 (2008).
[15] Huang, Ai-Mei, et al., *A Multistage Motion Vector Processing Method for Motion-Compensated Frame Interpolation*, 17 IEEE Transactions on Image Processing 694 (2008).

relied on by Petitioner can be found in Han, Tai, and Huang as a collection of separate partial teachings from each, that still does not demonstrate Rusert as a cumulative reference. The quality of disclosure simply is not the same if three references have to be combined to yield what Rusert itself discloses. Patent Owner also does not explain how it combines Han, Tai, and Huang to provide the same teachings relied on from Rusert by Petitioner.[16]

Patent Owner additionally asserts that Rusert was considered in an application ("the '156 Application") continuing from that which issued as the '714 patent and itself issuing as U.S. Patent No. 11,570,467 ("the '467 patent"), by the same Examiner who examined the application that issued as the '714 patent, and that the '467 patent has similar claims as the '714 patent. Prelim. Resp. 34, 37–38. This argument also is unpersuasive, for several reasons.

First, the '156 application is a continuing application and not a part of the prosecution history of the '714 patent. The '714 patent issued on January 14, 2020 (Ex. 1001, code (45)), and the Information Disclosure Statement including Rusert was filed in the '156 application on June 7, 2021 (Ex. 2004, 147–153). Second, the claims in the '467 patent issuing from the '156 application do not include this limitation in claims 9, 23, and 30 of the

[16] In its Sur-reply, Patent Owner argues that Rusert is cumulative of Tai. Paper 10, 3. Any argument that Tai alone includes all the teachings from Rusert that Petitioner has relied on should have been presented in the Preliminary Response. In any event, the Sur-reply does not account for, in Tai, all the features Petitioner has relied on Rusert to show, e.g., a prediction list and determining a subset based on the location of the block associated with the first spatial motion vector prediction candidate.

’714 patent: “without making a comparison of each possible candidate pair from the set of spatial motion vector prediction candidates.”

Patent Owner argues the fact that the claims of the ’467 patent are broader than the claims of the ’714 patent actually helps Patent Owner because, logically, the Examiner would have been expected to allowed the narrower claims of the ’714 patent over Rusert. Paper 10, 1–2. We disagree. The argument is misplaced. The inquiry under *Advanced Bionics* is whether the same or substantially the same art or arguments were previously presented to the Office, not whether one can deduce the same Examiner action based on arguments actually previously presented to the Examiner but which are not the same or substantially the same as those presented by the Petitioner here.

3. Preliminary Conclusion

For the foregoing reasons,[17] we find that the same or substantially the same prior art or arguments previously were not presented to the Office. We need not proceed past the first stage of the *Advanced Bionics* framework. We decline to exercise discretion under § 325(d) to deny the Petition.

H. Petitioner’s Filing of Multiple Petitions

The instant Petition is one of two petitions Petitioner filed on the same day, April 8, 2024, against the ’714 patent. No previous petition had been filed by Petitioner against the ’714 patent.

[17] We do not consider § 325(d) arguments relating to Nakamura and WD4, because we determine that the alleged ground of unpatentability based on Nakamura and WD4 lacks sufficient substantive merit, and because we institute review on the basis of the alleged grounds of unpatentability based on Rusert and Karczewicz and based on Rusert, Karczewicz, and Lin.

The Board has indicated that "one petition should be sufficient to challenge the claims of a patent in most situations." Consolidated Trial Practice Guide 59 (Nov. 2019) ("CTPG").[18] But "the Board recognizes that there may be circumstances in which more than one petition may be necessary." *Id*.

Petitioner has filed a paper explaining why in its view two petitions are appropriate in this case against the '714 patent, and ranking the two petitions, if it is permitted only to file a single petition. Paper 4. Petitioner ranks the petition here in IPR2024-00605, challenging claims 9–14, 23–28, and 30 of the '714 patent first, ahead of the Petition in IPR2024-00604, challenging claims 1–8, 15–22, and 29 of the '714 patent. *Id.* at 1.

Petitioner explains: "Here, two petitions are necessary because of the large number of challenged claims (30). Since Patent Owner has not yet identified the claims it intends to assert in district court, all of the challenged claims therefore remain material to the parties' dispute." Paper 4, 1–2. Petitioner further explains:

> The '714 patent has 30 claims, which alone includes 4,349 words, spanning 10 columns of text, reciting complex video compression subject matter. Given the volume of claims, challenging all 30 claims in a single petition would materially reduce the petitions' thoroughness and unduly burden the Board with overly terse analysis that would be more difficult to analyze. Filing two petitions, on the other hand, allows for clearer and more detailed analysis for this volume of claims.
>
> Institution of both Petitions would not be an inefficient use of resources because (i) the challenged claims share some common limitations and similar subject matter; and (ii) the petitions are based on the same prior art. Two petitions are

[18] Available at https://www.uspto.gov/TrialPracticeGuideConsolidated.

> necessary, as discussed below, to address non-overlapping limitations relating to encoding/decoding that include different explanations regarding the same prior art.

Id. at 3.

Petitioner additionally explains that this is not a situation where multiple petitions attack the same claims. Paper 4, 3. Petitioner notes that the claims challenged in this proceeding are directed to receiving and decoding blocks of pixels, and that the claims challenged in IPR2024-00604 are directed to encoding a block of pixels. *Id.* at 3–4. Petitioner notes that although the two petitions are based on the same prior art, different disclosures from the prior art references are relied upon in the two petitions. *Id.* at 4. Petitioner asserts that "multiple petitions are warranted due to the complex nature of the claims," and that "[t]he '714 claims recite granular details of operations performed during motion prediction." *Id.* at 5.

Although we do not think 30 claims are too numerous for one petition to cover, many claims in the '714 patent are extraordinarily lengthy and include numerous limitations. For example, claim 6, which depends from claim 5 which depends from claim 1, is more than one column long in the '714 patent. The length of claim 20, which depends from claim 19, which depends from claim 15, also is more than one column long in the '714 patent. Additionally, we agree with Petitioner that the subject matter of the '714 patent is complex. We further agree with Petitioner that the division of claims among the two petitions, i.e., encoder claims in IPR2024-00604 and decoder claims in IPR2024-00605, is a structured division which helps to facilitate the handling of two petitions.

Patent Owner has not presented arguments urging that the filing of two petitions by Petitioner against the '714 patent is excessive.

For the foregoing reasons, we determine that the filing of two petitions by Petitioner against the ’714 patent is reasonable under these circumstances. We decline to exercise discretion to deny either petition on the ground of the Petitioner filing an excessive number of petitions against the ’714 patent.

IV. CONCLUSION

For the foregoing reasons, we conclude that Petitioner has shown a reasonable likelihood that it would prevail in establishing that at least one of claims 9–14, 23–28, and 30 of the ’714 patent is unpatentable.

V. ORDER

In consideration of the foregoing, it is

ORDERED that *inter partes* review of all challenged claims, i.e., claims 9–14, 23–28, and 30 of the ’714 patent, is instituted on all grounds stated 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; the trial will commence on the entry date of this decision.

For PETITIONER:

Harper Batts
Chris Ponder
Jeffrey Liang
Sheppard, Mullin, Richter & Hampton LLP
HBatts@sheppardmullin.com
CPonder@sheppardmullin.com
JLiang@sheppardmullin.com

For PATENT OWNER:

Scott W. Hejny
Eric S. Hansen
MCKOOL SMITH P.C.
shejny@McKoolSmith.com
ehansen@McKoolSmith.com