UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

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

v.

NOKIA TECHNOLOGIES OY,
Patent Owner

Case: IPR2024-00605
U.S. Patent No. 10,536,714

PATENT OWNER'S RESPONSE

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Ex. No.	Title	Previously Submitted
2001	Declaration of Dr. Iain Richardson	**X**
2002	CV of Dr. Iain Richardson	**X**
2003	File History of App. Ser. No. 15/681,725 ("'725 Application")	**X**
2004	File History of App. Ser. No. 16/741,156 ("'156 Application")	**X**
2005	U.S. Patent No. 11,570,467 to Bici, et al. ("the ''467 Patent")	**X**
2006	Improved Video Compression Efficiency Through Flexible Unit Representation and Corresponding Extension of Coding Tools by Woo-Jin Han, et al.	**X**
2007	A Multi-Pass True Motion Estimation Scheme with Motion Vector Propagation for Frame Rate Up-Conversation Applications by Shen-Chuan Tai, et al.	**X**
2008	A Multistage Motion Vector Processing Method for Motion-Compensated Frame Interpolation by Ai-Mei Huang, et al.	**X**
2009	Bross, "BoG Report on MV Coding and Throughput/Parsing Robustness," Joint Collaborative Team on Video Coding (JCTVC) of ITU-T SG16 WP3 and ISO/IEC JTC1/SC29/WG11, 6th Meeting, Torino, Italy, Jul. 14-22, 2011, Document JCTVC-F744 ("F744")	**X**
2010	Declaration of Dr. Iain Richardson	
2011	Excerpts from "The H.264 Advanced Video Compression Standard", Richardson, 2010 (Cover pages, book pages 28-38, 69, 106, 108, 223-229)	**X**
2012	Gary J. Sullivan et al, "Overview of the High Efficiency Video Coding (HEVC) Standard," in IEEE Transactions on Circuits and Systems for Video Technology, vol. 22, no 12, pp. 1649-1668	**X**
2013	Respondents' Corrected Joint Expert Identification (without Exhibits)	**X**
2014	Declaration of R. Mitch Verboncoeur in Support of Pro Hac Vice Admission	**X**

Ex. No.	Title	Previously Submitted
2015	ITU-T Series H: Audiovisual and Multimedia Systems, Infrastructure of audiovisual service – Coding of moving video, High efficiency video coding (H.265) (04/2013)	
2016	Bici et al., "Non-CE13: Simplification of merge mode," Joint Collaborative Team on Video Coding (JCT-VC) of ITU-T SG16 WP3 and ISO/IEC JTC1/SC29/WG11 7th Meeting: Geneva, CH, 21-30, November, 2011, Document JCTVC-G593	
2017	Bici et al., "CE9: Results of SP experiments on simplification of merge process," Joint Collaborative Team on Video Coding (JCT-VC) of ITU-T SG16 WP3 and ISO/IEC JTC1/SC29/WG11 8th Meeting: San José, CA, USA, 1–10, February, 2012, Document JCTVC-H0252	
2018	Kim et al., "CE9: Summary report of core experiment on MV coding and Skip/Merge," Joint Collaborative Team on Video Coding (JCT-VC) of ITU-T SG16 WP3 and ISO/IEC JTC1/SC29/WG11 8th Meeting: San José, CA, USA, 1–10, February, 2012, Document JCTVC-H0039	
2019	Sullivan et al., "Meeting report of the eight meeting of the Joint Collaborative Team on Video Coding (JCT-VC), San Jose, US, 1–10 Feb. 2012," Joint Collaborative Team on Video Coding (JCT-VC) of ITU-T SG16 WP3 and ISO/IEC JTC1/SC29/WG11 8th Meeting: San Jose, US, 1–10 Feb. 2012, Document JCTVC-H1000	
2020	January 20, 2025 Deposition Transcript of Dr. Charles D. Creusere	
2021	January 22, 2025 Deposition Transcript of Dr. Vivienne Sze	
2022	January 23, 2025 Deposition Transcript of Dr. Clifford Reader	

I. INTRODUCTION

Following the Board's Decision Granting Institution of *Inter Partes* Review ("Decision"), Patent Owner Nokia Technologies Oy ("Nokia") sets forth the substantive errors, omissions, and shortcomings underlying the alleged grounds for invalidity argued in the Petition for *Inter Partes* Review of U.S. Patent No. 10,536,714 (the "'714 Patent") ("Petition" or "Pet."). All three of Petitioner's Grounds are flawed.

First, as to Grounds 1 and 2, Petitioner fails to show that Rusert's alleged "subset" is "based on the location of the block associated with the first spatial motion vector prediction candidate," as required by the claims. It is not, as Nokia explains below.

Second, as to Grounds 1 and 2, Petitioner fails to show that Rusert "compare[s] motion information of the first spatial motion vector prediction candidate . . . without making a comparison of each possible candidate pair from the set of spatial motion vector prediction candidates," as required by the claims. Rusert does not, as Nokia explains below.

Third, as to Ground 3, Petitioner fails to show that Nakamura's alleged "subset" is "based on the location of the block associated with the first spatial motion vector prediction candidate," as required by the claims. It is not, as Nokia explains below.

Fourth, as to Ground 3, Petitioner fails to show that Nakamura "compare[s] motion information of the first spatial motion vector prediction candidate . . . without making a comparison of each possible candidate pair from the set of spatial motion vector prediction candidates," as required by the claims. Nakamura does not, as Nokia explains below.

Fifth, as to Ground 3, Petitioner fails to show that Nakamura "determine[s] to include or exclude the first spatial motion vector prediction candidate," as required by the claims. Nakamura does not, as Nokia explains below.

Sixth, as to Ground 3, Petitioner fails to show motivation to combine Nakamura and WD4. Nakamura and WD4 include competing techniques for building a merge list, and cannot be combined without omitting aspects of one or the other.

Seventh, as to Ground 3, Petitioner fails to demonstrate that WD4 is prior art. Searching for WD4 relies on prior knowledge of its existence to locate the document by its meeting location and highly generic title.

In support of this Patent Owner's Response, Nokia provides a declaration from its expert. Dr. Iain Richardson (Ex-2010). Dr. Richardson's CV is attached as Ex-2002.

Nokia respectfully requests that the Board reject Petitioner's arguments and find that the '714 Patent's challenged claims not unpatentable under any of Petitioner's Grounds.

II. BACKGROUND

A. TECHNICAL BACKGROUND

1. Motion-Compensated Prediction in Video Coding

Many video coding techniques exploit pixel redundancy in both the spatial and temporal domains and involve finding ways to transmit new information in a bitstream by referencing, already communicated information. Ex-2010 at ¶ 53. The goal of these techniques is to reduce the amount of information needed to transmit, store, and playback video. An encoder can signal to a decoder that it should use previously coded data to generate an approximation, or prediction, of a block of pixels in a current frame. The encoder may include additional information, called prediction error or residual information, in a bitstream that a decoder can combine with a prediction to reproduce a reconstructed block. In sum, an encoder communicates to the decoder how to make predictions for each block as well as any residual information in a compressed form, and the decoder creates a prediction, decodes any residual information, and combines residual and prediction to reconstruct a block of pixels. *Id.*

There are two main ways of exploiting redundancy in video coding to create such predictions, namely—intra coding and inter coding. With an intra-coded block, a reference to already coded pixels in the same frame is used to create a prediction. Inter-coding is known as motion-compensated prediction. *Id.* at ¶ 54. The idea behind motion-compensation prediction is to use blocks of pixels from one or more coded frames to predict blocks of pixels in a current frame. Previously coded frames used for motion-compensated prediction are known as reference pictures. *Id.* Reference pictures are prior to a current frame in coding order, but this does not necessarily correspond to the frames' display order.[1] Motion vectors identify the relevant region of pixels in a reference frame to be used for motion-compensated prediction. Instructions for creating a prediction are encoded into a bitstream along with any prediction error or residual information. *Id.*

In video coding, motion may be approximated as being block-wise constant. In other words, blocks in a frame are represented by motion vectors with horizontal and vertical components. An example block size for prediction is 16x16 pixels. This is known as a macroblock. Modern video coding techniques allow for blocks of various sizes, including blocks ranging from 4x4 to 64x64. *Id.* at ¶ 56.

[1] That is, it is possible to use a reference frame that will be displayed *after* the current frame.

The ’714 Patent relates to Merge mode, which is an inter-prediction mode in the H.265 video coding standard. Merge mode exploits the property that motion vectors (i.e., indications of a prediction source in a reference frame) of neighboring blocks are often similar. In Merge mode, the encoder and decoder form lists of motion vector prediction candidates called merge lists, and then—through an indication in a bitstream—the encoder communicates to the decoder which motion vector prediction candidate to use.[2] Merge mode reduces the amount of data needed to transmit, store, and playback video by eliminating the need to transmit motion vectors for predictions directly, instead sending an index to identify the motion vector prediction from the merge list. However, Merge mode can lower prediction accuracy if the motion vectors in the list do not provide precise predictions. Additionally, if a transmission error happens, the decoder may select the wrong candidate from the list. *Id.* at ¶ 64. Moreover, Merge mode requires additional

[2] In Merge mode, a motion vector predictor is selected from a list of candidates, where each candidate is a motion vector from a previously encoded block. The index of the selected candidate in the list is then encoded and transmitted to the decoder. The H.265 standard specifies that decoders will form the list of candidates can using up to five motion vector candidates spatial neighbors in the current frame, and a temporal candidate. Ex-2010 at fn. 4.

processing by encoders and decoders to construct lists. Some Merge mode proposals relied on exhaustive comparisons to build merge lists that were computationally demanding. As with other video coding techniques, the best approach to Merge mode involves a balance of several factors. For example, longer merge lists could improve prediction accuracy, but longer merge lists would require added computational complexity to build the merge lists and additional bits in bitstreams to represent them. The '714 Patent provides a more efficient method for constructing merge lists that reduces the computational demands on encoders and decoders to build merge lists while allowing for precise motion vector predictions.

(a) Role of encoder in motion-compensation prediction

One of the most computationally intensive tasks in motion-compensated prediction is selecting the motion vector for a prediction. This is usually achieved by dividing the current frame into blocks and finding matching regions in previously coded reference frames to predict the blocks in the current frame. While the current frame blocks are typically arranged in a grid pattern, the best matching blocks in the reference frames often do not align with the same grid. As a result, identifying the best matching block requires numerous comparisons between the current block and various regions from the reference frames, each with different motion vectors relative to the current block, to find the optimal match. This process is known as motion estimation. *Id.* at ¶ 67.

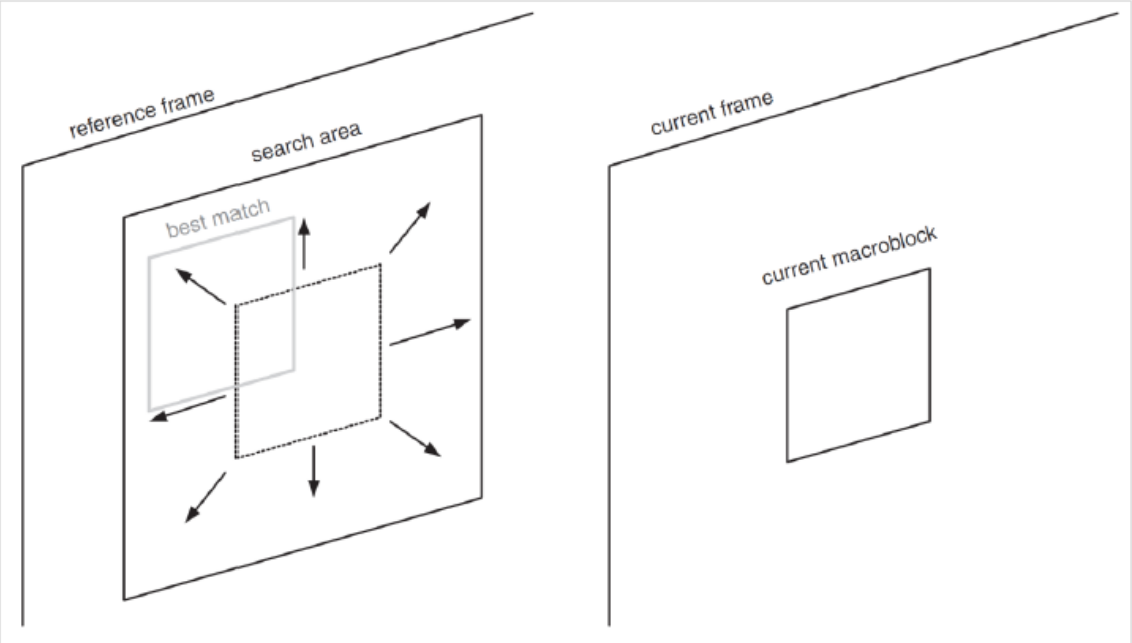


Figure 3.9 Motion estimation

The H.264 Advanced Video Compression Standard, Iain Richardson, 2010, at Section 3.3.1.4 (Ex-2011)

The encoder may select an offset or motion vector that points to an integer pixel offset value, which means that the corresponding block is a block of pixels present in the prior frame. Some encoders, in use at the time of the invention of the ’714 Patent, could choose motion vectors that identify sub-pixel locations (locations between full pixel values). Sub-pixel locations provide greater precision. However, the use of sub-pixel locations generally requires a greater number of calculations because pixel values must be generated for sub-pixel locations. *Id.* at ¶ 68.

Once a suitable block prediction method is chosen and motion vector(s) are identified, the encoder encodes the instructions necessary to recreate the block prediction. These instructions may include the motion vector(s) (or how to predict

the motion vector(s)) and whether they are to be used as part of a uni- or bi-prediction,[3] and an indication of one or more reference pictures. Additionally, the encoder may encode prediction error to represent a difference between a predicted block of pixels and an intended block of pixels. *Id.* at ¶ 69.

The prediction error is usually compressed using a block transform, like the Discrete Cosine Transform. The resulting transform coefficients, which represent the residual, are then quantized and entropy encoded to reduce the amount of data required to represent the residual in the encoded video bitstream. *Id.*

(b) Role of decoder in motion compensated prediction

In inter prediction, a decoder, at a high-level, decodes the bitstream to determine how to predict a block of pixels. It then decodes any prediction error and adds it to the prediction to obtain a reconstructed block of pixels. *Id.* at ¶ 70.

(c) Transmission and decoding of motion vectors

Motion vector data can constitute a significant portion of a compressed video frame, especially when small block sizes are used. Thus, one can reduce the amount of data needed to transmit, store, and playback video by minimizing the data needed to represent motion vectors. Motion vectors from adjacent blocks (both spatially and

[3] Uni-prediction involves one reference block. Bi-prediction involves two reference blocks (which can be from one or more frames).

temporally)[4] tend to be correlated. This redundancy can be leveraged. For example, the motion vector for a current block can be predicted based on the motion vectors of its neighboring blocks. *Id.* at ¶ 57.

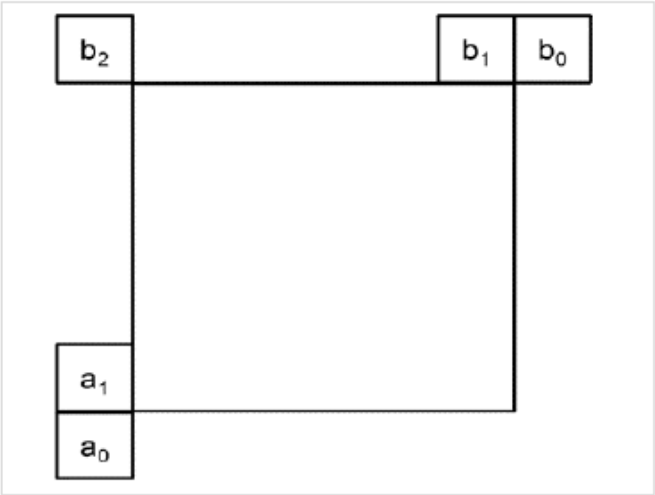
An H.264-compliant decoder can predict a motion vector for a current block of pixels being decoded by using the median of three motion vectors from already-decoded spatially adjacent blocks. Any discrepancy between the current motion vector and its predicted value can be losslessly encoded in the bitstream and decoded by the decoder. In this way, the decoder can predict a motion vector based on previously decoded motion vectors and reconstruct an intended motion vector by adding any signaled difference. *Id.* at ¶ 58.

(d) Merge Mode

H.265-compliant decoders can employ more advanced methods for predicting motion vectors. H.265-compliant decoders can utilize the Merge mode previously discussed. *Id.* at ¶ 62. The following figure, taken from the 2012 paper by Gary Sullivan *et al.* titled "Overview of the High Efficiency Video Coding (HEVC) Standard" (Ex-2012), illustrates the five spatially adjacent blocks (a0, a1, b0, b1, and

[4] Spatially adjacent blocks are those in the same frame as a current block of pixels being encoded or decoded. Temporally adjacent blocks are those in previously coded frames.

b2) that are neighbors to a current block and considered for Merge mode. *Id.* at ¶ 65. The order in which the availability of these blocks for Merge mode is assessed is as follows: a1, b1, b0, a0, b2. Additionally, a temporal candidate from the same location in a reference frame (a previously coded frame, not the current frame) is evaluated. *Id.* A decoder can identify which candidate to use for a predicted motion vector via an index value in a bitstream. Then, the motion information for the current block is "inherited" from the selected candidate block, resulting in the motion information for both blocks being merged. *Id.*



Ex-2012 at Figure 8

It is common for two or more candidates in the list to share the same motion vector. Removing duplicate motion vectors is advantageous as it shortens the list and reduces the number of bits required to specify the correct index value. However, comparing candidates for possible elimination can be computationally intensive.

One objective of the ’714 Patent is to provide an improved merge list process that “reduce[s] the complexity of the implementation [of Merge mode].” Ex-1001 at 4:19-30; Ex-2010 at ¶ 66.

The ’714 Patent arose from the inventors’ work developing the Merge mode of the H.265 Standard. Nokia contributed to the H.265 Merge mode process. The inventors of the ’714 Patent presented their solution for a more efficient and less computationally demanding Merge mode in the JCTVC-G593[5] and JCTVC-H0252 contribution documents. Ex-2016; *see also* Ex-2017. Merge mode was a focal point of a “core experiment” conducted by the JCTVC. Nokia’s JCTVC-H0252 proposal was tested and ultimately accepted by the JCTVC, the committee responsible for creating the H.265 Standard. Ex-2010 at ¶ 63. The Report on the Merge mode core experiment is JCTVC-H0039, and the Meeting Report that formally adopted Nokia’s contribution through JCTVC-H0039 is JCTVC-H1000. Ex-2018; *see also* Ex-2019. Nokia’s approach was accepted during the eighth JCTVC meeting in February 2012. Ex-2010 at fn. 3.

[5] JCTVC stands for the Joint Collaborative Team on Video Coding.

B. FEATURES OF THE '714 PATENT

The inventors of the '714 Patent sought to reduce the computational complexity of constructing Merge lists, including the process of comparing candidates in order to remove redundant candidates. Ex-1001 at 4:19-23.

A 1080p (High Definition) video frame contains 1920x1080 = 2,073,600 pixels. Inter prediction units can be as small as 4 x 4 = 16 pixels, resulting in up to 129,600 prediction units per frame (2,073,600 / 16). Assuming each unit uses Merge mode with 5 candidates, and each candidate is compared once to every other (10 comparisons), this totals 1,296,000 comparisons per frame (129,600 x 10). At 30 frames per second, this could reach 38,880,000 comparisons per second (1,296,000 x 30). While most videos use a mix of larger and smaller inter prediction units and other coding methods, decoders must be computationally capable of performing this number of comparisons per second to decode video.

Figure 8 of the '714 Patent illustrates an improved embodiment for constructing a merge list. In this embodiment, merge list candidates A0, A1, B0, B1, and B2 are part of a set of spatial motion vector prediction candidates, with block 900 representing a block of pixels. Ex-1001 at cl. 9, cl. 23, cl. 30; *see also id.* at 14:43-46, 17:5-13, Figures 9, 11a, and 11b (labeling the locations of merge list candidates relative to the current block); Ex-2010 at ¶ 72.

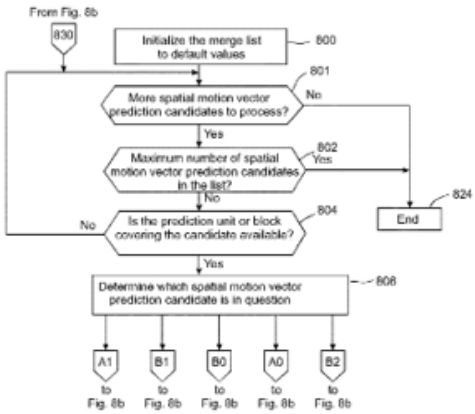


Fig. 8a

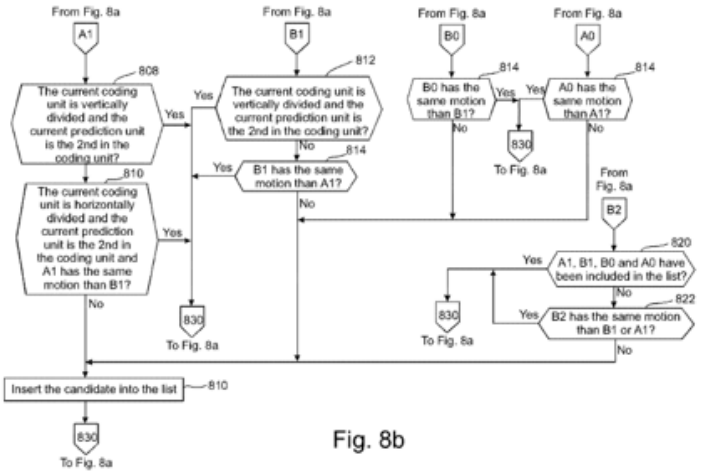


Fig. 8b

Ex-1001 at Figures 8a and 8b.

Each motion vector prediction candidate (A0, A1, B0, B1, and B2, which correspond to the locations of the blocks associated with these candidates)[6] undergoes a limited set of comparisons and conditions to determine its inclusion in the merge list. Ex-2010 at ¶ 73. By eliminating unlikely or illogical candidates, this embodiment reduces the worst-case scenario for comparisons from 10 to 6, Ex-1001 at 14:21-16:55, significantly reducing the number of comparisons that need to be performed to construct the merge list. As one example, the inventors recognized that a sub-divided block is unlikely to have the same motion information for both partitions of the block (otherwise it would typically not be efficient to sub-divide the

[6] A POSITA would understand that labels like "A0" in Figure 9 can refer to both the block location and its associated motion vector. Ex-2010 at fn. 5.

block), and so the candidate corresponding to the first partition of the block could be eliminated without the need for comparison when constructing the merge list for the second partition of the block. This is reflected, for example, in blocks 808 and 812 of Fig. 8b. Ex-1001 at 15:50-16:23.

The first spatial motion vector prediction candidate from the set is a "potential spatial motion vector prediction candidate to be included in a motion vector prediction list for a prediction unit of the block of pixels." *Id.* at cl. 9, cl. 23, cl. 30. For example, if candidate A0 is the "first spatial motion vector prediction candidate" in Claim 23, a subset of spatial motion vector candidates is determined based on the location of the block associated with candidate A0. *Id.*; *see also id.* at 14:64-15:18; Ex-2010 at ¶ 73.

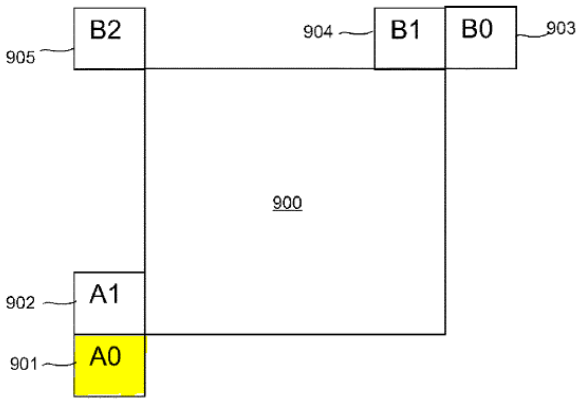


Fig. 9

Ex-1001 at Figure 9 (annotated to show the location of the block associated with candidate A0).

Using candidate A0 as the example for the first spatial motion vector prediction candidate and referring to Figures 8a and 8b of the '714 Patent, the "subset" associated with A0 is {A1}. The subset for A0 does not include B1 or B0, despite A0/B1 and A0/B0 being possible candidate pairs. After the subset is determined based on a location of the block associated with the first spatial motion vector prediction candidate, Claim 23 requires comparing the "motion information of the first spatial motion vector prediction candidate" with the "motion information of the spatial motion vector prediction candidate in the determined subset of spatial motion vector prediction candidates." *Id.* at cl. 23, cl. 30. Again using A0 as an example, A0 is compared to A1 according to the conditions outlined in Figures 8a and 8b. *Id.* at 15:50-16:49. Since A0 is only compared to A1—without any comparison to B0 or B1—the "comparing motion information" limitation is satisfied, as the comparison does not involve each possible candidate pair from the set of spatial motion vector prediction candidates. *Id.* at cl. 23, cl. 30. The decision to include or exclude the first spatial motion vector prediction candidate is based on this comparison step. *Id*; Ex-2010 at ¶ 74.

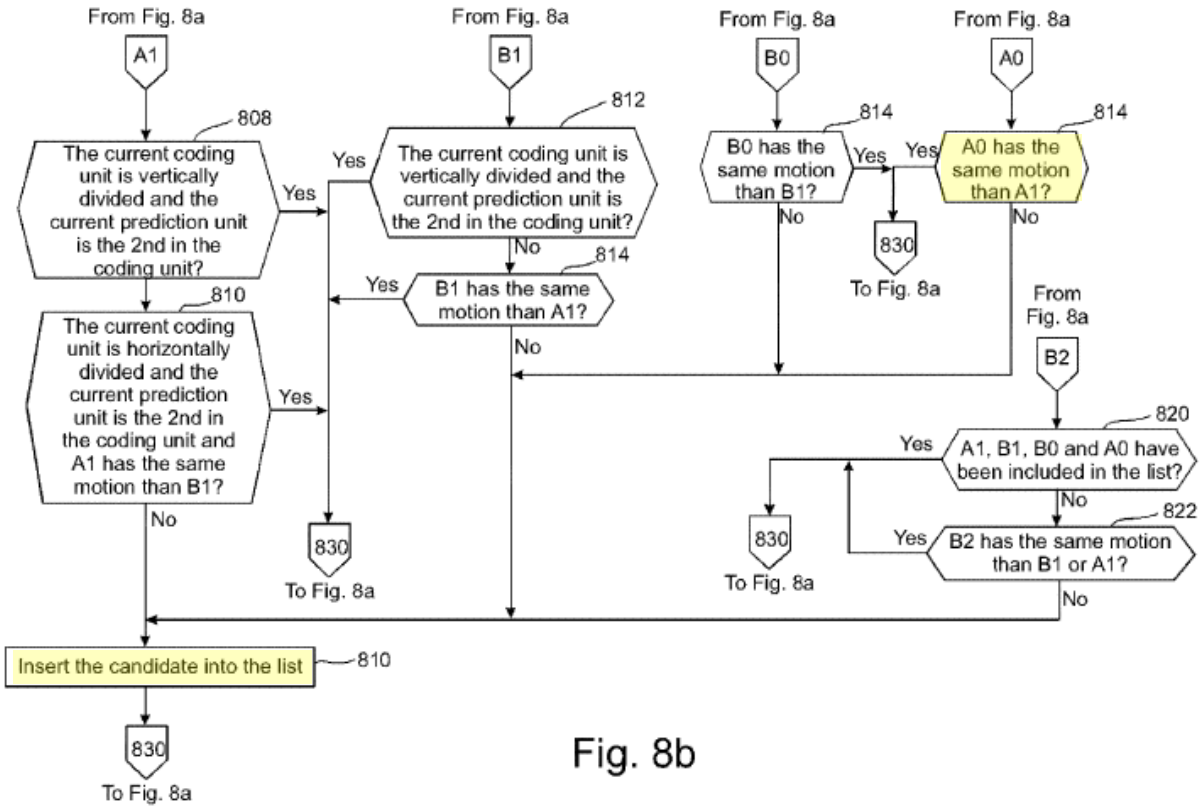


Fig. 8b

Ex-1001 at Figure 8b (annotating the example comparison). If it is determined that A0 has a different motion vector than A1, then A0 is added to the motion vector prediction list as a result of the comparison step. The candidate pairs that are examined are outlined in the ’714 Patent, as illustrated in the table below. Ex-2010 at ¶ 74.

First Spatial Motion Vector Prediction Candidate	Motion Vector Prediction Candidates in the Determined Subset of Spatial Motion Vector Prediction Candidates
A1	No subset. It is automatically included in the merge list if available.
A0	{A1}
B0	{B1}
B1	{A1}

B2	{A1, B1}

C. ALLEGED PRIOR ART

1. Ground 1 – Rusert and Karczewicz

Petitioner's Ground 1 proposes modifying U.S. Patent Application No. 2011/0194609 (Ex-1004) ("Rusert") and U.S. Patent Application Publication No. 2011/0249721 (Ex-1005) ("Karczewicz") with one another's disclosures, arguing a "POSITA would have been motivated to apply Rusert's teachings to H.265 PUs and related concepts." Pet. at 24.

(a) Rusert

Rusert describes a method for generating a potential motion vector (PMV) candidate list, referred to as PMV_CANDS, for a current block of pixels that is either being encoded or decoded. Ex-1004 at ¶¶ 11-12, 36-37. The PMV candidates are derived from previously coded neighboring blocks within an allowed distance from the current block. *Id.* at ¶¶ 11, 40-44, 73. Rusert provides various "scan orders" that describe the locations of possible PMV candidates and the order in which those locations may be checked for PMV candidates. Dr. Creusere characterizes the previously coded blocks in Rusert's scan orders as the "spatial motion vector prediction candidates." Ex-2020 at 72:11-76:19; Ex-2010 at ¶ 75.

Rusert discloses search or scan patterns for an "outward scan . . . around the current block." Ex-1004 at ¶¶ 44, 51-66; *see id.*, Figures 3a-3n (illustrating the

numerical scan order around the current block, labeled '.', starting from block 1 and progressing outward in a counterclockwise direction).

Fig. 3n

Id. at FIG. 3n (annotating the outwards going scan). Using Figure 3n as an example, the PMV_CANDS list can ultimately include the blocks available in the scan order, such as some or all of 1, 2, 3, ..., a, b, c, and so on. Ex-2020 at 75:6-76:1; *see also id.* at 72:11-76:19. In Figure 3n, the current block is represented by a dot. The evaluation begins with the previously coded block immediately above the current block, labeled '1', if available. The next block to the left of the current block, labeled '2', is evaluated if available, and so on. Ex-2010 at ¶ 76.

Some of the blocks in Rusert's scan order may not be available, such as when the current block is near a frame boundary, when certain blocks have not yet been encoded by the time the current block is processed, or when some blocks do not have a motion vector (e.g., intra-coded blocks). Rusert discusses scenarios where blocks

may be unavailable. Ex-1001 at ¶ 54, Figure 3c. Figure 3c illustrates an example where some blocks from the scan order in Figure 3b are unavailable, showing that only blocks 1, 2, 9, h, j, l, and m are available for inclusion in the PMV_CANDS list. Ex-2010 at ¶ 77.

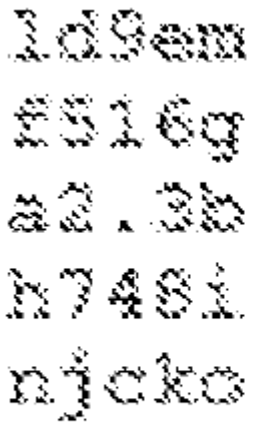


Fig. 3b

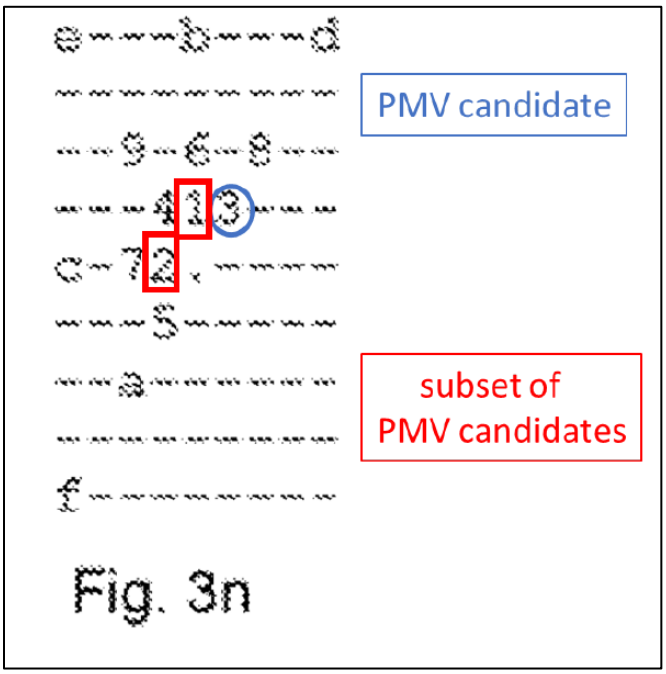
Fig. 3c

Ex-1001 at Figures 3b-3c.

As previously discussed, Rusert conducts an outward scan of selected and available previously coded PMV candidates, beginning from the current block and staying within an allowed distance. *Id.* at ¶¶ 4-5, 36-39, 43-44, 51-66; *see also* Ex-2010 at ¶ 78. As the scan progresses outward, what Petitioner refers to as "the subset," Pet. at 36, is determined by the availability of candidates in the blocks and whether those candidates meet the comparison criteria with the candidates already

present in PMV_CANDS, Ex-1004 at ¶¶ 44, 51-66; *see also id.* at Figures 3a-3n; Ex-2010 at ¶ 79.

For instance, when the motion vector for the block at location 3 ("block 3") is evaluated during Rusert's scan sequence, the subset of candidates in PMV_CANDS includes candidates from previously evaluated scan locations, such as blocks 1 and 2, assuming those blocks are available and that block 2 has not been excluded due to similarity to block 1. Petitioner argues the alleged "subset" (here, blocks 1 and/or 2) is based on the location of block 3, which Petitioner alleges corresponds to the "first spatial motion vector prediction candidate." Pet. at 33-34. This is incorrect. Rusert's "subset" is determined prior to knowing the location or value of the next spatial motion prediction candidate, which in this example is block 3. Ex-2010 at ¶ 80.



Pet. at 33-34.

The motion information for the block being evaluated, in this case, block 3, is then compared to the alleged subset, which includes blocks 1 and 2 in this example, to decide whether block 3's motion vector will be included in PMV_CANDS. Ex-1004 at ¶¶ 62, 71. When Rusert evaluates block 3, all possible pairs of candidates from the scan order are compared. Ex-2010 at ¶ 81. That is, comparisons are done with pairs 1/3 and 2/3. *Id.* at fn. 6.

(b) Karczewicz

Karczewicz describes a variable length code (VLC) for describing a quad-tree pattern by which a coding unit (CU) can be divided into sub-CUs. *See* Ex-1005 at ¶¶ 33-32. These CUs, in turn, may be divided into prediction units (PUs), which each include data for retrieving a reference frame and/or a motion vector. *See id.* at ¶ 35.

Figure 12A of Karczewicz depicts such a quad-tree structure. *See id.* at ¶¶ 123-125. Karczewicz does not disclose a motion vector prediction list.

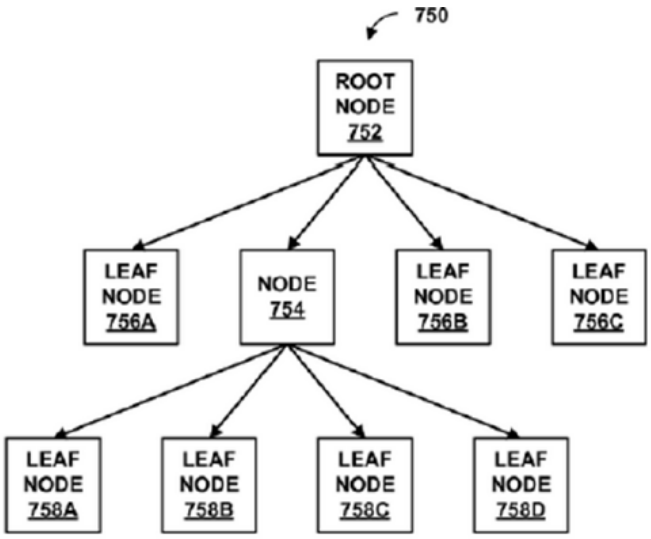


FIG. 12A

Ex-1005 at FIG. 12A.

2. Ground 2 – Rusert, Karczewicz, and Lin

Petitioner's Ground 2 proposes modifying Ground 1 with U.S. Patent No. 10,063,876 (Ex-1006) ("Lin"), arguing 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." Pet. at 50.

(a) Lin

Lin addresses a scenario where a coding unit (CU) is divided into multiple prediction units (PUs). *See* Ex-1006 at ¶¶ 6:60-7:26. Lin discloses that, where a CU

is divided into 2NxN or Nx2N PUs, a motion vector prediction candidate for the second PU located within the first PU is redundant and can be discarded to avoid effectively merging the two PUs as though they were in an NxN configuration. *See id.*

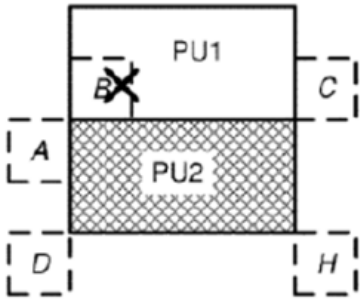


Fig. 7A

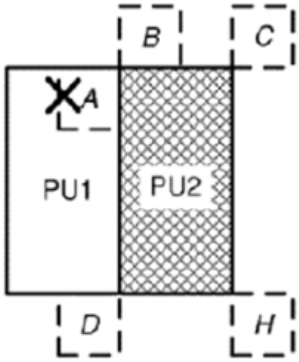


Fig. 7B

Id. at Figures. 7A-7B.

3. Ground 3 – Nakamura and WD4

Petitioner's Ground 3 proposes applying "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, Ex-1008, Ex-1009) ("Nakamura"), Pet. at 60-61, to "the draft H.265 standard" (Ex-1010) ("WD4") "because that was its express purpose," *id.* at 61.

(a) Nakamura

Nakamura (JCTVC-F419) is a submission to the JCTVC, the ITU-T and ISO/IEC working group responsible for developing the HEVC standard. Petitioner

relies on several separate documents consisting of a written description of a proposal, a presentation summarizing the proposal, draft language for implementing the proposal in the HM (the Test Model document describing the then-current draft HEVC standard), and spreadsheets summarizing performance tests performed to compare the proposal to the current HM.

Nakamura attempted to provide methods for deriving candidates for Merge mode and the motion vector predictor (MVP). Ex-1007 at § 1. Nakamura proposed that the positions of the spatial neighbors eligible as merging candidates should align with those of the spatial MVP candidates, effectively unifying the locations of spatial neighbors for both Merge mode and MVP. *Id.* Additionally, the proposed methods sought to standardize the derivation processes for Merge mode and MVP, as shown in Figure 1:

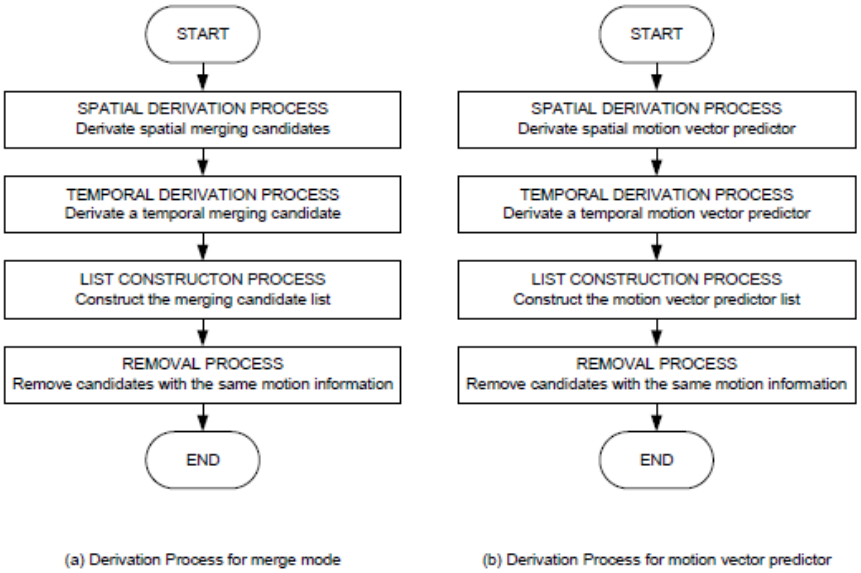
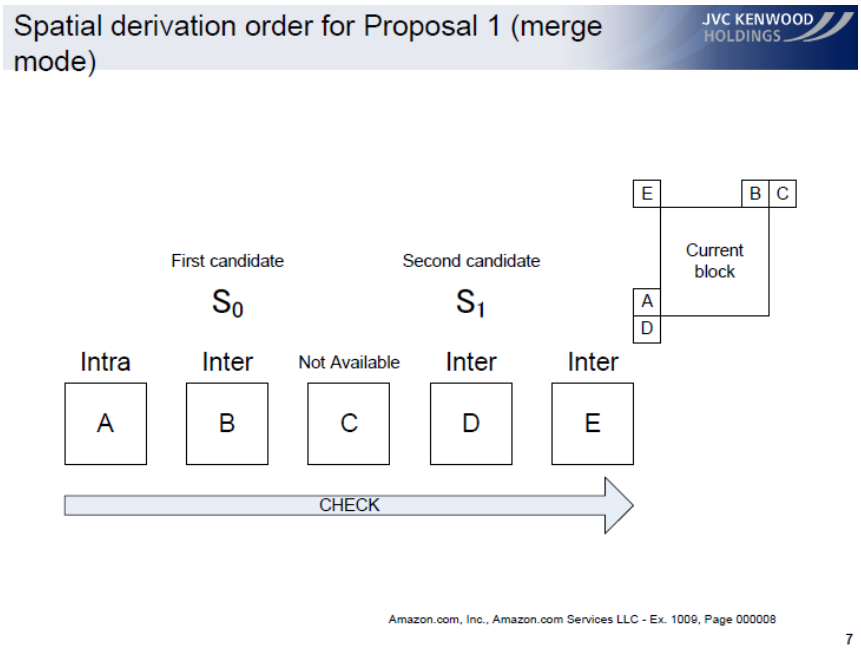


Figure 1 Derivation Process of merge mode and MVP in WD3

Id.; *see also id.* at § 2.1; Ex-2010 at ¶ 82.

Relevant to Merge mode and Petitioner's Ground 3, Nakamura teaches selecting two spatial motion vector prediction candidates (S0 and S1) for a merge list, which are chosen in a scan or checking order from blocks A, B, C, D, and E (blocks within the current frame) relative to the current prediction unit.[7] *Id.* at Abstract, § 1, § 2.2.1, Figures 1, 2(b), Tables 2-4. Specifically, Nakamura checks blocks A-E to find the first available motion vector, which is then designated as spatial candidate S0. Ex-1009 at 8. Once S0 is selected (i.e., it is assigned to the motion vector corresponding to one of the neighboring block locations), it is automatically added to Nakamura's merge list. *Id.* Nakamura then proceeds to check for the availability of a second candidate, S1. S1 which is similarly assigned to the next available motion vector and automatically added to the merge list once identified. *Id.*; Ex-2010 at ¶ 83.

[7] The JCTVC committee adopted Nokia's Merge mode proposal over Nakamura's proposal as part of the draft HEVC/H.265 standard. Ex-2019; Ex-2010 at fn. 7.



Ex-1009 at 8.

Petitioner incorrectly alleges Nakamura's S0 corresponds to a "subset" as described in the claims of the '714 Patent. Nakamura's S0 (like Rusert's alleged subset) is determined before Nakamura knows which block's motion vector will be assigned to S1 (which Petitioner claims is the "first spatial motion vector prediction candidate"). Therefore, S0 (the alleged "subset") cannot be determined based on the location of S1 (the block associated with the "first spatial motion vector prediction candidate") because Nakamura does not know the or use the location of S1 when determining S0. Ex-2010 at ¶ 84. Put simply, S0 is not determined based on the location of S1. Ex-1007 at § 2.2.1; Ex-1009 at 1, 8. The subset S0 remains unchanged regardless of the later choice of S1, as S0 is already selected before S1 is determined. Ex-2010 at ¶ 85.

(b) WD4

WD4 is a working draft of the H.265 standard posted on the JCT-VC's website sometime after the meeting where Nakamura was presented.

4. Comparison of Rusert and Nakamura

Rusert and Nakamura share at least two key similarities. First, both determine what Petitioner refers to as the "subset of spatial motion vector candidates" before selecting or determining the "first spatial motion vector prediction candidate." Second, both Rusert and Nakamura compare the "first spatial motion vector prediction candidate" with each "possible candidate pair." *See, e.g.*, Ex-1001 at cl. 23, cl. 30; *see also* Ex-2010 at ¶ 86.

For the same reasons the Board concluded that "the subset S0 has not been sufficiently shown to be based on the location of the block associated with the first spatial motion vector prediction candidate, S1" in Nakamura, the Board should find Rusert does not meet limitation 1[b]. Institution Decision at 58-59.

(a) In Nakamura and Rusert, the alleged subsets are determined before the alleged first spatial motion vector prediction candidate is known or confirmed

As Dr. Richardson explains in his declaration, both Rusert and Nakamura determine what the Petitioner refers to as the "subset of spatial motion vector candidates" ***before*** determining or selecting what Petitioner calls the "first spatial

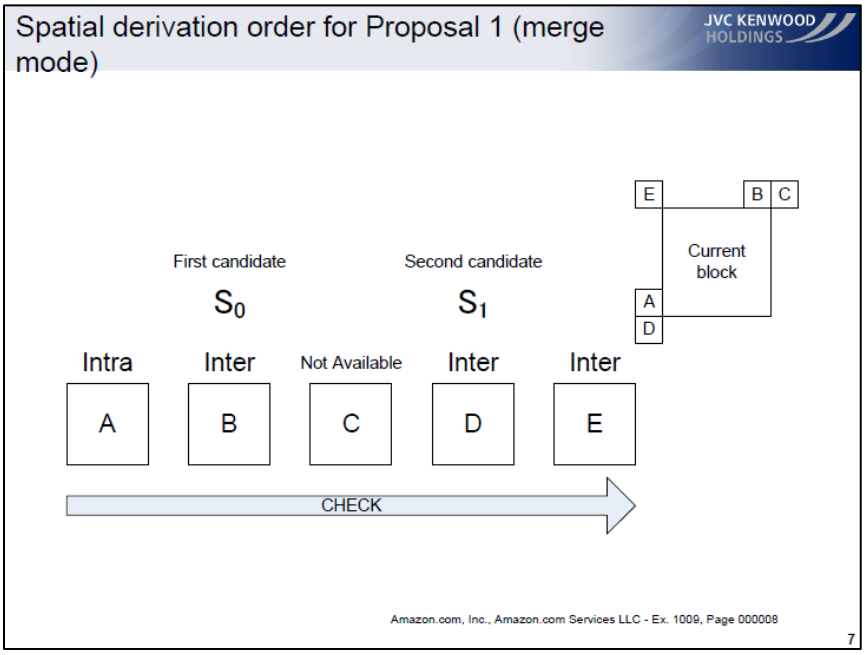
motion vector prediction candidate." Ex-2010 at ¶ 87. Dr. Creusere confirmed this in his deposition:

> **Q.** I think I agree with you, that's certainly true in Rusert, Doctor, that what will be the subset will be based on prior processing done at -- to the point where you reach the -- the first spatial motion vector prediction candidate.
>
> And so to clarify with an example, by the time we reach the -- candidate 3 in Rusert using Figure 3N, we would have done some processing on 1 and 2.
>
> And depending on 1 and 2 and whether they're the same or sufficiently similar or available, that's going to help us inform our choice of subset 3.
>
> Do you agree with that?
>
> **A.** Oh, for Rusert?
>
> **Q.** Yes.
>
> **A.** Yeah, I agree with that on -- with respect to Rusert.
>
> **Q.** Okay. And to some extent -- now I'm going to refer to the Nakamura reference.
>
> That's -- that's also true of the Nakamura reference, where we have S0 and S1; and if we're identifying S1 as the first spatial motion vector candidate, what exists in the subset of S0 will depend on some prior processing before we get to S1 in Nakamura's order.
>
> **A.** I -- I believe it's accurate, yeah. S0 will be filled first, yeah, and then -- and then -- and we don't know what's going to be a priori, right?
>
> So then you'll -- you'll have -- you'll evaluate candidates for S1.

Ex-2020 at 103:20-105:9; *see also* Ex-2010 at ¶ 87.

Patent Owner agrees with Dr. Creusere. In both Rusert and Nakamura, the contents of the alleged "subset" are already determined prior to any selection, processing, or evaluation of what Petitioner refers to as the "first spatial motion vector prediction candidate." Ex-2010 at ¶ 88.

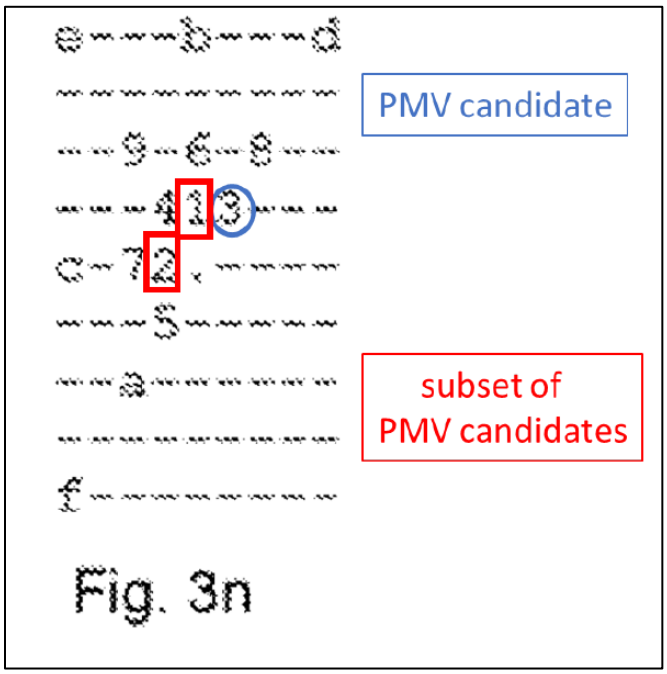
In Nakamura's approach, S0 (the alleged "subset") is determined first, without any knowledge or confirmation of what S1 will be. For instance, in the scenario illustrated in Nakamura's proposal, Ex-1009 at 8, the motion vector associated with neighboring block "B" is selected as the S0 value. Ex-2010 at ¶ 89. Importantly, the "check arrow" in Nakamura clearly shows the order in which A to E are considered. Ex-2010 at fn. 8.



Ex-1009 at 8.

The selection of the motion vector from block B as the value for S0 does not rely on the identity or block location of S1, which—at the time S0 is determined—could be any of C, D, E, or none, depending on availability. This holds true for any potential configuration in Nakamura's method. In other words, Nakamura's alleged subset (the value S0) is established without any knowledge of the alleged first spatial motion vector prediction candidate (the value S1) or the location of the block associated with S1. Thus, necessarily the subset (alleged to be S0) cannot be based on the location of the first spatial motion vector prediction candidate (S1) if S1 is not known or confirmed when the subset (S0) is determined. As Dr. Richardson explains, POSITAs would recognize that the first spatial motion vector prediction candidate must be known and confirmed for any subset to be "based on" its location. The Board correctly highlighted this point in its Institution Decision, noting that "S0 is already selected regardless of what the selection of S1 thereafter might be. The subset S0 does not change depending on the later choice of S1." Institution Decision at 59; *see also* Ex-2010 at ¶ 90.

As for Rusert, below is an annotated version of Rusert's Figure 3n from page 34 of the Petition and Paragraph 127 of Dr. Creusere's declaration. Pet. at 33-34; *see also* Ex-1003 at ¶ 127. Here, blocks '1' and '2' are the alleged subset, while block '3' is the alleged first spatial motion vector prediction candidate. Ex-2010 at ¶ 91.

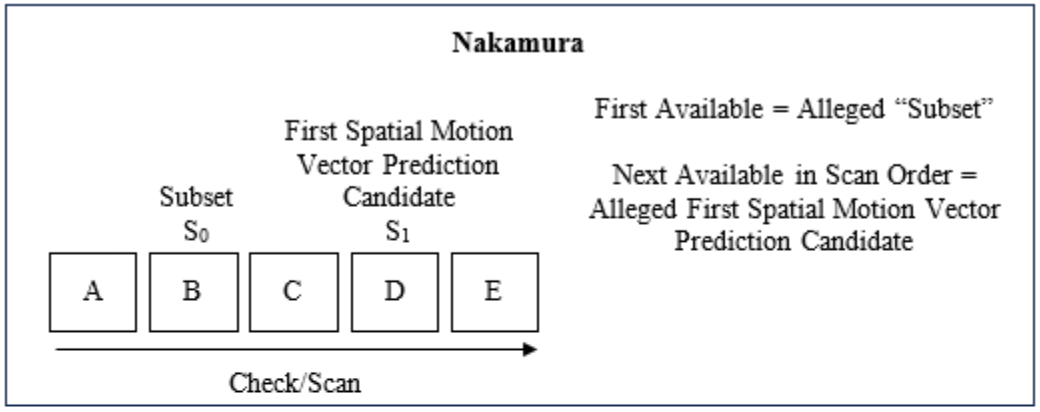


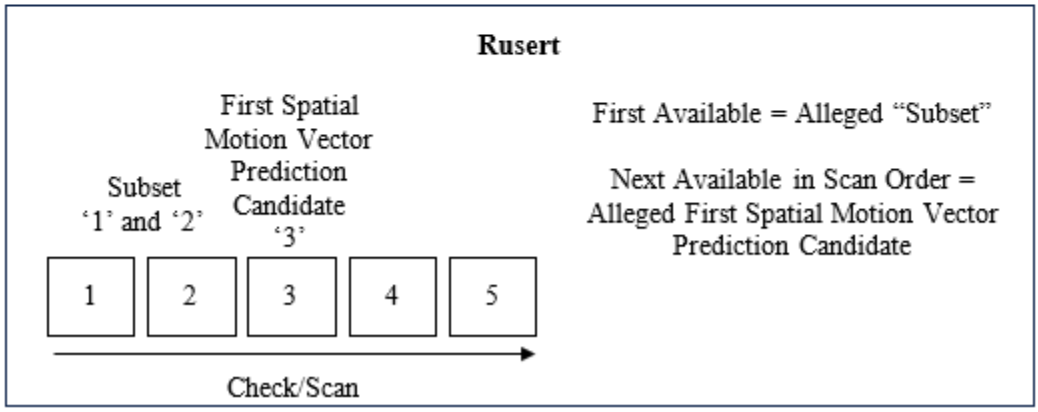
Pet. at 34; *see also* Ex-1003 at ¶ 127.

The content of Rusert's alleged subset depends on the availability of blocks processed up to that point. For instance, if the motion vector of block '1' is unavailable, Ex-1004 at ¶ 54 (providing examples where blocks may be unavailable due to coding order or lack of motion vector); *see also supra* Section II(C)(1)(a), the alleged subset will consist of just the motion vector of block '2'. The alleged subset also depends on a comparison between the motion vectors of blocks '1' and '2', assuming both are available. If both blocks are available and their motion vectors are sufficiently similar or identical, the alleged subset will consist of just block '1'. Ex-2010 at ¶ 92.

By the time Rusert begins processing to determine whether the motion vector for block '3' is available and whether to add it to PMV_CANDS, the alleged subset has already been established. Rusert does not know if block '3' or any associated motion vector is available when the alleged subset is determined. If block '3' is unavailable (e.g., it is intra-coded), and if blocks '1' and '2' are part of the subset, the next available candidate, such as block '4', '5', or another later block, will be compared to blocks '1' and '2'. Therefore, in Rusert, the alleged subset (which could be block '1' or blocks '1 and 2' in this case) has already been selected, regardless of which block (such as block '3', '4', or any later one) is chosen as the first spatial motion vector prediction candidate. The subset does not change based on which candidate is available and later selected for evaluation. *Id.* at ¶ 93.

Dr. Richardson's figure (provided below) demonstrates how in both Nakamura and Rusert, the alleged subsets are established before the first spatial motion vector prediction candidate is identified or confirmed. In Nakamura, S0 is assigned the motion vector of block B before a suitable motion vector for candidate S1 is determined. Similarly, in Rusert, PMV_CANDS is established as '1', '1, 2', or '2' before deciding whether to add the next available block's motion vector to PMV_CANDS. *Id.* at ¶ 94.





(b) In Nakamura and Rusert, comparisons are performed with all possible candidate pairs

Both Rusert and Nakamura compare what Petitioner alleges to be the "first spatial motion vector prediction candidate" with each "possible candidate pair." *See, e.g.*, Ex-1001 at cl. 23, cl. 30.

In Nakamura, the first available motion vector prediction is added to the list as S0. Nakamura then scans for the next available candidate, which, once found, is labeled S1. S1 is always compared to S0. Given Nakamura's approach, the only

possible pair of spatial motion vector prediction candidates is S1 and S0.[8] *See, e.g.*, Ex-1009 at 8; Ex-2010 at ¶ 96.

Below is a highlighted excerpt from Nakamura's JCTVC-F419 proposal, which explains that the only possible pair of spatial motion vector prediction candidates is S1 and S0. Ex-1007 at 2; Ex-2010 at ¶ 97.[9]

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)

Notes:

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

S_1: The second spatial candidate found in the spatial derivation process

[8] This holds true in any scenario, whether S0 and S1 constitute the set of "candidates" or A, B, C, D, and E are regarded as the set of "candidates." Ex-2010 at fn. 9.

[9] As Dr. Richardson explains, the abbreviation "Col" refers to a "collocated" block, which is a temporal motion vector prediction candidate and not a "spatial motion vector prediction candidate."

Rusert follows a similar approach. Looking at Figure 3n, the first available candidate in the scan order is automatically added to the PMV_CANDS list. Ex-1004 at Figure 3n. For instance, if block 1 is available, '1' is added to the PMV_CANDS list. Rusert then scans for the next available candidate in the scan order. If block 2 is available, '2' is chosen as the next candidate, and compared with '1'. This comparison involves all possible candidate pairs at this stage in Rusert's process to decide whether '2' should be added to the PMV_CANDS list. Ex-2010 at ¶ 98.

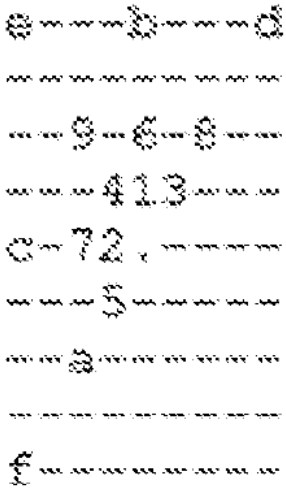


Fig. 3n

Ex-1004 at Figure 3n.

Rusert continues this process until the scan order is complete or the maximum list size is reached.[10] For instance, if '3' is available, it becomes the next candidate. If the PMV_CANDS list already contains '2' and '1', '3' will be compared to both '2' and '1'. Again, this step involves comparing all possible candidate pairs to decide whether '3' should be added to the list. Ex-2010 at ¶ 99.

III. PERSON OF ORDINARY SKILL IN THE ART

Patent Owner has applied Petitioner's definition of a POSITA for the sake of this Response. Pet. at 21.

IV. CLAIM CONSTRUCTION

The Board found that Petitioner's interpretation that "the block" in limitation 1[b] means the "current block," as in the "block of pixels" introduced in limitation 1[a] as unpersuasive. Institution Decision at 15-17, 29-32; Pet. at 22. Patent Owner agrees.

The Board proper interpreted the phrase "determine a subset of spatial motion vector prediction candidates based on the location of the block associated with the

[10] According to the Petitioner's interpretation of Rusert, each iteration in the scan involves selecting a new first spatial motion prediction candidate. In Rusert, for every subsequent iteration, the next available candidate in the scan order becomes the new "first spatial motion prediction candidate." Ex-2010 at fn. 10.

first spatial motion vector prediction candidate" to mean the subset is determined based on the location of the block with which the first spatial motion vector prediction candidate is associated. Institution Decision at 15-17. For instance, in Figure 9 of the '714 Patent, the block labeled "901" is associated with the first spatial motion vector prediction candidate, "A0." Ex-2010 at ¶ 43.

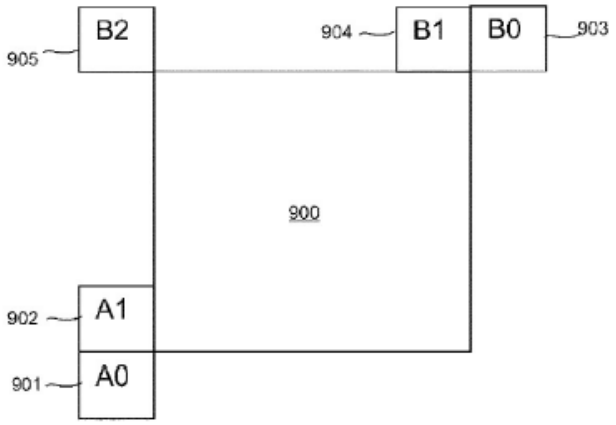


Fig. 9

Ex-1001, Figure 9. Petitioner argues the "based on the location of the block associated with the first spatial motion vector prediction candidate" limitation should be interpreted to mean "based on the location of [the encoded block of pixels]." Pet. at 22. Meaning, Petitioner contends that the claim language "the block associated with the first spatial motion vector prediction candidate" should be interpreted to refer to block 900 in Figure 9 (above), rather than to one of the blocks corresponding to any first spatial motion vector prediction candidate such as A0, A1, B0, B1, or B2. Ex-2010 at ¶ 44.

The only argument Petitioner put forward for its theory is that "[d]uring prosecution of the parent '833 patent, the Examiner allegedly applied Petitioner's interpretation, with 'the' block as the 'current block.'" Pet. at 22. The Board found Petitioner's argument unconvincing, stating that "[c]laim 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." Institution Decision at 17.

Petitioner's interpretation reads out the words "associated with the first spatial motion vector prediction candidate" from the limitation. The '714 Patent makes clear that the candidate motion vectors for the current frame use either "one or more … motion vectors of one or more neighbour blocks … of the current block in the same frame and/or co-located blocks … of the current block in one or more other frames[.]" Ex-1001 at 12:51-56. That is, these are motion vectors associated with other blocks, rather than the current block (which when processed lacks a motion vector), to define a list of suitable motion vector candidates for the current block, as would be understood by a POSITA. As Dr. Richardson explains, a POSITA would readily understand that "the block associated with the first spatial motion vector prediction candidate" refers to the blocks labeled 901 through 905 or A0 through B2 in Figure 9 above. Petitioner's interpretation fails to provide any real meaning to the

phrase "associated with the first spatial motion vector prediction candidate" in the claim language. Ex-1001 at cl. 9, cl. 23, cl. 30; Ex-2010 at ¶ 45.

Moreover, Petitioner and Dr. Creusere's allegations regarding the Examiner's interpretation of the claims are wrong as Dr. Richardson explains in his declaration. Ex-2010 at ¶ 46. Dr. Creusere alleges the Examiner interpreted "based on the location of the block associated with the first spatial motion vector prediction candidate" as referring to "based on the location of the 'current block.'" Ex-1003 at ¶ 66 (citing Ex-1015 at 000168). The only evidence Dr. Creusere cites to support this is the Examiner's Non-Final Office Action. *Id.* However, the Examiner's Non-Final Office Action supports Patent Owner and the Board's interpretation. Ex-2010 at ¶ 46.

The section of the page Dr. Creusere references in the prosecution history from the parent application, Ex-1015 at 000168, is highlighted below. In this part of the prosecution history, the Examiner addresses the phrase "based on the location of the block associated with the first spatial motion vector prediction candidate." The Examiner points to Tai, Ex-2007, and defines the subset "by selecting ***one of the*** $\overrightarrow{\boldsymbol{PMV}}$ ***from MVs of neighboring blocks***." Ex-1015 at 000168 (emphasis added); Ex-2010 at ¶ 47.

> determining a subset *(i.e.* $CS^i(\vec{X},t) = \{\vec{V} | \vec{V} = \overrightarrow{PMV}^i(\vec{X}) + \vec{U}, \vec{U} \in US^i\}$*- equation 2)* of spatial motion vector predictions based on the location of the block associated with the first spatial motion vector prediction candidate *(i.e. by selecting one of the* $\overrightarrow{PMV}$ *from MVs of neighboring blocks, a subset of* $CS^i(\vec{X},t)$ *is defined for different linear combination of that PMV and* $\vec{U} \in US^i$*);*

Ex-1015 at 000168 (highlighting added).

Below is a highlighted excerpt from Tai including the equation cited by the Examiner. Notably, $\overrightarrow{\boldsymbol{PMV}}$ is "chosen from the MVs of the neighboring blocks." *See* Ex-2007 at Figure 3 (illustrating exemplary patterns of neighboring blocks). Each neighboring block has an associated motion vector that may be selected as "$\overrightarrow{\boldsymbol{PMV}}$". This is what the Examiner referred to when stating "by selecting on of the $\overrightarrow{\boldsymbol{PMV}}$ from MVs of neighboring blocks." Ex-1015 at 000168. The Examiner did not point to a PMV selected from the motion vector of the current block, as Petitioner and Dr. Creusere seem to suggest. As Dr. Richardson explains in the context of the highlighted excerpt from Tai below, Petitioner and Dr. Creusere's interpretation is illogical, as the purpose of Tai's method is to address the situation where the current block lacks a motion vector and therefore requires a predicted motion vector. Ex-2010 at ¶ 48.

> The candidate vector set $CS^i(\overrightarrow{X}, t)$ is comprised by a single PMV and a set of update vectors. Let $\overrightarrow{X}$ represent the block location and let t be the frame number. The candidate vector set for this particular block in the ith pass are then defined as
>
> $$CS^i(\overrightarrow{X}, t) = \left\{ \overrightarrow{V} \,|\, \overrightarrow{V} = \overrightarrow{\text{PMV}}^i(\overrightarrow{X}) + \overrightarrow{\text{U}}, \overrightarrow{\text{U}} \in US^i \right\} \quad (2)$$
>
> where $\overrightarrow{\text{PMV}}^i(\overrightarrow{X})$ is the PMV of block $\overrightarrow{X}$ and is chosen from the MVs of the neighboring blocks and US^i is a set of update vectors. Every motion vector $\overrightarrow{V}$ in the candidate vector set is comprised by a single PMV and a update vector $\overrightarrow{U}$ selected from update vector set US^i.

Ex-2007 at 3 (highlighting added).

V. CLAIM LISTING

For the sake of this analysis, Patent Owner will use Petitioner's limitation labels provided in the Petition's claim appendix. Pet. at 90-100.

VI. ARGUMENT

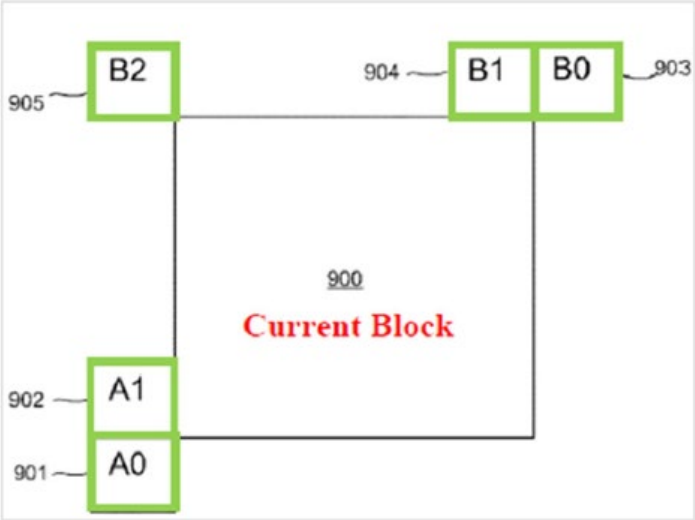
A. GROUND 1 – RUSERT IN COMBINATION WITH KARCZEWICZ

1. Rusert does not teach "determining a subset of spatial motion vector prediction candidates based on a location of the block associated with the first spatial motion vector prediction candidate"

Petitioner alleges this limitation is found in Rusert. However, Rusert does not teach "determine a subset of spatial motion vector prediction candidates based on a location of the block associated with the first spatial motion vector prediction

candidate," as required by the claims. Ex-1001 at cl. 9, cl. 23, cl. 30. What Petitioner alleges to be Rusert's subset of spatial motion vector candidates is not determined by the location of the block associated with the alleged first spatial motion vector candidate, nor is the determination of the alleged subset based on the alleged first spatial motion vector candidate. Ex-2010 at ¶ 101.

The '714 Patent describes how a set of spatial motion vector prediction candidates is derived from neighboring blocks surrounding the current block of pixels being encoded or decoded. Ex-1001 at 13:26-31. The following figure illustrates this relationship, with highlights around the neighboring blocks from which the set of spatial motion vector prediction candidates is sourced. Ex-2010 at ¶ 102.



Ex-1001 at Figure 9 (annotated to show the set of motion vector prediction candidates A0, A1, B0, B1 and B2).

As the ’714 Patent specifies, and as a POSITA would recognize, when creating the motion vector prediction list, first a spatial motion vector prediction candidate is chosen for evaluation and is then compared to a subset of other spatial motion vector prediction candidates. This comparison involves checking whether each candidate in the subset shares the same motion information as the selected candidate. *Id.* at 15:50-16:55. The purpose of this comparison is to prevent adding a redundant spatial motion vector prediction candidate to the motion vector prediction merge list. *Id.* at 4:19-26; *see also* Ex-2010 at ¶ 103.

The subset described in the ’714 Patent is determined “based on the location of the block associated with the first spatial motion vector prediction candidate.” For each candidate, a subset is selected that is smaller than the entire set of candidates. Instead of comparing a candidate to all possible candidate pairs, the candidate is compared to a subset to avoid redundancy and reduce the computational workload for the comparisons. Ex-1001 at 4:19-26. The ’714 Patent provide examples of comparing a candidate with a subset. *See, e.g.*, *id.* at cols. 15-16. Referring to the Figure above, for the candidate located to the left (A1), the ’714 Patent teaches that a subset containing only B1 can be used for comparison. *Id.* at 15:50-16:7. Similarly, for the candidate located at the top left (B2), the ’714 Patent teaches that a subset containing only A1 and B1 should be used for comparison. *Id.* at 16:40-49; *see also* Ex-2010 at ¶ 104.

In the embodiments of the ’714 Patent, the location of the selected spatial motion vector prediction candidate must be known first to determine the subset based on that location. That is, the location of the selected spatial motion vector prediction candidate (e.g., A1 or B2) determines the members of the subset used for comparison (e.g., {B1} or {A1, B1}). This contradicts Petitioner’s construction of “the block” in element 1[b]. Pet. at 22 (arguing that “the block” in element 1[b] refers to the “block of pixels” (i.e., the “current block” being encoded or decoded)); *see also* Ex-2010 at ¶ 104; *supra* Section IV.

In its Institution Decision, the Board rejected the Petitioner’s interpretation of “the block” as “the block of pixels” in limitation 1[a]. Institution Decision at 17. In fact, the Board sided with Patent Owner, agreeing that “the block” in limitation 1[b] refers to “the block associated with the first spatial motion vector prediction candidate,” as specified in limitation 1[b]. *Id.*; *see also* Ex-2010 at ¶ 105. Regarding Petitioner’s alternative argument, Pet. at 36-37, Patent Owner disagrees with the Board that Rusert discloses limitation 1[b].

In Rusert, each spatial motion vector candidate is obtained from neighboring blocks in a scanning order determined by its distance from the current block. For each candidate, Rusert assesses whether it should be added to the list, if available, and then proceeds to the next PMV candidate in the scanning order until the process is completed. Ex-1004 at ¶ 44. Figure 3n of Rusert shows an example of this

distance-based scanning method, where the closest PMV candidates are evaluated first, followed by the farthest (i.e., in the order 1, 2, 3 . . . 9, a, b . . . depending on availability), in a counterclockwise spiral starting from the current block, marked as '.'. *Id.* at ¶ 58; *see also* Ex-2010 at ¶ 106.

When deciding whether to add a PMV candidate to the motion vector prediction (PMV_CANDS) list, Rusert compares the candidate to each of the PMV candidates already on the list. For instance, if candidate 1 is already on the list at the time candidate 2 is considered for inclusion, candidate 2 will be compared to candidate 1. If candidates 1 and 2 are on the list at the time 3 is considered, candidate 3 will be compared to both candidates 1 and 2, and so on. Ex-1004 at ¶¶ 71-72. If the comparison shows the candidate being considered is the same or similar to one already on the list, it can be excluded from the PMV_CANDS list. *Id.*; *see also* Ex-2010 at ¶ 107.

Petitioner is mistaken in claiming that the alleged "subset" is determined based on the location of its alleged first spatial motion vector prediction candidate for at least two reasons. First, the contents of PMV_CANDS when a PMV candidate is considered have already been established, regardless of the first spatial motion vector prediction candidate under consideration. Second, the PMV_CANDS list is determined by the values of the previous candidates, not by the location of the current candidate being evaluated. Pet. at 36-37; *see also* Ex-2010 at ¶ 108.

Regarding the first point, Rusert's PMV_CANDS list is built by scanning neighboring blocks in an order based on their distance from the current block, where each available motion vector block along the scan path can be checked as a PMV candidate.[11] Ex-1004 at ¶ 61, Figure 3n. Motion vectors of blocks that are outside the allowed distance or are unavailable cannot be included in the PMV_CANDS list. *Id.* at ¶ 54; *see also* Ex-2020 at 125:9-127:20; Ex-2010 at ¶ 109.

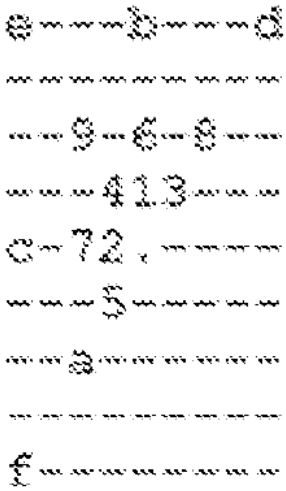


Fig. 3n

Ex-1004 at Figure 3n.

[11] In Rusert, only valid motion vectors can be included in the subset of motion vectors in PMV_CANDS. Ex-1004 at ¶ 44. Therefore, a block that is unavailable is excluded from Rusert's scan order and is not evaluated for inclusion in PMV_CANDS. Ex-2010 at fn. 12.

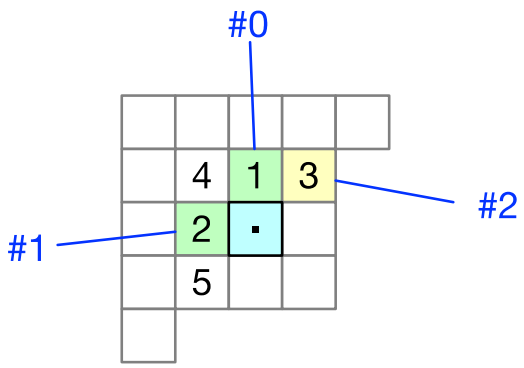
Petitioner alleges that if the current block is 3, the subset would consist of blocks 1 and 2, i.e., {1, 2}, which is dependent on the evaluation of block 3. Pet. at 36-37. This argument is incorrect. For example, at iteration 0 of Rusert's scan (see below table), PMV_CANDS is empty, and block 1 is evaluated and added to PMV_CANDS. At iteration 1, PMV_CANDS now contains {1}, and block 2 is evaluated and added. At the next iteration (iteration 2), regardless of the position of block 3 (which may or may not have an available motion vector to be a spatial motion vector prediction candidate), PMV_CANDS (the alleged subset) can only include blocks 1 and 2. The location of block 3, assuming an associated motion vector is available, does not influence the construction of the previous content of PMV_CANDS (the alleged subset). For instance, if block 3 is available, iteration 2 compares block 3 (following the scan order in Figure 3n above) with a subset (PMV_CANDS) that already contains blocks 1 and 2. Ex-2010 at ¶ 110.

Iteration	PMV_CANDS before	Block being evaluated	PMV_CANDS after
0	{}	1	{1}
1	{1}	2	{1, 2}
2	{1, 2}	3	{1, 2, 3}

By the time neighboring block 2 has been evaluated, the content of the PMV_CANDS list for the next block to be considered is already determined. It will include candidates 1 and 2, assuming they are sufficiently dissimilar. The location and information related to block 3 (or block 4 if block 3 is unavailable) do not impact

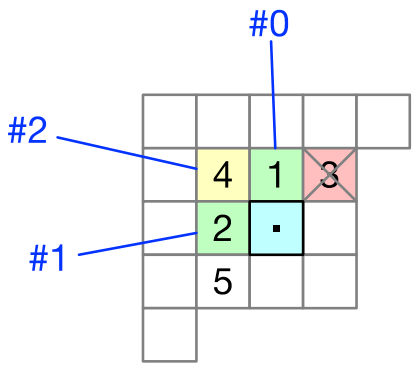
the contents of PMV_CANDS when the motion vector of block 3 (or 4) is being evaluated. PMV_CANDS is already established before considering the next block. No information about a candidate (including its position) is used to determine PMV_CANDS prior to evaluating that candidate. Therefore, PMV_CANDS (the alleged subset) is not determined based on the location or any other characteristic of the so-called "first spatial motion vector prediction candidate."

Consider three examples, based on the scan order of Figure 3n. First, all neighboring blocks are available (i.e., they have motion vectors and have already been coded). Assume that all evaluated blocks are added to PMV_CANDS based on comparisons. At iteration #0 (highlighted in green), the previous PMV_CANDS is empty {} and block 1 is evaluated. Then the block 1's motion vector is added to PMV_CANDS. At iteration 1 (highlighted in green), the previous PMV_CANDS is {1} and block 2 is evaluated. Then block 2's motion vector is added to PMV_CANDS. At iteration 2 (highlighted in yellow), the previous PMV_CANDS is {1, 2} and block 3 is evaluated. Then block 3's motion vector is added to PMV_CANDS. Ex-2010 at ¶ 110.



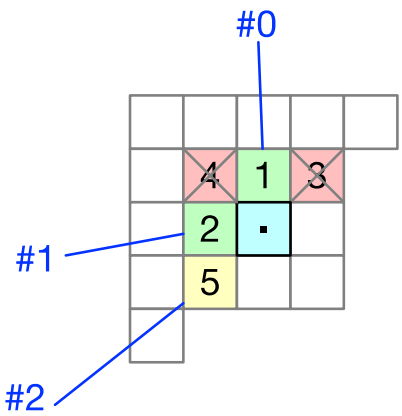
Example 1

Second, assume block 3 is unavailable: e.g., it is intra coded and has no motion vector. Iterations 0 and 1 are the same as in example 1. At iteration 2 (highlighted in yellow), the previous PMV_CANDS is {1, 2} and block 4 is evaluated. *See* Ex-1004 at ¶ 54. Then block 4's motion vector is added to PMV_CANDS. Ex-2010 at ¶ 111.



Example 2

Third, assume blocks 3 and 4 are both unavailable. Iterations 0 and 1 are the same as in examples 1 and 2. At iteration 2 (highlighted in yellow), the previous PMV_CANDS is {1, 2} and block 5 is evaluated. *See* Ex-1004 at ¶ 54. Then block 5's motion vector is added to PMV_CANDS.



Example 3

Comparing these three examples, we see that the location of the block evaluated at iteration 2 has changed. That is, it may be the block at location 3, 4, or 5 depending on block availability. However, the contents of PMV_CANDS (the alleged subset) at iteration 2 have not changed, as seen in the table below. Therefore, the content of PMV_CANDS prior to evaluating a new block (e.g., the bock evaluated at iteration 2) cannot depend on the location of that new block. This is demonstrated by the fact that at iteration 2, regardless of whether the new block is located above and to the right (example 1), above and to the left (example 2), or below and to the left (example 3), the content of PMV_CANDS is the same. Ex-2010 at ¶¶ 113-115.

Iteration	PMV_CANDS before	Block being evaluated	PMV_CANDS after
0	{}	1	{1}
1	{1}	2	{1, 2}
2	{1, 2}	5	{1, 2, 5}

For purposes of its argument under the Board and Patent Owner's interpretation, Petitioner alleges that the claimed "block associated with the first spatial motion vector prediction candidate" is the block being evaluated at a current iteration of Rusert's scan path. In the examples above, this block is either block 3, 4, or 5 depending on availability. Petitioner also alleges that the claimed "subset of spatial motion vector candidates" is the list PMV_CANDS prior to evaluating the block at the current iteration of Rusert's scan path. In the examples above, this is PMV_CANDS prior to iteration 2.

The above discussion shows that the alleged subset (PMV_CANDS) is not determined based on the location of the alleged first block (whichever block is evaluated at iteration 2 in the above examples). Rather, the content of PMV_CANDS prior to evaluating a new block depends on the current iteration number (iteration 2 in the above examples) and whether each previously evaluated block has been added to PMV_CANDS or not (whether blocks 1 and 2 have been added to PMV_CANDS in the above examples). In the above examples, the content of PMV_CANDS prior to iteration 2 can be either {1} or {1, 2}. This content cannot and does not depend on the location of the block being evaluated at iteration 2. The only factor determining the candidates in the PMV_CANDS list at any given iteration is the

availability and motion vectors of the blocks considered before the current block being evaluated.

Instead of being based on the location of a PMV candidate under consideration, the set of PMV candidates used for comparison in Rusert is determined by the availability and value of each PMV candidate that has already been considered and added to the list. Ex-1004. As explained above, when candidate 3 is compared to candidates 1 and 2, it is not because candidate 3 is in the top right. Rather, it is because candidates 1 and 2 are available and sufficiently dissimilar, which is why they were both previously added to PMV_CANDS. *Id.* at ¶¶ 70-72; *see also* Ex-2010 at ¶ 117.

In its Institution Decision, the Board presented the following 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." Institution Decision at 34. This example mischaracterizes Rusert. For instance, if the first selected candidate is at the location of block 5, Rusert's PMV_CANDS ***may*** consist of {1, 2, 3, 4}, but it could also be a smaller set, such as {1, 2}, {1, 3}, etc., depending on the availability of blocks and the similarity of their motion vector values. Likewise, if the first selected candidate is at the location of block 3, PMV_CANDS could consist of {1, 2}, but it could also consist of {1}, {2}, or be empty, depending on the availability

and similarity of the blocks, as explained above. In other words, the alleged subset PMV_CANDS could consist of {1, 2} for the first selected candidate at block 3, block 4, block 5, or any other block in Rusert's scan, depending on block availability. For these reasons, Patent Owner disagrees with the Board's conclusion that "[t]he members of the determined subset [PMV_CANDS] depend on the location of the block associated with the first selected spatial motion vector prediction candidate." Institution Decision at 34; *see also* Ex-2010 at ¶ 118. In short, Rusert does not determine "a subset of spatial motion vector prediction candidates based on a location of the block associated with the first spatial motion vector prediction candidate."

Accordingly, Rusert fails to teach at least elements 9[b], 23[b], and 30[b], and the Petitioner has failed to show by a preponderance of evidence that the Challenged Claims are unpatentable based on this Ground. Petitioner does not rely on Karczewicz for this limitation. Pet. at 32-37.

2. Rusert does not teach "comparing . . . without making a comparison of each possible candidate pair from the set of spatial motion vector prediction candidates"

Petitioner alleges this limitation is found in Rusert. However, Rusert does not teach "comparing . . . without making a comparison of each possible candidate pair from the set of spatial motion vector prediction candidates." *See, e.g.*, Ex-1001 at cl. 23, cl. 30.

As discussed in Section IV(A)(1), the ’714 Patent provides examples of comparing candidates in the subset of spatial motion vector prediction candidates. Ex-1001 at cols. 15-16. Referring to Figure 9 below, for the candidate on the left (A1), assuming A1 is the claimed “first spatial motion prediction candidate,” the ’714 Patent teaches that a subset containing only B1 can be used for comparison. *Id.* at 15:50-16:7. Likewise, for the candidate on the top left (B2), assuming B2 is the claimed “first spatial motion prediction candidate,” the ’714 Patent indicates that the subset comprising A1 and B1 is used for comparison. *Id.* at 16:40-49; *see also* Ex-2010 at ¶ 121.

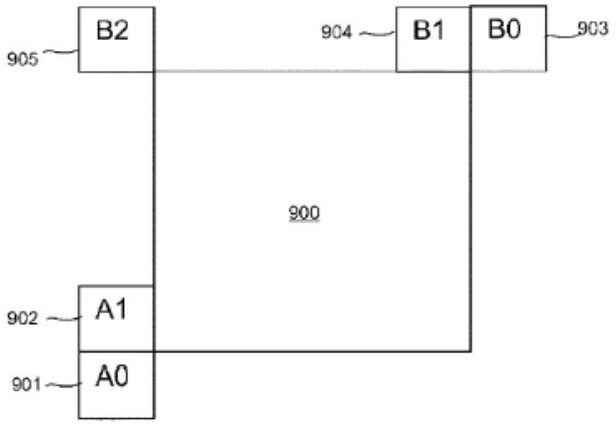


Fig. 9

Id. at Figure 9.

As specified in claim limitation 23[c], the motion information of the first spatial motion vector prediction candidate (left column of the table below) is compared to the motion information of the spatial motion vector prediction

candidates within the determined subset (right column of the table below). Ex-2010 at ¶ 122.

First Spatial Motion Vector Prediction Candidate	Motion Information of Spatial Motion Vector Prediction Candidates in the Determined Subset of Spatial Motion Vector Prediction Candidates
A1	No subset. It's automatically included in the merge list if available.
A0	{A1}
B0	{B1}
B1	{A1}
B2	{A1, B1}

As the '714 Patent indicates, and as a POSITA would understand, the first spatial motion vector prediction candidate is compared to a determined subset, without needing to compare each possible candidate pair from the set of spatial motion vector prediction candidates. For instance, when B0 is the first spatial motion vector prediction candidate, it is not compared to A1 or A0; when B1 is the first spatial motion vector prediction candidate, it is not compared to A0 or B0; and when B2 is the first spatial motion vector prediction candidate, it is not compared to A0 or B0. *Id.* at ¶ 123.

Petitioner takes a different approach to "comparing" than the technique claimed in the '714 Patent. First, Petitioner states, "the selected set of PMV candidates comprises a subset of the set of previously coded motion vectors." Pet. at 35 (discussing PMV_CANDS and citing Ex-1004 at ¶ 11). However, Petitioner is indicating Rusert is referring to all previously coded motion vectors, not just those

that are candidates for predicting the current motion vector. In Rusert, the "subset" refers to a "subset of the set of previously coded motion vectors," Ex-1004 at ¶ 11, that are in the scan order (which Petitioner and Dr. Creusere call the "set"), not the claimed "subset of spatial motion vector candidates" used for comparison purposes. Ex-2010 at ¶ 124.

Second, Petitioner suggests that, "Rusert's … comparisons … compare … without making a comparison of each pair from the set of motion vectors used for all previous blocks." Pet. at 42. However, in Rusert, the candidates for predicting the current block's motion vector are not the entire set of motion vectors from all previously coded blocks. Dr. Creusere confirmed in his deposition that the "candidates" refer to those in Rusert's scan order, not all previously coded blocks. Ex-2020 at 72:11-76:19. Additionally, the Petition's statement overlooks the fact that Rusert compares each possible candidate pair when comparing the alleged first spatial motion vector prediction candidate (e.g., '3') to the alleged subset (e.g., '1' and '2'). Ex-2010 at ¶ 125.

Petitioner further alleges that, "[e]ven within the scan order, Rusert compares potential candidates with preceding candidates already in PMV_CANDS, which are a subset of the candidates in the scan order; therefore, Rusert avoids comparing each pair of candidates from the scan order." Pet. at 41. Here Petitioner implicitly acknowledges that Rusert does in fact compare each possible pair of candidates from

the scan order. As the Petitioner states, "within the scan order, Rusert compares potential candidates with preceding candidates already in PMV_CANDS, which are a subset of the candidates in the scan order." *Id.* However, in Rusert, the subset of candidates is the full set of candidates available for comparison at the current iteration—i.e., at the point when a potential candidate (the alleged "first spatial motion vector prediction candidate") is being compared. In other words, the higher scan-order locations are not included in the subset because they have not yet been evaluated to determine whether they contain a valid PMV. Since these higher scan-order locations are not part of the available candidates at that point, they cannot be considered as part of any potential candidate pair. Therefore, the Petitioner's statement that "Rusert compares the selected candidate with a subset of candidates, without comparing each pair from the set of previously coded motion vectors or the entire scan order" is incorrect. The Petitioner overlooks the fact that Rusert compares each possible candidate pair that is available at the time a particular block's motion vector is being evaluated for inclusion in the PMV_CANDS list. *Id.*; *see also* Ex-2010 at ¶ 126.

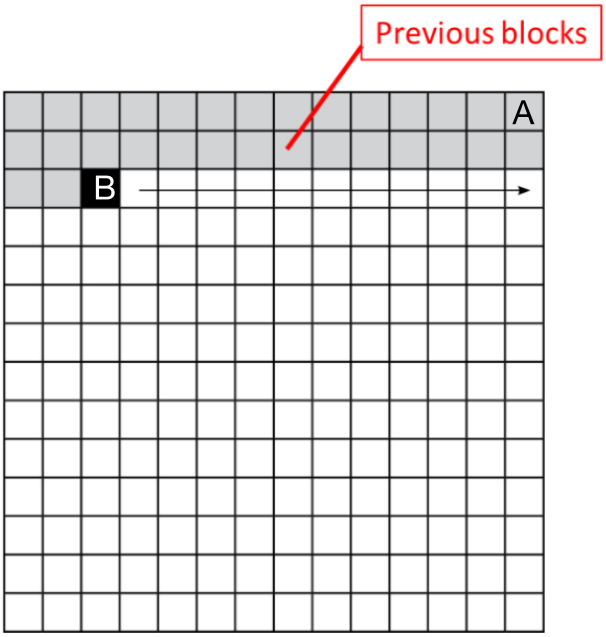
For instance, if Rusert's scan allows for a maximum of four candidates, and after the third iteration, PMV_CANDS includes {1, 2, 3, 4} (assuming blocks 1-4 are available), the motion vector for the fifth block in the scan would not be considered as an available candidate. At the very least, the motion vector of the fifth

block is not available for comparison, meaning it would not be included in any "possible candidate pair" when comparing a first spatial motion vector prediction candidate (such as '3' or '4') with its subset, and the decision to include or exclude it is made. For example, after block 4 is evaluated and compared to blocks '1,' '2,' and '3,' all possible candidate pairs have already been considered. This is because, during the scan of a particular block, Rusert compares the motion vector of that block with all the motion vectors already stored in PMV_CANDS. Therefore, all candidates that could be compared to the current block are, in fact, compared during the current iteration. In other words, all possible candidate pairs are compared. *Id.* at ¶ 127.

Alternatively, if the "set" includes all the previously coded motion vectors in the current frame, as the Petitioner seems to suggest,[12] Pet. at 43, then the previously coded motion vectors, excluding those from the blocks in what the Petitioner refers to as the "subset," are not available candidates or possible candidate pairs for the current block. For example, the motion vector of the top-right block (labeled A below) is not available for comparison—meaning it is not part of any possible

[12] However, Dr. Creusere identifies the previously coded blocks within Rusert's scan order as spatial motion vector prediction candidates. Ex-2020 at 72:11-76:19; *see also* Ex-2010 at fn. 13.

candidate pair—when evaluating the current block to the left (labeled B below). This is because, in Rusert's method, A is too far from B to be considered a candidate or used in any comparison. Ex-2010 at ¶ 128.



Pet. at 28 (annotated).

Accordingly, Rusert fails to teach at least elements 9[c], 23[c], and 30[c], and the Petitioner has failed to show by a preponderance of evidence that the Challenged Claims are unpatentable based on this Ground. Petitioner does not rely on Karczewicz for this limitation. Pet. at 37-42.

B. GROUND 2 – RUSERT IN COMBINATION WITH KARCZEWICZ, AND LIN

In addition to Rusert and Karczewicz, Petitioner's second Ground further relies on Lin (Ex-1006). Ground 2 only relates to dependent claim 4 and accordingly fails for the same reasons as Ground 1. Therefore, for purposes of this Response,

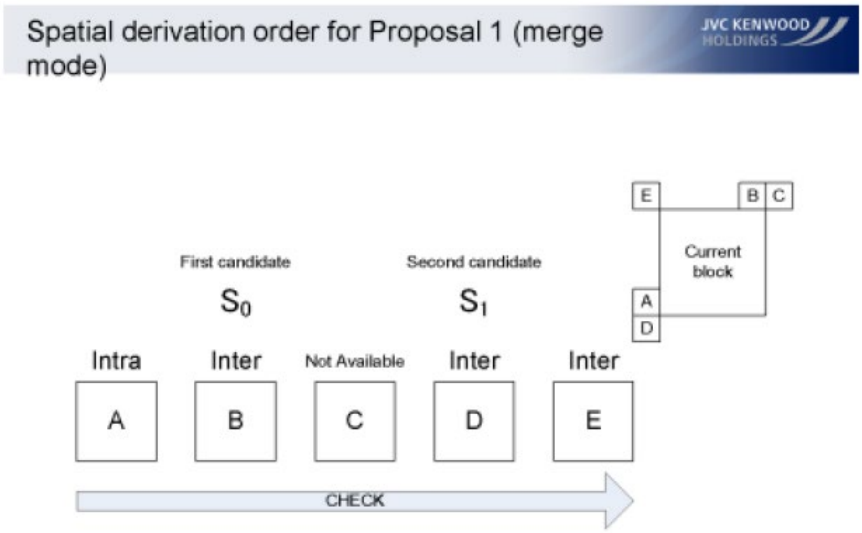
Ground 2 rises and falls with Ground 1. See *In re Fine*, 837 F.2d 1071, 1076 (Fed. Cir. 1988) (indicating that "[d]ependent claims are nonobvious under section 103 if the independent claims from which they depend are nonobvious.").

C. GROUND 3 – NAKAMURA IN COMBINATION WITH WD4

1. Nakamura does not teach "determining a subset of spatial motion vector prediction candidates based on a location of the block associated with the first spatial motion vector prediction candidate"

Petitioner alleges this limitation is found in Nakamura. However, Nakamura does not teach "determine a subset of spatial motion vector prediction candidates based on a location of the block associated with the first spatial motion vector prediction candidate," as required by the claims. Ex-1001 at cl. 9, cl. 23, cl. 30.

Petitioner's argument is flawed. First, Petitioner suggests S0 is a subset of the spatial motion vector prediction candidates. Pet. at 68. Second, Petitioner claims that S1 is the first spatial motion vector prediction candidate, even though Nakamura discloses that S1 is derived after S0, as shown in the figure below, which illustrates the processing or check order (arrow) that generates S0 (the first candidate) followed by S1 (the second candidate). *Id.* at 66, 68; *see also* Ex-2010 at ¶ 130; *supra* Section II(C)(3)(a).



Ex-1009 at 8.

Elements 9[a] and 9[b] in the ’714 Patent follow a logical sequence, as one cannot “determine a subset . . . based on a location . . . associated with the first spatial motion vector prediction candidate” until a “first spatial motion vector candidate” has been selected. Ex-1001 at cl. 9, cl. 23, cl. 30. In contrast to the ’714 Patent, Nakamura adds two candidates, S0 and S1, to its merge list based on availability. As shown in the Figure above, S0 (the first candidate added to the list in Nakamura) corresponds to the “B” block because it is the first inter-coded block encountered in the example. S1 (the second candidate added that Petitioner alleges is the “first spatial motion vector prediction candidate”) corresponds to block “D”. Nakamura skips over “C” because it is unavailable in the example. With this understanding, Petitioner’s arguments are flawed for at least the following reasons. Ex-2010 at ¶ 131.

S0 (the alleged "subset") is not determined based on location of, nor is it related to, S1 (the alleged "first spatial motion vector prediction candidate"). There is no connection between the selection of the motion vector of block B as the alleged "subset" and, for example, the location of block D in the bottom non-adjacent corner. Instead, block B's motion vector is considered the "subset" in Nakamura simply because B is the first inter-coded block with an available motion vector. Furthermore, by the time S0 is being considered as the alleged "subset" relevant to S1, S0 has already been determined. As a result, the alleged determination of the subset is unrelated to any characteristic of S1 (including the location of the block associated with that motion vector). *Id.* at ¶ 132.

Moreover, Petitioner relies on S1 as the "first spatial motion vector prediction candidate" likely because S0 is added to the list without any comparison, meaning S0 cannot possibly meet the requirements of the claims. Ultimately, neither S0 nor S1 can fulfill the claimed "first spatial motion vector prediction candidate." This is because S0 is selected based on the availability of neighboring blocks and is automatically added to the merge list, and S1 is then chosen as the next available candidate after S0. Additionally, when S0 and S1 are compared (the only comparison of spatial motion vector prediction candidates that occurs), only S1 can be removed from the merge list if both S0 and S1 have the same motion vector information. *Id.* at ¶ 133.

As a result, Petitioner's claimed S0 subset cannot be determined based on anything related to S1 (including location of the associated block) at the time Nakamura determines S0, as S1 has not yet been derived and does not exist at this stage. Nakamura therefore fails to render obvious at least elements 9[b], 9[c], 9[d], 23[b], 23[c], 23[d], 30[b], 30[c], and 30[d], and Petitioner has failed to show by a preponderance of evidence that the Challenged Claims are unpatentable based on this Ground. Petitioner does not rely on WD4 for this limitation. Pet. at 68-70.

2. Nakamura does not teach "comparing . . . without making a comparison of each possible candidate pair from the set of spatial motion vector prediction candidates"

Petitioner alleges this limitation is found in Nakamura. However, Nakamura does not teach "compar[ing] 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," as required by the claims. *See, e.g.*, Ex-1001 at cl. 23, cl. 30.

First, Petitioner cites to the table below, where Nakamura proposal is compared against HM3.0 (WD3).

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)

Notes:

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

S_1: The second spatial candidate found in the spatial derivation process

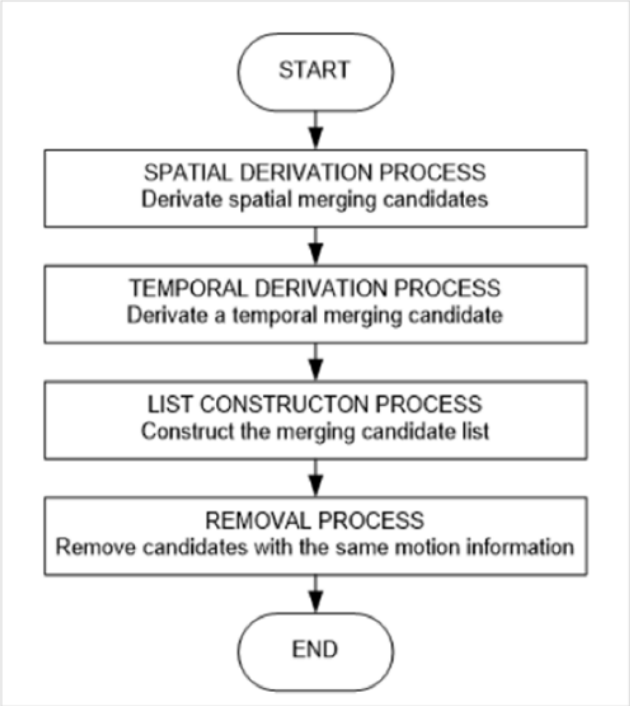
Ex-1007 at § 2.2.1, Table 2. Regarding Nakamura's Proposal 1, Petitioner is mistaken in suggesting that fewer than all possible candidate pairs are compared. Pet. at 74. This incorrect conclusion seems to stem from Nakamura's omission of comparisons between each of the A-E neighbors, which occurs because only "2 out of 5" neighbors are used as "spatial candidates." *Id.*; *see also* Ex-1007 at Table 2. However, Petitioner overlooks whether Nakamura compares every "possible candidate pair" of spatial motion vector prediction candidates. Nakamura does, in fact, compare each "possible candidate pair." Without question, Nakamura can only compare spatial candidates S0 and S1 and always does so. Therefore, for the alleged first spatial motion vector prediction candidate 'S1', Nakamura consistently compares all possible candidate pairs. Ex-2010 at ¶ 138.

Accordingly, the combination fails to render obvious elements at least elements 9[c], 23[c], and 30[c], and Petitioner has failed to show by a preponderance of evidence that the Challenged Claims are unpatentable based on this Ground. Petitioner does not rely on WD4 for this limitation. Pet. at 70-71.

3. Nakamura does not teach "determining to include or exclude . . . based on the comparing"

Petitioner alleges this limitation is found in Nakamura. However, Nakamura does not teach "determining to include or exclude . . . based on the comparing," as required by the claims. Ex-1001 at cl. 1, cl. 15, and cl. 29. To the contrary, Nakamura teaches adding both S0 and S1 to the merge list first and only afterward removing S1 based on a comparison between S0 and S1. Ex-2010 at ¶ 140.

As shown in the figure below, Nakamura teaches that once spatial and temporal candidates are derived, they are all included in the merge candidate list. After this "list construction process," a subsequent "removal process" takes place, where candidates are compared to each other and those with the same motion information are removed, which in Nakamura's case, S1 would be removed if it has the same motion information as S0. *Id.* at ¶ 141.



Ex-1007 at Figure 1(a).

Unlike Nakamura, the independent claims of the ’714 Patent begin with an empty list, and for each selected spatial motion vector prediction candidate, a decision is made whether to include (add) or exclude (not add) the candidate to the merge list. This approach differs from Nakamura’s method, which first fills the list with candidates and then removes some, which is a less efficient process. Compared to the ’714 Patent, Nakamura’s method requires additional processor operations to first add candidates to the list and later remove them, while the ’714 Patent’s approach simply adds only the necessary candidates from the start. Ex-2010 at ¶ 141.

Additionally, each independent claim in the ’714 Patent includes limitations that require a decision to both “include or exclude” candidates, not just “include” or

just "exclude." The purpose of the invention and the efficiency considerations of the inventors suggest that the list should be constructed in a single pass, where comparisons are made, and a final decision is reached on whether each candidate should be added to the merge list. Nakamura's method fails in this respect because it includes every available candidate before any comparison is made. Even if Nakamura could somehow anticipate an "exclude" decision through the removal process (which it does not), Nakamura's disclosure does not demonstrate that both "include" and "exclude" can result from the comparison process. *Id.*

Therefore, Nakamura fails to teach the independent claim limitations 9[d], 23[d], and 30[d], and Petitioner has failed to show by a preponderance of evidence that the Challenged Claims are unpatentable based on this Ground. Petitioner does not rely on WD4 for this limitation. Pet. at 71-72.

4. A POSITA would not be motivated to combine Nakamura and WD4

Although Nakamura and WD4 are both directed to the ongoing development of improved video coding standards, the suggestion by Petitioner that a POSITA would therefore be motivated to combine the two documents is unfounded. Nakamura and WD4 include competing techniques for building a merge list and cannot be combined without omitting aspects of one or the other. Ex-2010 at ¶ 144.

Petitioner suggests that once Nakamura was proposed, it would have been obvious to a POSITA to combine it with WD4 or, indeed, any working draft of the HEVC standard. Pet. at 60-63. This is incorrect, as demonstrated by WD4 itself. Petitioner agrees Nakamura was originally proposed as an improvement to Working Draft 3 of the HEVC standard but fails to address the reality that Nakamura's proposed simplification to the derivation method for merge mode candidate was expressly evaluated by experts in the field and then not included in Working Draft 4. *See id.*; *see also* Ex-2010 at ¶ 143.

Rather than following the suggestion of Nakamura, which "tries to reduce the number of candidates in the spatial derivation process," WD4 reflects a decision not to reduce the number of candidates during the spatial derivation process, instead adopting a technique that more strongly resembles the same HM3.0 technique with which Nakamura contrasts its proposed technique. *See* Ex-1007, Abstract; compare Ex-1007 at § 2.2.1 with Ex-1010 at § 8.4.2.1.1; *see also* Ex-2010 at ¶ 144.

JCTVC-F744-v3 ("F744") details the JCTVC's evaluation of the Nakamura proposal. Despite Petitioner's assertion to the contrary, the unification of the spatial neighbor locations used for merge mode and Motion Vector Prediction ("MVP") does not reflect an adoption of Nakamura's proposal that would motivate a POSITA to combine Nakamura with WD4. *See* Pet. at 60-63. In F744, the JCTVC adopted

only an extremely limited aspect of Nakamura: the "candidate search order and TMVP refidx derivation." *See* Ex-2009 at 8; *see also* Ex-2010 at ¶ 145.

On the other hand, the principal technique of Nakamura, in which only "two spatial candidates and a temporal candidate are derived," was flatly not adopted, with WD4 making use of 5 spatial candidates where WD3 and Nakamura suggested using 4 and 2 spatial candidates respectively. *See* Ex-1010 at Figure 8-5; Ex-1007, Table 2. Given that the JCTVC considered Nakamura for integration into the Working Document and adopted only a narrow portion thereof, a POSITA would not be compelled to reopen the JCTVC's consideration of Nakamura and adopt further aspects of the proposal that were previously rejected. Ex-2010 at ¶ 146.

5. Petitioner cannot demonstrate that WD4 is prior art

WD4 is not prior art to the '714 patent because WD4 was not publicly accessible before the priority date of the '714 Patent.

To be a prior art reference under 35 U.S.C § 102(a), a reference must be shown to be published, which requires that the reference be accessible to the public; while this does not require that a document was actually received by certain members of the public, it does require a satisfactory showing that the document had been "disseminated or otherwise made available to the extent that persons interested and ordinarily skilled in the subject matter or art, exercising reasonable diligence, can

locate it." *See Samsung Elecs. Co. v. Infobridge Pte. Ltd.*, 929 F.3d 1363, 1368-1369 (Fed. Cir. 2019). Respondents cannot make this requisite showing.

In support of its Petitioner, Petitioner has provided a declaration of Dr. Vivienne Sze, which includes a section addressing the "public availability of JCT-VC documents" including WD4. See *Amazon.com Services, LLC v. Nokia Technologies Oy,* IPR20204-00604, Paper 1014 at 5 (PTAB Apr. 8, 2024) ("Sze Declaration (604)"); *Amazon.com Services, LLC v. Nokia Technologies Oy*, IPR20204-00605, Paper 1014 at 5 (PTAB Apr. 8, 2024) ("Sze Declaration (605)").

In support of the proposition that WD4 was publicly available, Dr. Sze presents screenshots of the process she took to download a copy of JCTVC-F803-v3.zip, version 3 of the zip archive containing the documents associated with WD4, through the JCT-VC document management website (http://phenix.int-evry.fr/jct/). See Sze Declaration (604) at 2 (Ex-1014); Sze Declaration (605) at 2 (Ex-1014). Dr. Sze also alleges that "persons interested in tracking the developments of the latest video coding standard would regularly visit the JCT-VC website to ensure that products and services they were developing were consistent with the HEVC Standard under development." Sze Declaration (604) at 9 (Ex-1014); Sze Declaration (605) at 9 (Ex-1014). This is improper expert testimony, opining on the ultimate question of public accessibility, despite Dr. Sze not being included in Respondents' Corrected Joint Expert Identification. Ex-2013.

Illustrating the search she performed to find the WD4 document, Dr. Sze explains that she first navigated to the specific page for the meeting associated with WD4. To do this, she followed menu items to navigate from the website's front page, to "All Meetings" and then to "Meeting Number 6 ("Torino"). *See* Sze Declaration (604) at 10 (Ex-1014); Sze Declaration (605) at 10 (Ex-1014). She then searched that meeting's documents for terms such as "Working Draft" and "High-Efficiency Video Coding" to locate WD4 by its title. *See* Sze Declaration (604) at 15-16 (Ex-1014); Sze Declaration (605) at 15-16 (Ex-1014). This search, which relies on prior knowledge of the existence of WD4 to locate the document by its meeting location and highly generic title, does not constitute support for the public availability of WD4. Ex-2021 at 25:11-27:13.

In *Samsung v. Infobridge*, the Federal Circuit directly addressed the public accessibility of the very same WD4 document after Samsung appealed the Board's finding that WD4 was not publicly accessible. *See* 929 F.3d at 1365. With respect to the JCT-VC site, the Board found that "identifying a meeting location was key to navigating the JCT-VC site," and that "a person who did not know to look under the Torino meeting would not have found the WD4 reference." *See id.* at 1371. Samsung also argued that testimony from Benjamin Bross, one of WD4's authors, supported the public availability of WD4, which the court dismissed stating "a work is not publicly accessible if the only people who know how to find it are the ones who

created it," and that the Board "properly focused on whether those outside of the JCT-VC knew about the JCT-VC website." *Id.* at 1372. In confirming that the Board's findings were consistent with substantial evidence, the court in Samsung provided the following summary: "the structure of the [JCT-VC] website, which organized content by meeting and lacked a way to search by subject matter, meant that a person would only find the WD4 reference if they knew where to look." *Id.* at 1373.

The present facts match those of Samsung, and the Board should similarly determine that the WD4 reference was not publicly available as a matter of law. Dr. Sze's declaration reflects the same shortcomings noted by the Board in Samsung, requiring that a user should know to view documents pertaining to "Meeting Number 6 ('Torino')" in order to begin their search. *See* Sze Declaration (604) at 10 (Ex-1014); Ex-2021 at 25:11-27:13. The user would then be shown 780 documents for that meeting, and be required to search for WD4 using terms in its highly generic title "Working Draft 4 of High-efficiency Video Coding." *See* Ex-1014 at 11, 15-16. A POSITA would not have thought to search the Torino meeting for generic terminology such as "working draft" or "high efficiency video coding" in search of prior art, and WD4 "would not have been reasonably accessible even if a skilled artisan knew about the JCT-VC website." *Samsung*, 929 F.3d at 1372.

Further, the declaration of Vivienne Sze and the declaration of Clifford Reader have the same shortcomings as the testimony of Benjamin Bross from the Samsung case. *See id.* at 1372 (stating that the Board "properly focused on whether those outside the JCT-VC knew about the JCT-VC website."). Dr. Sze describes herself as "an active member of JCT-VC since October 2010" and states that she attended every meeting between October 2010 and the end of 2012. *See* Sze Declaration (604) at 3 (Ex-1014). Likewise, Dr. Reader describes himself as "one of the top dogs in the field of video coding," Ex-2022 at 11:19-12:6, and maintains a database of video coding standardization documents going back to the 1990s, *id.* at 15:4-21:14; *see also* Reader Declaration (Ex-1050). Thus, Sze and Reader's declarations are hardly evidence that a POSITA, particularly one outside the JCT-VC, would have known to access WD4.

Petitioner also raises arguments in favor of public availability, but these arguments likewise fail. *See* Pet. at 20-21. Petitioner's arguments primarily repeat the ineffective reasoning from Dr. Sze's declaration but additionally suggest that the existence of published papers which cite Nakamura and WD4 establish the public availability of WD4 as well as suggesting that the citation to WD4 on the face of the '714 Patent establishes its prior art status. This is not the case, as the fact that a reference has been cited before does not establish that a POSITA would be able to find WD4 without "already knowing what to look for and where to look for it." *See*

Samsung, 929 F.3d at 1372. Further, it is not apparent that the version of WD4 cited on the face of the ’714 Patent is the same “version 3” which Respondents allege renders the Asserted Claims of the ’714 Patent obvious—to not only find WD4, but specifically the third version, would necessitate a POSITA to check and re-check the JCT-VC website very frequently in order to take note of additional versions. This highly attenuated basis for public availability is simply insufficient to carry Respondents’ burden.

Because Petitioner offers threadbare evidence in support of the public availability of WD4, evidence which has already been considered in precedential case law, the ALJ should find that Petitioner is unable to show that the WD4 reference was publicly accessible as a matter of law. Accordingly, Petitioner’s arguments as to the invalidity of the ’714 Patent which rely on the WD4 reference should be rejected.

VII. CONCLUSION

For the foregoing reasons, Patent Owner respectfully requests that the Board reject Petitioner’s arguments and uphold the challenged claims of the ’714 Patent as valid.

Dated: January 30, 2025

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CERTIFICATION OF WORD COUNT

The undersigned hereby certifies that the portions of the above-captioned **PATENT OWNER'S RESPONSE** specified in 37 C.F.R. §42.24 has 13,998 words, in compliance with the 14,000 word limit set forth in 37 C.F.R. §42.24(b)(1). This word count was prepared using Microsoft Word 2010.

Dated: January 30, 2025

Respectfully submitted,

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CERTIFICATION OF SERVICE

The undersigned hereby certifies that the foregoing **PATENT OWNER'S RESPONSE** has been served on Petitioner via email on the following counsel of record for Petitioner:

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