UNITED STATES PATENT AND TRADEMARK OFFICE

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BEFORE THE PATENT TRIAL AND APPEAL BOARD

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ASUSTEK COMPUTER, INC and
ASUS COMPUTER INTERNATIONAL,
Petitioner

v.

NOKIA TECHNOLOGIES OY,
Patent Owner

_____

Case: IPR2025-01153
U.S. Patent No. 10,536,714

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PATENT OWNER'S RESPONSE

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TABLE OF EXHIBITS

Ex. No.	Title	Previously Submitted
2001	Declaration of R. Mitch Verboncoeur in Support of *Pro Hac Vice* Admission	**X**
2002	Declaration of Mr. R. Mitch Verboncoeur in Support of Patent Owner's Notice of Intent to Designate a Provisionally Recognized PTAB Attorney as Back-Up Counsel	**X**
2003	Order No. 10-First Amended Adopted Procedural Schedule in Investigation No. 337-TA-1448, dated June 25, 2025	**X**
2004	Investigation Initiation Letter to The Honorable Lisa R. Barton in Investigation No. 337-TA-1448, dated April 11, 2025	**X**
2005	Respondents Initial Invalidity Contentions in Investigation No. 337-TA-1448, dated July 1, 2025	**X**
2006	Exhibit D-4 Claim Chart Regarding U. S. Patent No. 10,536,714, in Investigation No. 337-TA-1448	**X**
2007	Exhibit D-4 Claim Chart Regarding U. S. Patent No. 10,536,714, in Investigation No. 337-TA-1380	**X**
2008	Public Version of Initial Determination on Violation of Section 337 and Recommended Determination on Remedy and Bond in Investigation No. 337-TA-1380, dated December 20, 2024	**X**
2009	Original Complaint in *Nokia Technologies Oy v. Asustek Computer Inc. et al.*, Case No. 2:25-cv-03053 (C.D. Cal.), April 7, 2025	**X**
2010	Declaration of Dr. Iain Richardson	**X**
2011	CV of Dr. Iain Richardson	**X**
2012	Excerpts from "The H.264 Advanced Video Compression Standard", Richardson, 2010 (Cover pages, book pages 28-38, 69, 106, 108, 223-229)	**X**
2013	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**

2014	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	**X**
2015	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	**X**
2016	ITU-T Series H: Audiovisual and Multimedia Systems, Infrastructure of audiovisual service – Coding of moving video, High efficiency video coding (H.265) (04/2013)	**X**
2017	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	**X**
2018	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	**X**
2019	Nakamura et al., "Unification of derivation process for merge mode and MVP" Presentation, Joint Collaborative Team on Video Coding (JCT-VC) of ITU-T SG16 WP3 and ISO/IEC JTC1/SC29/WG11, 6th Meeting, Torino, Italy, Jul. 14-22, 2011, Document JCTVC-F419 ("Nakamura Presentation")	
2020	Deposition Transcript of Dr. Charles D. Creusere, Petitioner's Expert in IPR Nos. IPR2024-00604 and IPR2024-00605, January 22, 2025	**X**
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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."). Both 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. In Rusert, the content of the working list (PMV_CANDS) at any iteration is fixed by what has already been scanned and admitted, not by where the next candidate happens to be, so the alleged "subset" is determined before the "first" candidate's location is even known. The Petition's theory therefore misreads both the claim language and Rusert's outward scan, and it ignores that the Board has already rejected a construction that would decouple the subset determination from the candidate's associated block.

Second, as to Grounds 1 and 2, the Board has already rejected the very "subset" theory ASUS advances here. In the prior Amazon IPRs, the Board found that Nakamura does not disclose "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," because the subset is fixed before the later candidate is even identified. ASUS's expert, Dr. Havlicek, confirmed this sequencing in deposition and conceded that Rusert operates the same way in all respects relevant to this limitation: the working list is assembled from earlier-processed neighbors, and only afterward is a subsequent candidate considered and compared against that preexisting list. Amazon's expert, Dr. Creusere—whose analysis ASUS's expert now adopts—admitted the same in his deposition. The fatal timing defects that defeated the Nakamura ground therefore defeats ASUS's Rusert ground.

Third, as to Grounds 1 and 2, Petitioner fails to show that Rusert performs the claimed comparison "without making a comparison of each pair from the set of spatial motion vector prediction candidates." It does not. Rusert's sequential scan compares each new candidate to every candidate already on the PMV_CANDS list, so that by the end of the scan every pairwise combination among the candidates has been compared. The Petition obscures this result only by toggling between two inconsistent definitions of "the set"; all previously coded motion vectors in one breath, and just the scan-order candidates in the next. But under either definition Rusert fails to satisfy the limitation.

Fourth, as to Grounds 1 and 2, the Petition's proposed combination of Rusert with Karczewicz lacks both a motivation to combine and a reasonable expectation of success. Rusert's scan order, including its distance calculations, corner/middle position definitions, and iteratively refined scan patterns, presupposes a uniform grid of equally sized blocks as found in H.264. However Karczewicz, the very reference the Petition borrows for H.265 "prediction unit" terminology, teaches that H.265 introduces variable-size, non-square PUs that are fundamentally incompatible with that uniform-grid assumption. Petitioner's own expert acknowledged the complications this mismatch creates, and neither reference provides guidance for the substantial redesign that would be required.

In support of this Patent Owner's Response, Nokia provides a declaration from its expert. Dr. Iain Richardson (Ex-2022). Dr. Richardson's CV is attached as Ex-2011.

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. Motion-Compensated Prediction in Video Coding

At a high level, most video coding techniques exploit pixel redundancy in the spatial and temporal domains and involve finding ways to communicate new

information in a bitstream by referencing similar, already communicated information. The references to already coded information are used to generate approximations of each block of a video frame being encoded; such approximations are commonly referred to as predictions. Predictions are combined with additional information, sometimes referred to as prediction error or residual information, to reproduce a reconstructed image upon decoding. The encoder communicates to the decoder how to make predictions for each block as well as the residual information in a compressed form, and the decoder creates the same prediction, decodes the residual information, and combines the residual and prediction to reconstruct the coded block. Ex-2022 at 18-19.

There are two main ways of exploiting redundancy in video coding to create such predictions—intra coding and inter coding. In an intra-coded block in a frame of video, reference to already coded pixels in the same frame are used to create a prediction and to reduce the number of bits necessary to encode and represent the current block. In an inter-coded block, a prediction block is constructed with reference to pixels in one or more previously coded frames, which may be frames in the past or the future in display order. The choice of one or more previously coded frames (known as reference pictures or reference frames) and an offset, or motion vector, identifying each similar region of pixels in a reference picture, are used to create a prediction block. The instructions for creating the prediction block and the

prediction error or residual are encoded. *Id.* at 19. In many cases, inter coding can produce a better match than intra coding, resulting in a residual block that contains less data and is therefore smaller once compressed.

In video coding, motion compensation is applied to blocks of pixels on a block-by-block basis, meaning that translational motion predictions (one or more motion vector with horizontal and vertical components indicating reference blocks and, potentially, interpolation filters to apply to those blocks) are signaled for the entire block. An example block size for prediction is 16x16 pixels, however modern video standards such as H.264 (aka AVC, or Advanced Video Coding, first published in 2003 and still widely used today for distribution of video content) and its successor H.265 (aka HEVC, or High Efficiency Video Coding, first published in 2013 and increasingly popular for video streaming) allow variable block size, with blocks potentially as small as 4x4 pixels and as large as 64x64 pixels (in the case of HEVC). *Id.* at 20. Smaller blocks permit more accurate motion compensation, but can incur more signaling costs related to motion vectors for each block. Merge mode in HEVC is one strategy used to address this problem, which is described further below.

A motion vector for a current block to be encoded can be found using a search procedure, whereby the best matching block (according to a similarity criterion) in a previously encoded reference frame is found. Motion-compensated prediction is accomplished by identifying data (image content) from the reference frame(s) that

is a good match with data in the current frame. When a suitable matching region is found, the encoder communicates its location by identifying the appropriate motion vector. The motion vector will allow the decoder to obtain the same block used at the encoder from previously received encoded data. The encoder uses the block prediction corresponding to the motion vector to obtain a corresponding block of difference values (aka prediction error or residual) for the current block, which it compresses, encodes and transmits to the decoder. The decoder decodes the compressed prediction-error information for the current block and combines it with the prediction corresponding to the block identified by the motion vector to reconstruct an approximation of the original data (image content). The encoder and decoder carry out different steps in their respective parts of the process, but the encoder and decoder must form the same prediction for the process to work. *Id.* at 18-19.

The ’714 Patent relates to an inter prediction mode in the H.265 video coding standard called merge mode. In merge mode, the encoder and decoder form lists of motion vector prediction candidates, called merge lists, for the current block and then the encoder communicates to the decoder which candidate from the merge list to use for the block. Merge mode exploits the property that motion vectors (i.e., offsets with a horizontal and vertical component that indicate a prediction source in a previously coded frame) for a block are often similar to the motion vectors of neighboring blocks. Merge mode can save bits by avoiding the need to send a motion

vector explicitly and instead just sending an index value to identify a motion vector prediction included in the merge list. If the merge list includes motion vectors that produce accurate predictions, the use of an index to communicate the motion for the block can yield significant savings. Ex-2022 at 26. As explained below, the '714 patent relates to a more efficient method for constructing merge lists.

1. Role of the Encoder in Motion-Compensated Prediction

A computationally taxing part of motion-compensated prediction is identifying the best motion vector to use for the current block's prediction. This is typically done by dividing the current frame into blocks and finding matching regions in previously coded frames to use to predict the blocks in the current frame. While the blocks in the current frame are generally formed based on a grid pattern of some sort, the partitioning in previous frames does not necessarily match the current frame, so the best matching blocks in previous frames may not—and typically do not—align with the same grid constraints. As a result, the search for a best-matching block typically involves many comparisons between the current block and many potential candidate blocks from prior frames to find the best available matching block. This search for a matching block is referred to as motion estimation.

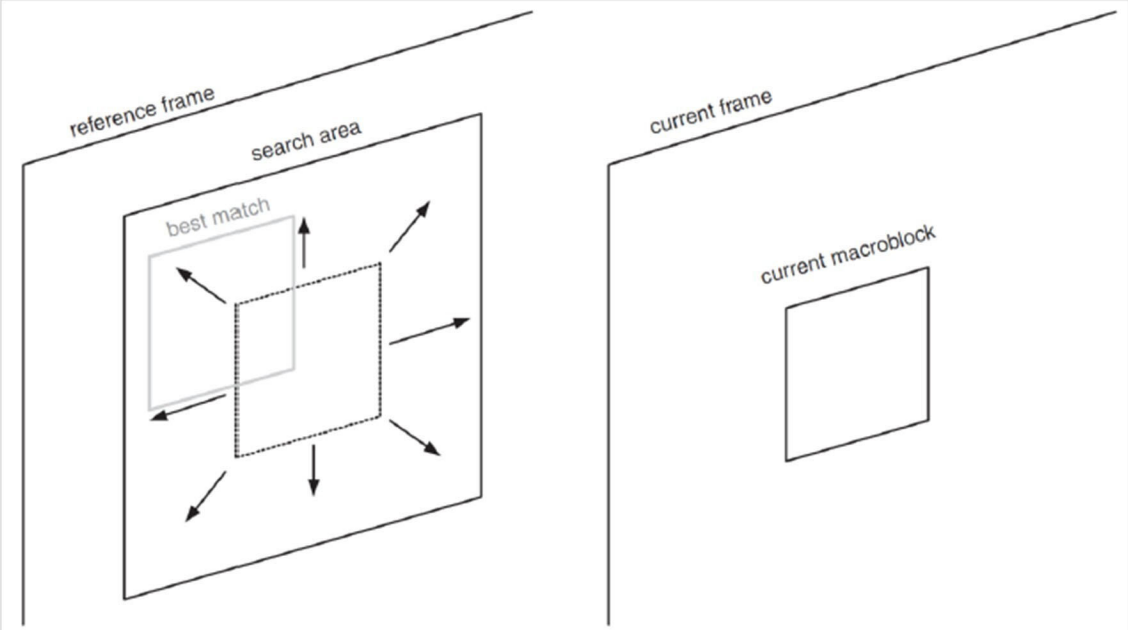


Figure 3.9 Motion estimation

The H.264 Advanced Video Compression Standard, Iain Richardson, 2010, at Section 3.3.1.4 (Ex-2012)

The encoder may select an offset, or motion vector, that points to an integer pixel value, so that the corresponding block is a block of pixels actually present in the prior frame. In typical video codecs in use at the time of the invention of the'714 Patent, the encoder could also choose a motion vector that pointed to a sub-pixel location – a location between full pixel values, which generally results in a need for an even greater number of calculations, to generate pixel values at sub-pixel (fractional pixel) locations. Ex-2022 at 28-29.

Once a suitable block prediction method is chosen and motion vector(s) are identified, the encoder encodes the information necessary to recreate the block

prediction, including the motion vector(s) and whether they are to be used as part of a uni-prediction or bi-prediction and in some cases including an indication of chosen reference picture(s). Additionally, the encoder compresses and encodes the difference between the predicted values (identified in the reference frame) and the actual values (present in the current block to be encoded), generally using a block transform, such as the Discrete Cosine Transform, and quantization to limit the amount of residual data sent. *Id.* at 29.

2. Role of the Decoder in Motion Compensated Prediction

The decoder's task, at a high level, is to reconstruct the predictor specified by the encoder (e.g., using the signaled motion vectors and prediction mode), then decode the compressed prediction error (residual) and combine the two to obtain the decoded video. Importantly, the decoder must recreate the prediction signaled by the encoder exactly. Encoding processes generally use as reference frames previously coded frames that the decoder has already decoded, so that the decoder can reconstruct the same prediction for a current blocking using the prediction information communicated to the decoder. *Id.* at 29-30.

3. Transmission and Decoding of Motion Vectors

A strategy for reducing the amount of data encoded related to motion-compensated prediction is to reduce the data needed to send the motion vector itself.

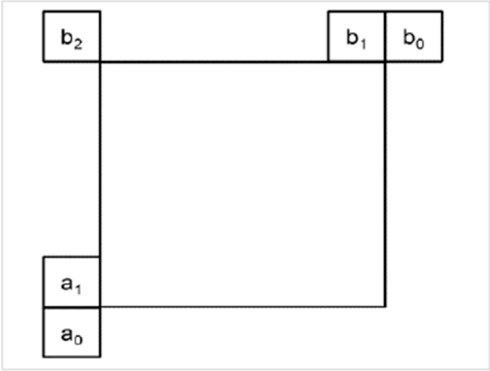
The motion vector information must be encoded and transmitted to the decoder to allow the decoder to form the same predictions as the encoder. Motion vector information can make up a substantial portion of a compressed video frame, particularly when small block sizes are used. However, the motion vectors of adjacent blocks (in space and time) are generally correlated, and this correlation (redundancy) can be exploited through efficient encoding. Modern video coding techniques use predictive methods to encode the motion vectors. Ex-2022 at 20-21.

Typical encoders encoding bitstreams into H.264-compliant formats can use the median value of three already-coded spatially adjacent motion vectors to form a prediction of the current motion vector. The difference between the current motion vector and its prediction is then losslessly encoded. The decoder forms the same prediction the encoder made, based on previously decoded data, and adds the motion vector difference to reconstruct the motion vector. *Id.*at 21.

Encoders encoding bitstreams into H.265-compliant formats may use more sophisticated ways to reduce the number of bits necessary to encode motion vectors. One option for signaling a block's motion vector is Merge mode. Merge mode allows neighboring blocks to share the same motion vectors and other motion information. *Id* at 24-25.

The following figure, taken from the 2012 paper by Gary Sullivan *et al*. titled "Overview of the High Efficiency Video Coding (HEVC) Standard" (Ex-2013)

conceptually displays five blocks labeled a_0, a_1, b_0, b_1, and b_2 that are spatially adjacent to the current block to be encoded. Ex-2013. The motion vector prediction candidates from these blocks are then evaluated for availability and redundancy, and the remaining candidates are placed in the merge list in the following order: a_1, b_1, b_0, a_0, b_2. A temporal candidate at the same location in a reference frame (i.e., a previously coded frame that is not the current frame) is also evaluated as a motion vector prediction candidate. A candidate block is selected and the motion information for the current block is "inherited" from the candidate block, such that the motion information of the two blocks is merged. Ex-2022 at 27. Upon completion of the merging process, the blocks in the resulting merged region (i.e., the selected candidate block and the current block) share the same motion vector.



Ex-2013 at Figure 8.

It is frequently the case that two or more candidates in the list have the same motion vector. It is beneficial to eliminate such duplicates to shorten the list and reduce the

number of bits needed to specify the index in the list. Comparing candidates for potential elimination is a computationally costly process that can be reduced or avoided by using the invention described in the '714 patent. Ex-2022 at 27-28, 30.

B. Features of the '714 Patent

One method for conveying information about a motion prediction, such as the motion vectors and reference frames to use for a particular prediction unit,[1] is the construction of parallel lists of motion information such as motion vectors in both an encoder and a decoder. If both an encoder and decoder construct motion vector prediction lists (also called merge lists), then data can be saved by encoding an index into the list rather than the motion information itself. The inventors of the '714 Patent understood this to be a desirable technique, but there was a need to reduce the computational complexity of constructing such lists and, in particular, the process of comparing candidates in order to exclude redundant (i.e., identical) candidates. Ex-1001 at 4:19-23. The inventors also realized that developing a parallelizable Merge mode, *see* Ex-1001 at 17:40-41, could lead to faster, more efficient candidate

[1] In HEVC, the frame is made up of coding tree units (CTUs) that may be broken down into smaller coding units before predictions are applied. Prediction units are the subdivisions of the CTUs where predictions are applied.

processing and thus faster, more efficient encoding and decoding. Ex-2014; *see also* Ex-2015.

A brief analysis of the potential number of such merge lists confirms the scale of the potential problem. A 1080p (High Definition) video frame has 1920x1080 = 2,073,600 pixels, and inter prediction units (prediction blocks) in H.265 can be as small as 4x4 = 16 pixels. Each coded frame can therefore include up to 2,073,600/16 = 129,600 prediction units, each with its own merge list to construct. If each merge list comprises 5 candidates and each candidate is compared once to each other candidate (hence, 10 comparisons), this would total 1,296,000 comparisons per frame. At 30 frames per second, this could require more than 38,880,000 comparisons per second. While many video sequences are encoded using a mix of larger and smaller inter prediction units and other coding methods, a decoder must be able to accommodate such a worst-case sequence, and so must be computationally capable of performing this number of comparisons per second to decode real-time video.

To reduce the complexity of constructing motion prediction candidate lists for inter prediction modes such as merge mode, and to make it less complex to implement at the decoder, the inventors of the ’714 Patent sought to incorporate into the merge list construction method a way to balance improved diversity of potential candidates while reducing the number of comparisons based on, among other things,

the location of the candidates relative to the prediction unit having its spatial motion vector candidate list constructed. Ex-1001 at 4:23-39. The inventors' Merge mode is also parallelizable; in other words, encoders and decoders can perform comparisons in parallel rather than one after the other. Ex-1001 at 17:40-41.

Figure 5 of the '714 Patent, with reference to Figures 9 and 11, illustrates improvements in merge list construction methods developed by the inventors. Figures 9, 11a, and 11b, reproduced below, label the locations of merge list candidates relative to a current block. In Figures 11a and 11b, the larger block 900 has been divided into two smaller prediction units (1st PU and 2nd PU), and in each case the candidates are shown for the second prediction unit in the block.

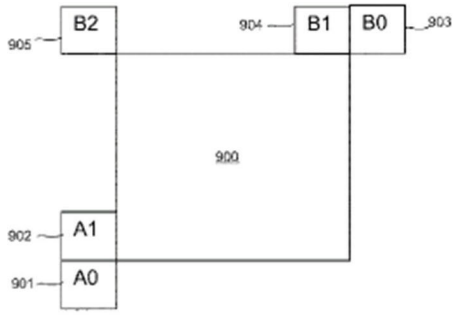


Fig. 9

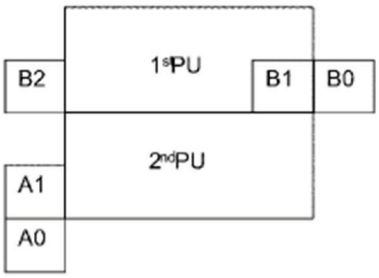


Fig. 11a

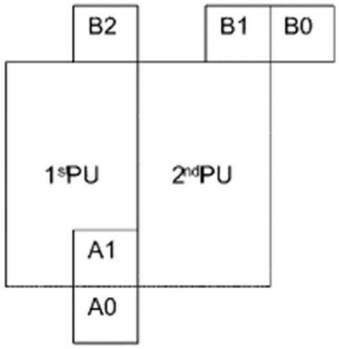


Fig. 11b

Ex-1001 at Figures 9, 11a, and 11b.

Figures 5a and 5b and 8a and 8b illustrate the encoder and decoder processes for merge list construction, respectively. Figures 5a and 5b are reproduced below:

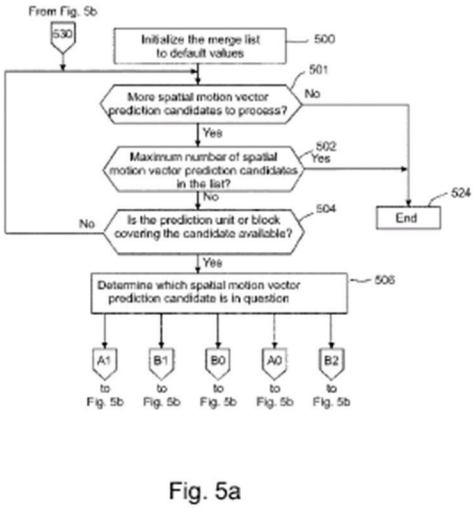


Fig. 5a

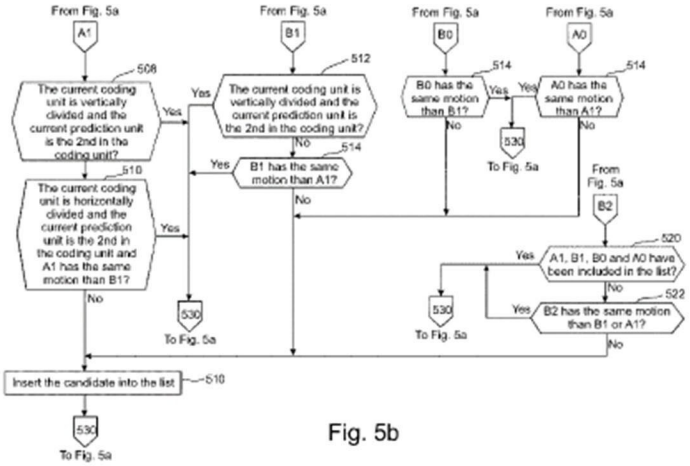


Fig. 5b

Ex-1001 at Figures 5a and 5b.

Each spatial motion vector prediction candidate A0, A1, B0, B1, and B2, which represent the locations of the blocks with which the motion prediction candidates are associated, is subject to a limited set of comparisons and other conditions to determine whether it can be included in the merge list. By eliminating candidate pairs for comparison that are unlikely to have diverse motion vector information, the inventors of the ’714 Patent reduced the worst-case scenario for comparisons from 10 to 6 (*see* Ex-1001 at 14:21-16:55), significantly reducing the number of comparisons that need to be performed to construct the merge list. As shown in Figure 5b, because subsets for comparison are determined based on the location of the block associated with a spatial motion vector prediction candidate, the comparisons are parallelizable. Ex-1001 at 17:40-41. For example, Figure 5b

depicts the possibility of parallel processes for A0, A1, B0, and B1. *Id.*; Ex-1001 Fig. 5b.

C. The Asserted Prior Art

1. Rusert (Ex-1004)

Rusert (U.S. Patent App. Pub. No. 2011/0194609, Ex-1004) is a published patent application titled "Selecting Predicted Motion Vector Candidates" and naming Thomas Rusert, Jacob Ström, Kenneth Andersson, Per Wennersten, and Rickard Sjöberg as inventors.

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 ¶¶ 11-12, 36-37. The PMV candidates are derived from previously coded neighboring blocks within an allowed distance from the current block. *Id.* ¶¶ 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. Ex-1004 ¶¶ 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).

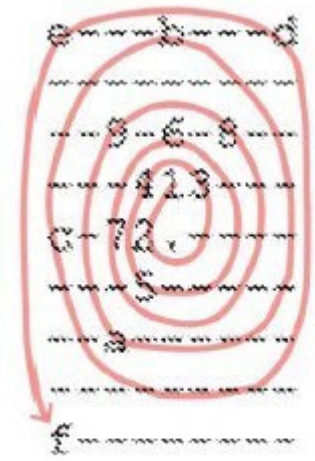


Fig. 3n

Ex-1003 at 130 (Dr. Creusere annotating the counterclockwise scan order in red).

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. IPR2024-00604, IPR2024-00605, Ex-2020 at 75:6-76:1; *see also id.* at 72:11-76:19. In Figure 3n, the current block is represented by the dot at the center of the figure. 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-2022 ¶ 72. 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-2022 ¶ 71.

Some of the blocks in Rusert's scan orders 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). *See* Ex-1004 ¶ 54. Rusert 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-2022 ¶ 73.

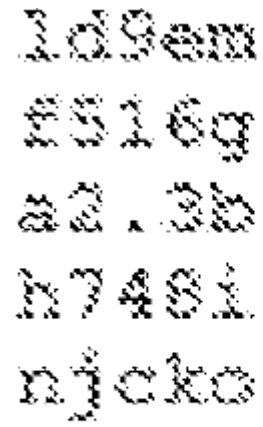


Fig. 3b

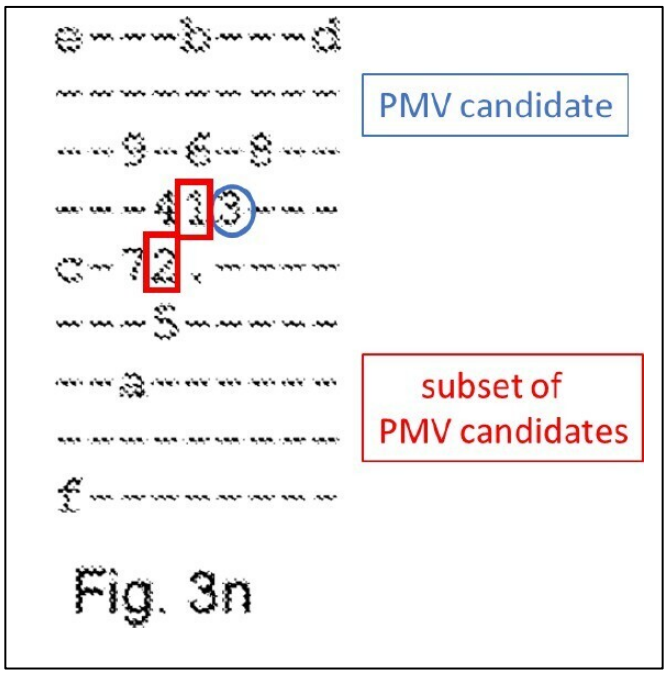
Fig. 3c

Ex-1004 at Figures 3b-3c.

As previously discussed, Rusert's scan pattern depicted in Fig. 3n—the pattern relied upon by Petitioner—conducts a counterclockwise scan of selected and available previously coded PMV candidates, beginning from the current block and staying within an allowed distance. *Id.* ¶¶ 4-5, 36-39, 43-44, 51-66; *see also* Ex-2022 ¶ 74. As the scan progresses outward, what Petitioner refers to as "the subset," Pet. at 28-29, has already been determined before Rusert reaches the next "spatial motion vector prediction candidate." That is, what is in Rusert's alleged "subset" are the

results of evaluations of prior "candidates," which depend only on the availability of candidates in the prior blocks in the scan order and whether those prior "candidates" met the comparison criteria with the candidates already present in PMV_CANDS at that time, Ex-1004 ¶¶ 44, 51-66; *see also id.* at Figures 3a-3n; Ex-2022 ¶ 75. Rusert's prior evaluations to determine the alleged "subset" are complete before Rusert ever reaches what Petitioner alleges is the "first spatial motion vector prediction candidate." Ex-2022 ¶ 87. These prior evaluations also do not, and cannot, take into account the location or value of subsequent candidates that may be located in Rusert's scan order.

For instance, when the motion vector for the block at location 3 ("block 3") is evaluated during Rusert's counterclockwise scan sequence, the "subset" of candidates in PMV_CANDS already includes candidates from previously evaluated scan locations, such as blocks 1 and 2, assuming those blocks are available and that the candidate associated with block 2 has not been excluded due to similarity to block 1. Petitioner argues the alleged "subset" (here, candidates associated with 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 28. 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-2022 ¶ 76.



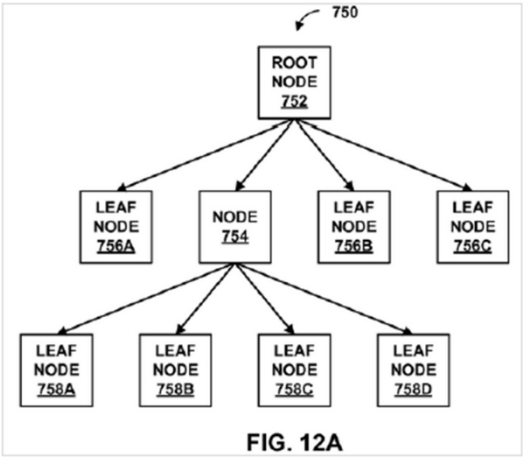
Pet. at 28.

The motion information for the candidate being evaluated, in this case, the candidate associated with 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 ¶¶ 62, 71. When Rusert evaluates block 3, all possible pairs of spatial motion vector prediction candidates from the scan order are compared. Ex-2022 ¶ 77.

2. Karczewicz (Ex-1005)

Karczewicz (U.S. Patent App. Pub. No. 2011/0249721) is a published patent application titled "Variable length coding of coded block pattern (cbp) in video compression" that names Marta Karczewicz, Wei-Jung Chien, and Xianglin Wang as inventors.

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 ¶¶ 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.* ¶ 35. Figure 12A of Karczewicz depicts such a quad-tree structure. *See id.* ¶¶ 123-125. Karczewicz does not disclose a motion vector prediction list, a merge list, or a method for constructing such a list.



Ex-1005, Fig. 12A.

3. Lin (Ex-1006)

Lin (U.S. Patent No. 10,063,876) is a published patent titled "Method and apparatus for removing redundancy in motion vector predictors" that names Jian-Liang Lin, Yi-Wen Chen, Yu-Wen Huang, and Shaw-Min Lei as inventors.

Lin addresses a scenario where a coding unit (CU) is divided into multiple prediction units (PUs). See Ex-1006 ¶¶ 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*.

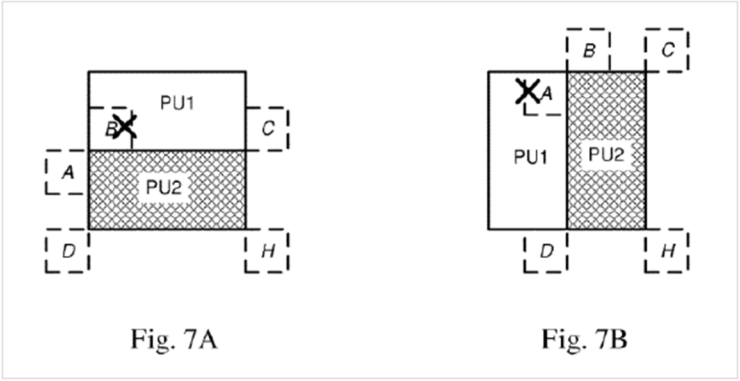


Fig. 7A Fig. 7B

Ex-1006, Figs. 7A and 7B.

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 13-14.

IV. CLAIM CONSTRUCTION

Previously, the Board found Petitioner's interpretation unpersuasive that "the block" in limitation 1[b] means the "current block," as in the "block of pixels" introduced in limitation 1[a]. Ex-1052 at 16-18, 30-33. Patent Owner agrees.

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

with the first spatial motion vector prediction candidate" to mean the subset is determined based on the location of the block with which the first spatial motion vector prediction candidate is associated. Ex-1052 at 16-18. 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-2022 ¶ 43.

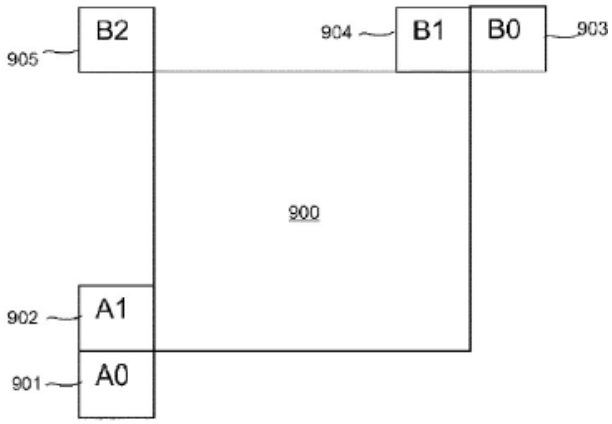


Fig. 9

Ex-1001, Figure 9. The Board has already observed that Petitioner's construction wrongly reads out "associated with the first spatial motion vector prediction candidate." Ex-1052 at 17. Petitioner's attempt to preserve both constructions should be disregarded.

This response does not depend on further constructions, so Patent Owner does not address it here. Patent Owner reserves the right to further address claim construction should trial be instituted.

V. CLAIM LISTING

For the sake of this analysis, Patent Owner will use Petitioner's limitation labels provided in the Petition's Listing of Claims. Pet. at v-xxviii.

VI. ARGUMENT

As laid out below, both Grounds fail to teach limitations [1b], [1c], [9b], [9c], [15b], [15c], [23b], [23c], [29b], [29c], [30b], and [30c]. As a result, the petition fails to teach the limitations of any challenged claim.

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/the] location of the block associated with the first spatial motion vector prediction candidate"

The Petition fails on limitations [1b], [9b], [15b], [23b], [29b], and [30b] because Rusert's subset (PMV_CANDS) is fully determined before the alleged "first spatial motion vector prediction candidate" is even known, let alone before any information about that candidate's location could influence the subset. Ex-2022 ¶¶ 82–88, 95–108. As Dr. Richardson explains, in Rusert, the subset at any iteration is a product of sequential processing of earlier scan-order blocks; it is never a function of the location of the next block to be evaluated. Ex-2022 ¶¶ 96–97.

The '714 Patent operates differently. In the patented method, the subset for a given candidate is deterministically defined by the candidate's spatial position: if the first spatial motion vector prediction candidate is A0, the subset is {A1}; if it is B0,

the subset is {B1}. Ex-1001, 15:50–16:49; Ex-2022 ¶¶ 91–93. Knowing the location of the first candidate is both necessary and sufficient to determine the subset. Ex-2022 ¶ 93. This location-based subset determination is what the claims require by the phrase "based on a location of the block associated with the first spatial motion vector prediction candidate."

Rusert has no such location-based subset mapping. In Rusert, the content of PMV_CANDS at any iteration depends entirely on the availability and motion-vector values of the blocks previously processed in the scan order, not on the location of the next block to be considered. Ex-2022 ¶¶ 97, 102–105. As Dr. Richardson demonstrates, the same PMV_CANDS content (e.g., {1, 2}) may be the alleged "subset" regardless of whether the next block evaluated is block 3, block 4, or any later-numbered block, depending solely on which earlier blocks are available. Ex-2022 ¶¶ 99–104.

Two concrete examples confirm this point. If blocks 1 and 2 are available and dissimilar, PMV_CANDS will be {1, 2} at iteration 2. If block 3 is available, it is compared to {1, 2}. If block 3 is not available, block 4 is compared to the identical {1, 2}. Ex-2022 ¶¶ 99–104. The location of the candidate under evaluation—block 3 versus block 4—has no bearing whatsoever on the content of PMV_CANDS. *Id.* Any correlation between position in the scan order and subset size is therefore

incidental to sequential processing, not evidence of a causal location-based determination. Ex-2022 ¶ 110.

Petitioner's own expert, Dr. Havlicek, confirmed this sequential reality. When asked whether, once the update to the list has concluded, "we know the subset to which the next selected motion vector will be compared, but we do not yet know if the next visited block contains a motion vector," Dr. Havlicek answered: "It is true that we know the next block that will be visited. It is true that we do not know if that block has a motion vector." Ex-2021, Havlicek Dep. Tr. at 135:17–136:2; Ex-2022 ¶ 87. He further confirmed that Rusert's PMV_CANDS is "in construction, under construction" as blocks are processed and that it "evolved" during the scan. Ex-2021, Havlicek Dep. Tr. at 119:18–120:2; Ex-2022 ¶ 97. This evolving, sequential character is fundamentally inconsistent with a subset that is determined "based on" a candidate's location.

Dr. Havlicek also agreed that "Rusert's subset can only consist of motion vectors taken from blocks prior to the selected block in the scan order" and that this "is the way I believe a person of ordinary skill reads Rusert." Ex-2021, Havlicek Dep. Tr. at 131:12–17; Ex-2022 ¶ 82. He acknowledged that when block 5 is selected, "it is not possible for any motion vector from the block marked 6 to be part of the subset" because Rusert "teaches that we follow a scan pattern that has an order to it" and the scan order "does not look at the motion vector associated with the block

marked 6 until after the subset has been evaluated" with respect to block 5. Ex-2021, Havlicek Dep. Tr. at 130:8–131:6; Ex-2022 ¶ 82.

When asked how the subset is determined for a given candidate, Dr. Havlicek testified: "It's determined by the scan order." Ex-2021, Havlicek Dep. Tr. at 128:18–129:2; Ex-2022 ¶ 108. This is a critical distinction. In the '714 Patent, the subset is a direct function of the candidate's spatial position. In Rusert, the subset is determined by the scan order and the results of prior sequential processing. As Dr. Richardson explains, knowing only the location of the next block in Rusert's scan order tells a POSITA nothing about the contents of PMV_CANDS. Ex-2022 ¶ 108.

Petitioner argues that the subset is "based on" the current PMV block location because, for example, if the current block being evaluated is block 3, the subset is at most {1, 2}. Pet. at 30. This argument confuses temporal sequence with causal dependence. As Dr. Richardson explains, PMV_CANDS after iteration 2 will contain (at most) blocks 1 and 2 regardless of which block is next evaluated. Ex-2022 ¶¶ 99–105. The location of the block being evaluated is therefore not taken into account in any way during the previous content selection of PMV_CANDS. Ex-2022 ¶ 102.

Petitioner's alternative construction of "the block" as referring to the current block being encoded or decoded, rather than the block associated with the first spatial motion vector prediction candidate, was already rejected by the Board in the

prior Institution Decision in IPR2024-00604 and IPR2024-00605. Institution Decision at 16–18 (ASUS-1052); Ex-2022 ¶¶ 44, 94. The Board correctly held that "the block" in limitation [1b] means "the block associated with the first spatial motion vector prediction candidate." *Id.* Dr. Richardson agrees with both the Board and Patent Owner on this point. Ex-2022 ¶ 94.

Even under Petitioner's alternative construction, Rusert still fails. As Dr. Richardson explains, Rusert's PMV_CANDS list is not determined based on the location of the current block in the manner the claims require. Rather, the content of PMV_CANDS depends on the availability and values of prior candidates, not on the location of the current block under consideration. Ex-2022 ¶¶ 95–98. The subset for a given location is not fixed or deterministic in Rusert; it depends on the contingent results of prior processing. *Id.*

Because Petitioner relies solely on Rusert for limitations [1b], [9b], [15b], [23b], [29b], and [30b] in both Ground 1 and Ground 2, and Rusert does not teach it, both Grounds fail for this independent reason. Ex-2022 ¶ 89.

2. Petitioner's Ground 1 argument fails because the Board already rejected Petitioner's "subset" theory advanced under Nakamura, and Dr. Havlicek agrees with Dr. Creusere that Nakamura and Rusert operate the same way for this limitation

Petitioner's theory that Rusert determines a "subset" based on the location of the first spatial motion vector prediction candidate is not new. It is the same theory

Petitioner advanced in the prior proceedings (IPR2024-00604 and IPR2024-00605) through its prior expert, Dr. Creusere, with respect to Nakamura. The Board considered and rejected that theory at institution. *See* IPR2024-00604, Institution Decision at 56-57 (ASUS-1052); Ex-2022 ¶¶ 80–88.

In those earlier proceedings, Petitioner alleged that Nakamura's S0 constitutes the claimed "subset" and that S0 is determined "based on a location of the block associated with the first spatial motion vector prediction candidate" (S1). Ex-2022 ¶ 80. The Board squarely rejected this contention, noting: "As Patent Owner notes, 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 56; Ex-2022 ¶ 84. In other words, the alleged subset (S0) is determined before the alleged first spatial motion vector prediction candidate (S1) is known or confirmed, and therefore the subset cannot be "based on" the location of S1's associated block.

The same deficiency applies to Rusert. As Dr. Richardson explains, both Rusert and Nakamura are similar in that both determine what Petitioner alleges to be the "subset of spatial motion vector candidates" before ever determining or selecting what Petitioner alleges to be the "first spatial motion vector prediction candidate." Ex-2022 ¶¶ 80–81. Dr. Creusere agreed with this similarity in his deposition in the prior proceeding, confirming that in both Rusert and Nakamura, "what exists in the subset . . . will depend on some prior processing before we get to

[the first candidate] in [the reference's] order." Ex-2020, 103:20–105:9; Ex-2022 ¶¶ 81–82.

Dr. Havlicek, Petitioner's expert in this proceeding, adopted Dr. Creusere's analysis wholesale. Dr. Havlicek stated in his declaration that he "agree[s] with the technical opinions and substance of Dr. Creusere's declarations" and "adopt[s] them as my own." Ex-1003 ¶ 4; Ex-2022 ¶ 109. Yet Dr. Havlicek offers no independent opinions on Nakamura, confirming at deposition: "My declaration submitted in this IPR proceeding offers no opinions on Nakamura." Ex-2021, Havlicek Dep. Tr. at 32:1–2; Ex-2022 ¶ 109.

Petitioner cannot have it both ways. Dr. Havlicek adopts Dr. Creusere's opinions as his own, including Dr. Creusere's concession that both Nakamura and Rusert determine the alleged subset before the alleged first spatial motion vector prediction candidate is known. Ex-2022 ¶¶ 81–82, 109. Dr. Havlicek independently confirmed the same sequential ordering during his own deposition, as discussed in Section 1 above. Ex-2022 ¶¶ 82–83, 87, 106, 108. If the Board rejected the "subset" theory under Nakamura because S0 is determined before S1 is known, the same reasoning compels rejection of the identical theory under Rusert, particularly where Petitioner's own experts in both proceedings have agreed that Nakamura and Rusert operate the same way for this limitation.

The Petition now advancing Rusert is, in substance, a copycat of the prior Petition's theory. The only difference is the prior-art label. The underlying mechanism—sequential processing in which the alleged subset is fully established before the alleged first candidate is identified—is the same. Ex-2022 ¶¶ 80–88. The Board's prior reasoning applies with equal force here.

Furthermore, the logical deficiency identified by the Board is structural, not reference-specific: if the subset is determined before the first spatial motion vector prediction candidate is known, then the subset cannot be "based on" the location of that candidate's associated block. Ex-2022 ¶ 84. As Dr. Richardson explains, a POSITA would understand that the first spatial motion vector prediction candidate must be known and confirmed for any determination of a subset to be "based on" the location of the first spatial motion vector prediction candidate. Ex-2022 ¶ 84.

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

The Petition also fails on limitations [1c], [9c], [15c], [23c], [29c], [30c] because Rusert's method of building the PMV_CANDS list necessarily compares every possible candidate pair from the set of spatial motion vector prediction candidates. Ex-2022 ¶¶ 112–126. The '714 Patent achieves comparison reduction by determining a subset that is less than the full set of candidates and then comparing

the first spatial motion vector prediction candidate only to the members of that subset—not to every other member of the set. Ex-2022 ¶ 113. Rusert does not.

In the ’714 Patent, when candidate A0 is the first spatial motion vector prediction candidate, it is compared only to A1 (the subset). It is not compared to B0, B1, or B2. Candidate pairs such as A0/B0 and A0/B1 are never compared. Ex-1001, 15:50–16:7; Ex-2022 ¶ 113. A POSITA would understand that is what it means to compare “without making a comparison of each possible candidate pair from the set.” Ex-2022 ¶ 113.

Rusert operates differently. In Rusert, the “set of spatial motion vector prediction candidates” is created dynamically as the method moves through the scan order. Ex-2022 ¶ 114. At each position in the scan order, if a motion vector is present, its motion information is compared to the motion information of every previously identified candidate that has been added to PMV_CANDS. Ex-1004 ¶¶ 71–72; Ex-2022 ¶ 115. Dr. Havlicek confirmed this, testifying that a candidate “will be compared to everything on the PMV candidate list at the time that it is processed.” Ex-2021, Havlicek Dep. Tr. at 156:6–11; Ex-2022 ¶ 115.

As Dr. Richardson demonstrates through a walkthrough of Rusert’s Figure 3n (assuming blocks 1 through 4 are available), every possible candidate pair from the set is compared. At iteration 0, block 1 is added. At iteration 1, candidate 2 is compared to candidate 1 (pair {2, 1}). At iteration 2, candidate 3 is compared to

candidates 1 and 2 (pairs {3, 1} and {3, 2}). At iteration 3, candidate 4 is compared to all remaining members, forming pairs {4, 1}, {4, 2}, and {4, 3}. In total, the pairs {2, 1}, {3, 1}, {3, 2}, {4, 1}, {4, 2}, and {4, 3} are compared—every possible candidate pair from the set of candidates 1 through 4. Ex-2022 ¶ 116.

The Petition argues that Rusert "avoids comparing each pair of candidates from the scan order" because Rusert compares potential candidates with "preceding candidates already in PMV_CANDS, which are a subset of the candidates in the scan order." Pet. at 35. This argument conflates two distinct concepts: (i) the number of candidates in PMV_CANDS at a given iteration and (ii) whether all candidate pairs are compared. Ex-2022 ¶ 117. In Rusert, a candidate is removed from PMV_CANDS only after it is compared to all current members of PMV_CANDS and found to be a duplicate or within a threshold distance. Ex-1004 ¶¶ 71–72; Ex-2022 ¶ 117. The removed candidate's motion information has already been compared to every candidate in PMV_CANDS, and its motion information is the same as (or within a threshold distance of) an existing member. *Id.*

Critically, when a duplicate candidate is removed, subsequent candidates are still compared to the excluded candidate's motion information. As Dr. Richardson explains, if candidates 1 and 2 have identical motion information, candidate 2 is excluded as a duplicate. But when candidate 3 arrives and is compared to candidate 1, that comparison is also a comparison against candidate 2's motion information

because candidates 1 and 2 share the same (or substantially the same) motion information. Ex-2022 ¶ 118. Thus, every prior candidate's motion information has been compared, whether or not that prior candidate remains in PMV_CANDS. Ex-2022 ¶¶ 118–119.

This is fundamentally different from the '714 Patent. In the '714 Patent, when A0 is compared to A1, the comparison of A0's motion information with B0's motion information never occurs; the pair A0/B0 is never compared, even indirectly or by proxy. Ex-1001, 15:50–16:7; Ex-2022 ¶ 119. There is no mechanism in the claimed method by which the comparison of A0 with A1 accounts for or substitutes for a comparison with B0. *Id.* By contrast, in Rusert, every candidate's motion information is compared, either directly or through a proxy of identical motion information from aggregated comparisons to every other candidate's motion information in PMV_CANDS. Ex-2022 ¶ 119.

The Petition further argues that Rusert satisfies this limitation because the "scan may be terminated . . . as soon as a pre-defined number of unique PMV candidates have been found." Pet. at 35 (citing Ex-1004 ¶ 48). This argument fails because blocks at positions in the scan order that are never reached by the scan are not "candidates" in any meaningful sense and therefore not part of "the set of spatial motion vector prediction candidates." Ex-2022 ¶¶ 120–123. A block position that Rusert's scan never reaches was never identified, never selected, and never

considered for inclusion in the motion vector prediction list. It is simply not a spatial motion vector prediction candidate for that block. Ex-2022 ¶ 121. Dr. Creusere agreed that the "candidates" in Rusert are those in the scan order, not all previously coded blocks. Ex-2020, 72:11–76:19; Ex-2022 ¶ 123.

Petitioner's logic would render the "without making a comparison" limitation meaningless. Under Petitioner's reasoning, virtually any comparison process, no matter how exhaustive within its defined scope, would satisfy the limitation simply because there exist blocks outside the scope that were never compared. Ex-2022 ¶ 122. That cannot be correct. A POSITA would understand that the "set of spatial motion vector prediction candidates" refers to the candidates that are actually identified and considered for the block being processed. Ex-2022 ¶ 122.

Additionally, Petitioner's own interpretation of the "set" across its arguments is internally inconsistent. When arguing that Rusert teaches "a set of spatial motion vector prediction candidates" (limitation [1a]/[9a]), the Petition characterizes the "set" as "previously coded motion vectors that were used for previous blocks." Pet. at 21 (citing Ex-1004 ¶¶ 11–12). But when arguing that Rusert teaches "without making a comparison of each possible candidate pair from the set," the Petition contends that candidates in PMV_CANDS are a "subset of the candidates in the scan order." Pet. at 35. Ex-2022 ¶ 125. These two characterizations are irreconcilable. If the "set" is all previously coded motion vectors, then the scan order itself is already

a subset, and the "comparing" step trivially avoids all pairs from the larger set—but only because the majority of those motion vectors are not even candidates. If the "set" is the scan-order candidates, then Rusert compares every pair within that set, as shown above. Either way, Petitioner's argument fails. Ex-2022 ¶ 125.

Because both Ground 1 and Ground 2 rely on Rusert for limitations [1c], [9c], [15c], [23c], [29c], [30c], and Rusert fails to teach these limitations, both Grounds fail for this additional, independent reason. Ex-2022 ¶ 126.

4. Rusert's Scan Order Teaches Away from Combination with Karczewicz's Variable-Size Prediction Units, and a POSITA Would Not Have Had a Reasonable Expectation of Success in Combining the References

The Petition proposes combining Rusert with Karczewicz to apply Rusert's block-based teachings to H.265 "prediction units" as taught by Karczewicz. Pet. at 17–19; Ex-1003 ¶¶ 71–86. This combination fails because Rusert's scan order is designed for, and only suited to, a uniform grid of equally sized blocks, and Karczewicz teaches that H.265 introduces variable-size prediction units, including non-square, rectangular PUs, that are fundamentally incompatible with Rusert's scan methodology. Ex-2022 ¶¶ 127–138.

Rusert's scan patterns are designed for a uniform grid. Rusert explains its teachings in the context of H.264, for which Rusert describes a motion vector is provided for each "8×8 pixel block." Ex-1004 ¶ 36. Rusert's scan patterns, illustrated

in Figures 3a through 3n, depict a regular grid in which each cell represents a block of the same size. Ex-1004 ¶¶ 51–66; Ex-2022 ¶ 128. The current block, represented by ".", is surrounded by blocks of equal dimensions, and the scan order proceeds outward through this uniform grid. *Id.*

Rusert's scan order depends on distance calculations that presuppose a uniform block grid. Rusert teaches calculating distances using Euclidean distance, Chebyshev distance, and Manhattan distance. Ex-1004 ¶¶ 44, 51–59; Ex-2022 ¶ 129. These calculations assume that each surrounding block occupies a fixed (x, y) position on a regular grid. *Id.* For example, Rusert's Euclidean distance formula—"euclidian_dist = sqrt((xpos-3)^2 + (ypos-5)^2)"—is meaningful only when each position on the grid represents a block of the same size. Ex-1004 ¶¶ 51–52; Ex-2022 ¶ 129.

Rusert's preferred scan pattern (Figure 3n) further confirms the uniform-block assumption. It includes only blocks "directly above and to the left of the current block" and "corner blocks." Ex-1004 ¶ 65. Rusert defines "corner" and "middle" positions relative to the current block: "A previous block at a corner position is offset from a current block position by an equal distance in a horizontal direction and a vertical direction. A previous block at a middle position is either horizontally aligned or vertically aligned with a current block position." Ex-1004 ¶ 16; Ex-2022 ¶ 130. These definitions are coherent only when all blocks are uniform squares on a regular

grid. *Id.* Dr. Havlicek confirmed that Figure 3n is "the apex of Rusert's sequential improvement." Ex-2021, Havlicek Dep. Tr. at 95:22–96:5; Ex-2022 ¶ 130.

Karczewicz, by contrast, teaches that in H.265, coding units can be divided into prediction units (PUs) of varying sizes, including non-square, rectangular shapes such as 2NxN and Nx2N PUs. Ex-1005 ¶ 35; Ex-2022 ¶ 131. The Petition itself acknowledges these partition modes. Pet. at 5–6; Ex-1003 ¶ CA19.

The Petition needs Karczewicz specifically for its H.265 PU terminology, but Karczewicz also introduces the very feature that undermines the combination: variable-size, non-square PUs. Ex-2022 ¶ 132. The Petition cannot selectively adopt Karczewicz's "PU" terminology while ignoring that PUs in H.265 can be rectangular, non-uniform in size, and arranged in patterns that do not conform to a regular grid. *See* Pet. at 5–6; Ex-1003 ¶ CA19.

Rusert's scan order breaks down when applied to non-uniform, rectangular PUs. As Dr. Richardson explains, consider a coding unit vertically divided into two Nx2N prediction units. The resulting PUs are tall, narrow rectangles, not squares. The spatial relationships that Rusert's scan order relies upon—uniform grid positions, consistent distances between blocks, and predictable "corner" and "middle" positions—no longer hold. Ex-2022 ¶ 133. A rectangular PU may span multiple positions in what would otherwise be Rusert's uniform grid, or a single grid position may correspond to only a fraction of a larger PU. *Id.* Even when the current

block is a square PU, the neighboring blocks may be PUs from coding units that were partitioned differently, resulting in a heterogeneous mix of PU sizes and shapes. Ex-2022 ¶ 133.

Dr. Havlicek himself acknowledged these complications. When asked how Rusert's scan would apply to surrounding blocks in an H.265 context, Dr. Havlicek conceded: "Well, if it's H.265 and not H.264, then it's possible that all of those blocks were already processed because of division of a—of a coding unit, or maybe they weren't. So it might be that you can't consider the ones that are below the dot, you know." Ex-2021, Havlicek Dep. Tr. at 102:16–103:1; Ex-2022 ¶ 134. This testimony confirms that even Petitioner's own expert recognizes that transitioning Rusert's scan order to H.265's variable-size PU structure introduces significant uncertainty that Rusert does not address. Ex-2022 ¶ 134.

Rusert teaches away from the proposed combination. Throughout its description of scan patterns, Rusert iteratively refines its approach for a uniform grid, noting that certain scan patterns are "quite hard to 'spiral outwards'" (Ex-1004 ¶ 55), that some patterns "could require too many tests" (Ex-1004 ¶ 65), and that the preferred pattern of Figure 3n was selected because it "has been found to combine good compression efficiency . . . with good computation performance." Ex-1004 ¶ 66; Ex-2022 ¶ 135. These refinements all assume and are optimized for a uniform

grid. Applying Rusert's scan to non-uniform, rectangular PUs would reintroduce and exacerbate the very problems Rusert worked to solve. Ex-2022 ¶ 135.

Although Rusert states generally that its "principles . . . can also be applied to . . . other coding standard[s]" (Ex-1004 ¶ 116), a POSITA would understand this statement to refer to Rusert's general principle of selecting PMV candidates from spatially neighboring blocks but not to the specific scan methodology of Figure 3n, with its distance calculations, corner and middle position definitions, and uniform-grid assumptions. Ex-2022 ¶ 135. The portability of a general concept does not mean that the particular implementation upon which the Petition relies can function in a non-uniform block environment. *Id.*

A POSITA would not have been motivated to combine Rusert and Karczewicz. The Petition asserts that "Rusert's concepts were readily applicable to PUs" and that the combination would produce "predictable results." Pet. at 19. But this assertion ignores the fundamental mismatch between Rusert's uniform-grid scan methodology and H.265's variable-size PU architecture. Ex-2022 ¶ 136. A POSITA would have recognized that Rusert's scan patterns were specifically designed for the uniform 8×8 sub-block grid of H.264 and that the introduction of variable-size, rectangular PUs would undermine the distance-based ordering and spatial assumptions upon which Rusert's entire scan methodology depends. Ex-2022 ¶ 136.

A POSITA would not have had a reasonable expectation of success in combining the references. A POSITA attempting to apply Rusert's Figure 3n scan pattern to a frame containing a mixture of 2N×2N, 2NxN, and Nx2N prediction units of varying sizes would face fundamental design choices that Rusert does not address, including: how to define "distance" between non-uniform PUs, how to determine the scan order when neighboring PUs span multiple grid positions, and how to identify "corner" and "middle" positions when the current block is itself a non-square rectangle. Ex-2022 ¶ 137. These are not trivial implementation details; they go to the core of Rusert's scan methodology. A POSITA would not have had a reasonable expectation that Rusert's scan order could be straightforwardly applied to variable-size PUs without substantial redesign of the scan methodology itself; a redesign that neither Rusert nor Karczewicz provides. Ex-2022 ¶ 137.

For these reasons, the Petition's proposed combination of Rusert and Karczewicz lacks both an adequate motivation to combine and a reasonable expectation of success. Rusert's scan order teaches away from application to non-uniform block shapes, and Karczewicz—the very reference the Petition relies upon for PU terminology—introduces the non-uniform, rectangular PU shapes that are incompatible with Rusert's scan methodology. Ex-2022 ¶ 138. This provides an additional, independent basis for finding that Petitioner has failed to demonstrate that the challenged claims are unpatentable under Grounds 1 and 2.

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.").

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.

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Respectfully submitted,

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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 8,824 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.

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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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