

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

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

Petitioner

v.

NOKIA TECHNOLOGIES OY,

Patent Owner.

Case IPR2024-01141
U.S. Patent No. 8,036,273

PATENT OWNER'S PRELIMINARY RESPONSE

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Exhibit	Description
2001	Declaration of Dr. Douglas A. Chrissan
2002	CV of Dr. Douglas A. Chrissan
2003	U.S. Patent No. 6,950,469 to Karczewicz, et al. (“’469 Patent”)
2004	File History of App. Ser. No. 09/954,608 (“’608 Application”)
2005	File History of App. Ser. No. 11/090,717 (“’717 Application”)
2006	U.S. Patent No. 7,280,599 to Karczewicz, et al. (“’599 Patent”)
2007	U.S. Patent No. 5,901,248 to Fandrianto, et al. (“’248 Patent”)
2008	Certified Translation of the Brazilian Patent Office’s Opinion Regarding Brazilian Patent PI0211263-9
2009	“ITU-T Series H: Audiovisual and Multimedia Systems, Infrastructure of audiovisuals services – Coding of moving video, Advanced video coding for generic audiovisual services, Recommendation ITU-T H.264” International Telecommunication Union, March 2005. (“H.264”)

I. INTRODUCTION

Amazon.com, Inc. and Amazon.com Services LLC (“Amazon” or “Petitioner”) petition for *inter partes* review of claims 1, 4-17, 19-26, 28-29, 31-33, 36-49, 51-59, 61-62, and 64-83 (the “Challenged Claims”) of U.S. Patent No. 8,036,273 (the “’273 Patent”), which is owned by Nokia Technologies Oy (“Patent Owner” or “Nokia”). Petitioner asserts two grounds of unpatentability relying on a combination of two prior art references and the knowledge of a POSITA. The Board should decline institution for several reasons:

First, this Petition should be denied under 35 U.S.C. § 325(d) because the substance of the two cited references were disclosed to and considered by the Examiner of the ’273 Patent during prosecution.

Second, Petitioner has failed to meet its burden to show a reasonable likelihood of unpatentability of the Challenged Claims on the merits. *See* 37 C.F.R. § 42.108(c). Petitioner did not adequately plead a motivation to combine TML6 and Fandrianto, as well as the separate, distinct TML6 files. Moreover, even if combined, the references fail to disclose or render obvious key aspects of the ’273 Patent’s invention.

Third, the factors for discretionary denial under 35 U.S.C. § 314 warrant denying institution because the parallel District of Delaware litigation is between the

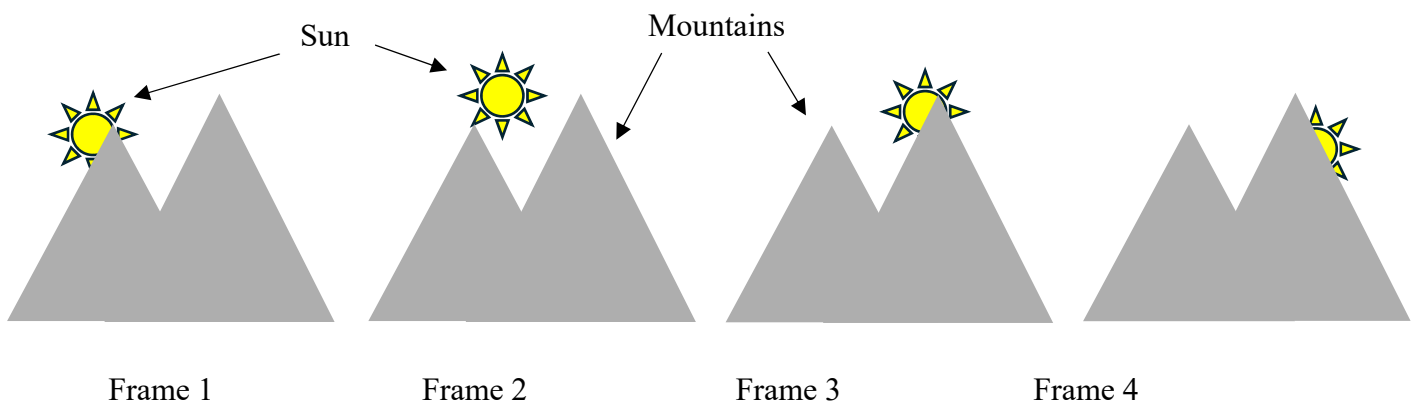
same parties. Petitioner has already challenged the patentability of the '273 Patent under Section 101 in the parallel Delaware litigation by motion. Ex. 1010.

Accordingly, Patent Owner requests that the Board deny institution of *inter partes* review.

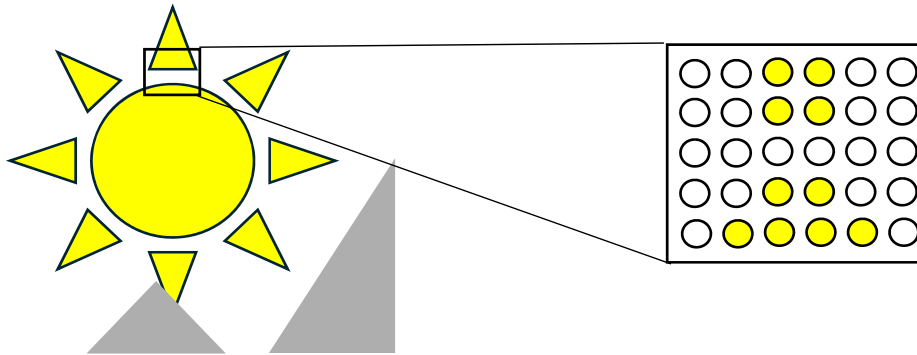
II. BACKGROUND

A. Technology

The '273 Patent relates to methods and apparatuses used in encoding and decoding digital videos. *See* Ex. 1001 at 1:13-16. Digital videos consist of series or sequences of still images or frames. *Id.* at 1:21-25. Displaying these frames at a relatively fast frame rate generates the illusion of motion. *Id.* For instance, when the series of frames shown below are illustrated in rapid succession, the sun appears to rise over and set behind the mountains.



Each uncompressed frame of a digital video sequence is created from an array of image pixels. Ex. 1001 at 1:43-45. The figure below illustrates the pixels for a portion of the image. Ex. 2001 at ¶ 37.



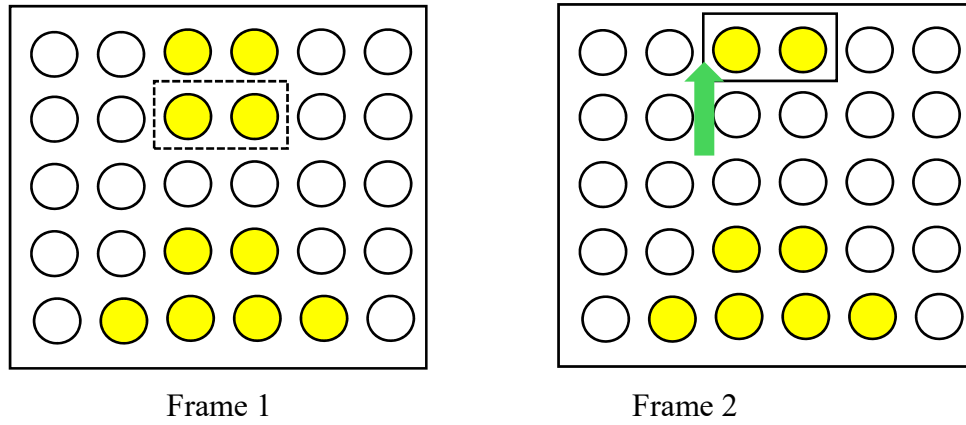
“[E]ach pixel [of an uncompressed video frame] is represented by a certain number of bits, which carry information about the luminance and/or colour” of the area within each pixel. *Id.* at 1:48-51. A pixel can be represented by a luminance (brightness) component and two chrominance (color) components. *Id.* at 1:51-56; Ex. 2001 at ¶ 37. Even basic image resolutions include tens of thousands of pixels. *Id.* at 1:45-48. Contemporary resolutions like 4K have millions of pixels. Thus, representing each pixel of each frame of a given video sequence requires a tremendous amount of data that is impractical for transmission. *Id.* at 1:41-43. Thus, to efficiently store and transmit video, it is necessary to compress video frames.

In a typical digital video, many elements often remain stationary throughout the sequence of frames. *Id.* at 1:25-31. For example, in the above sequence depicting a sun rise and set, the mountains stay in a fixed position in each frame. Other elements of the video sequence (*e.g.*, the sun) may maintain the same shape and color but shift to a different region of the frame. *Id.*; Ex. 2001 at ¶ 36. Some video compression methods take advantage of these common elements. For instance, an

encoder can use motion vectors to communicate changes to common elements from one frame to the next. Ex. 1001 at 2:42-44, 2:62-3:2, 4:18-19; *see also* Petition at 2. This is achieved through a concept known as “motion compensated prediction,” a technique that reduces temporal redundancy by “predicting” the content of certain frames based on the common elements from previous frames in the video sequence by tracing the motion of the common elements or regions of an image between frames. Ex. 1001 at 2:42:3:2; Ex. 2001 at ¶ 41. However, the predicted image is often not precise enough to represent the image content with sufficient quality, and therefore a prediction error frame can be associated with each predicted image. Ex. 1001 at 3:3-10. The prediction error frame contains prediction error information (also known as “residual information”) that represents a difference between the frame being coded and a predicted frame. Ex. 1001 at 3:40-51; Ex. 2001 at ¶ 42. The idea is to correct any unwanted errors in a prediction. Ex. 2001 at ¶ 43. To achieve smaller bitstreams, encoders attempt to “minimise the amount of information in a prediction error frame.” Ex. 1001 at 3:40-44. One way to minimize prediction error is to achieve better predictions.

An example of motion compensated prediction may be useful. The figures below demonstrate the shift of certain pixels between two frames. From Frame 1 to Frame 2, the sun moves up by one full pixel unit. The green arrow in Frame 2, for

example, shows the shift of two yellow pixels and represents the motion vector that can be used to explain the changes to the image in Frame 2 as compared to Frame 1.



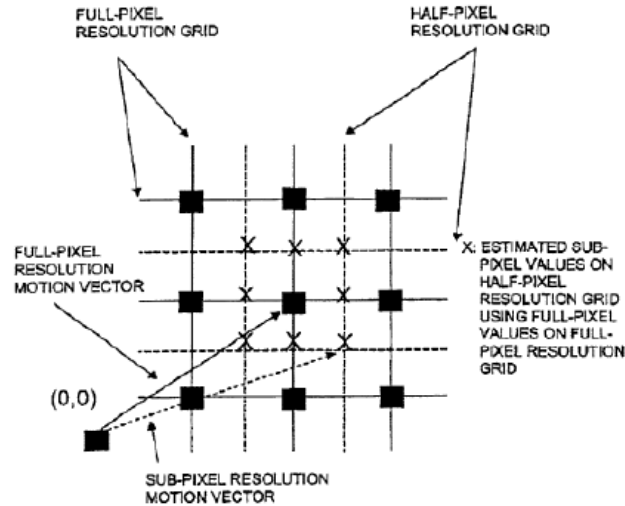
In real-life motion, however, digital image elements usually do not shift by a full pixel. Ex. 1001 at 6:31-48; Ex. 2001 ¶ at 48. Real-life motion typically involves fractional pixel movement between frames because a digital image only has a finite, discrete number of pixels captured at a moment in time, whereas the real-life motion captured by a video is continuous. Video compression methods thus often use “sub-pixel” resolution (i.e., motion vectors that point to a sub-pixel or fractional pixel rather than a full pixel). *Id.* The values corresponding to these sub-pixel motion vectors are calculated from full pixel values in a reference frame and used to “predict” pixel values in the frame being coded, thereby allowing for more accurate alignment of the image with the reference image. In turn, these more accurate predictions require less residual information in the bitstream, thereby improving coding efficiency. The sub-pixel values do not actually exist in the reference image

or in the bitstream but are created at the encoder and decoder based on the full pixel values of the reference image through a process called sub-pixel interpolation.

The interpolated values at the encoder and decoder ideally match to prevent introduction of error in the decoding process, but the demands on the encoder and decoder are different. An encoder's motion estimation process requires searching through many possible full- and sub-pixel values for a reference frame to identify an appropriate match for a current block of pixels being coded. Ex. 1001 at 4:37-60. This process requires the encoder to interpolate many sub-pixel values, even though the majority will not be chosen as a match. Once the closest matching block in a reference frame is identified, the encoder identifies it using a motion vector, which may be sent to the decoder with coded residual block information representing the difference between the current block of pixels and a prediction based on the transmitted motion vector. *Id.* at 4:6-36, 4:61-5:3; Ex. 2001 at ¶¶ 46-47. The decoder can reconstruct the current block of pixels by interpolating sub-pixel values from the closest matching block in the reference picture using the decoded motion vector and adding the decoded residual information to the interpolated sub-pixel values. Ex. 1001 at 6:3-17. Unlike the encoder, the decoder needs to interpolate only the sub-pixel values identified by the encoder.

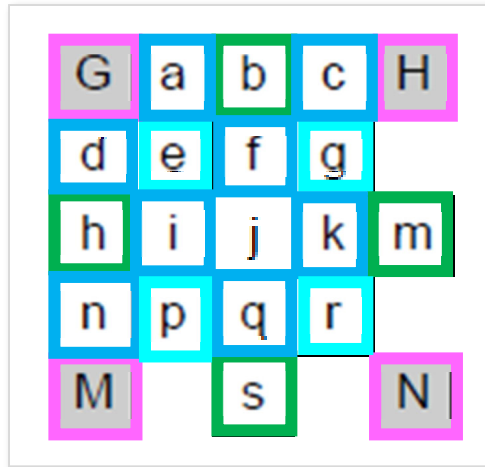
In designing an encoder or decoder, the full and sub-pixel values are typically represented on a grid to illustrate the relative positions of each pixel and sub-pixel

within a frame. Figure 5 of the '273 Patent, shown below, depicts an example grid of full pixels (squares) and “half-pixels” (x’s), which are located at half the distance between two full pixels.



Ex. 1001 at Figure 5.

Motion vectors may also identify quarter-pixels, located at half the distance between two-half-pixels. Ex. 1001 at 6:45-48. Although complexity is added, it is common for video coding schemes to use $\frac{1}{4}$ resolution. For instance, the figure below is an example of labels used to identify the pixels or sub-pixels:



Pixel - *G, H, M, and N*

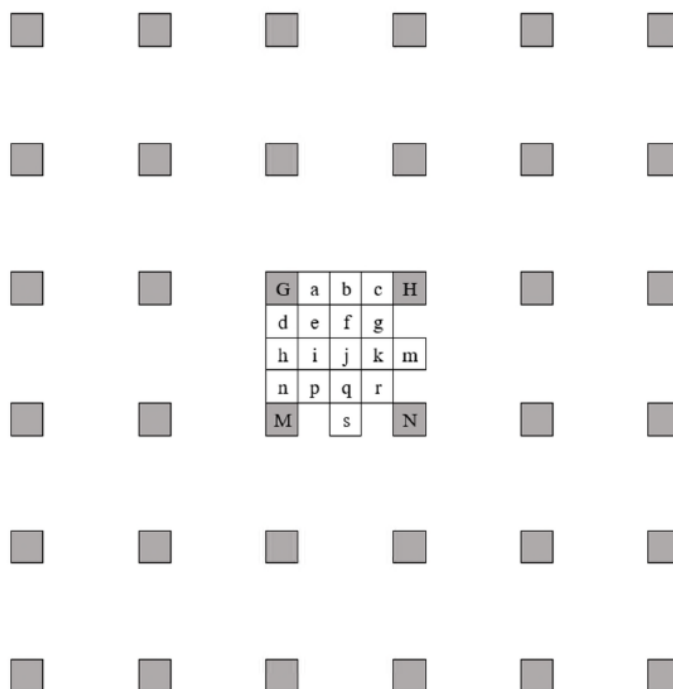
Half-pixel - *h, b, m, and s*

Quarter-pixel - *a, c, d, f, i, k, n, and q*

Quarter-Quarter pixel - *e, g, p, and r*

Half-Half pixel - *j*

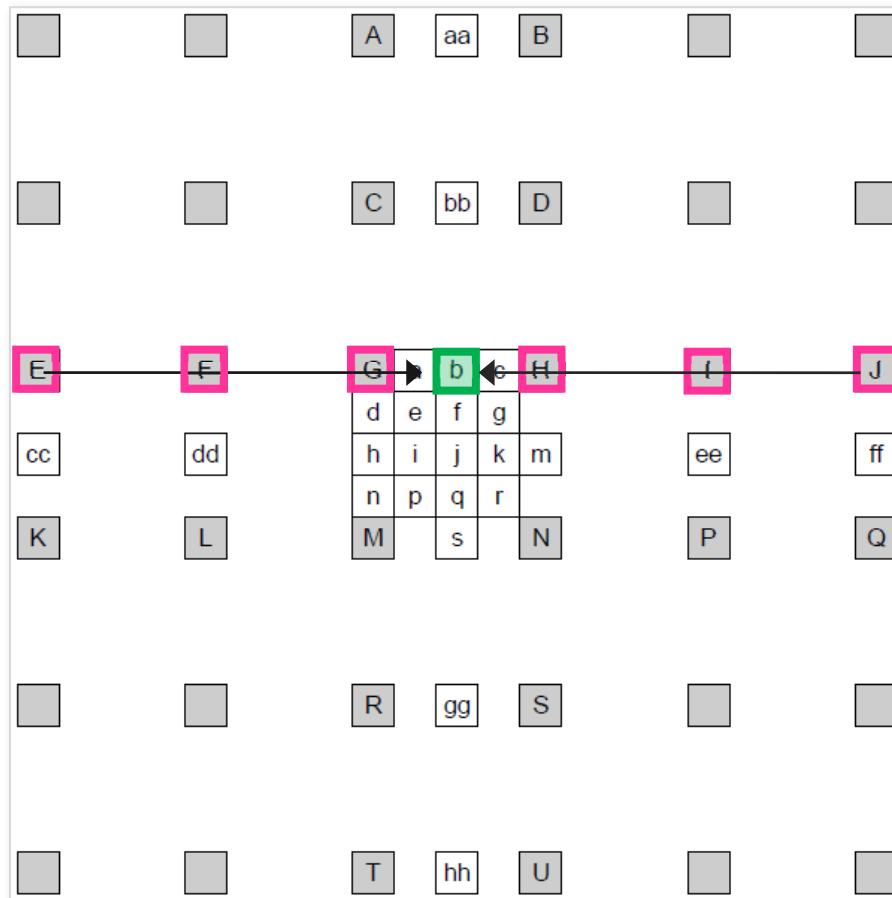
Although the block of four full-pixels (i.e, *G, H, M, and N*) with corresponding half- and quarter-pixels depicted above is commonly used as a search block, it is worth noting that these pixels and sub-pixels are surrounded by additional sets of full- and sub-pixels within the larger image frame. *See Ex. 1001 at 4:6-36; Ex. 2001 at ¶¶ 46-47.* The image below shows how the above grid is positioned relative to the neighboring full-pixels (highlighted in grey).



Using sub-pixel resolution to represent motion increases the quality of the video sequences when reconstructed at a decoder, but it also adds to the complexity of encoders and decoders. Ex. 1001 at 6:41-48; Ex. 2001 at ¶ 48. This additional complexity stems from the fact that the images of the video sequence to be coded do not include sub-pixels, and thus, for a motion vector to point to a sub-pixel, the encoder and decoder must interpolate the sub-pixels from nearby full pixels. *See* Ex. 1001 at 4:37-6:67.

One way to interpolate pixel and sub-pixel values is by using values of the six surrounding pixels (known as a “6-tap filter”). *See e.g. id.* at 10:1-10 (describing use of a 6-tap filter in TML5). In sub-pixel interpolation, a filter is often referred to by the number of taps, which is the number of input samples used in the calculation of an output value. For example, a 6-tap filter uses six sample points to perform

interpolation, each sample point being multiplied by a corresponding coefficient which determines the contribution each respective sample makes to the interpolated output value. A 6-tap filter offers precise interpolation of the sub-pixel value, but it is computationally and memory intensive. *Id.* at 13:9-17. The image below provides an example of 6-tap filter, where the sub-pixel *b* (highlighted in green) is interpolated using the pixel values for *E*, *F*, *G*, *H*, *I*, and *J*.



Ex. 2009 at Figure 8-4 (annotated).

Determining how many pixels or sub-pixels to use for interpolating the value of a given sub-pixel is a key design challenge for video coding because it involves balancing the need for more accurate predictions—achieved by incorporating additional pixel values into the interpolation—with the increased computational complexity and memory usage that come with using more pixel values. *See* Ex. 1001 at 43:47-44:32, 47:27-48:6. As described in more detail below, prior art methods, such as TML5 and TML6, used predetermined combinations of certain nearby pixels and sub-pixels to interpolate other sub-pixel values but failed to adequately balance the need for accuracy, computational complexity and memory usage. *See id.* at 12:65-13:18.

B. Prior Art Described in U.S. Patent No. 8,036,273

Before the '273 Patent, there were two approaches contemplated by the ITU-Telecommunications Standardization Sector (“ITU”), Study Group 16 Video Coding Experts (known as “VCEG”): Test Model 5 (referred to as “TML5”) and Test Model 6 (referred to as “TML6”).

The invention of the '273 Patent addresses the problems in prior art methods of sub-pixel value interpolation by optimizing both computational complexity and memory requirements while maintaining accuracy. Ex. 1001 at 43:47-52 (TML5), 44:9-22 (TML6). To highlight these benefits, the specification provides a detailed

description of several prior art methods of interpolation, including those used in TML5 and TML6,¹ and points to the disadvantages of those methods. *Id.* at 8:38-48.

For example, the '273 Patent describes that TML5 is “computationally complex” in its approach to interpolating quarter-pixels because it “depends upon the interpolation of $\frac{1}{2}$ resolution sub-pixel values.” Ex. 1001 at 11:6-13. At the decoder, TML5 requires interpolating multiple sub-pixel values other than the value identified by the motion vector. TML5’s methods for interpolating quarter-pixels also “depend upon the interpolated values obtained for other $\frac{1}{4}$ resolution sub-pixels,” which have been truncated and rounded, causing a decrease in precision. *Id.* at 11:13-20. “Another disadvantage of TML5 is that it is necessary to store the values of the $\frac{1}{2}$ resolution sub-pixels in order to interpolate the $\frac{1}{4}$ resolution sub-pixels values[,]” which requires excess memory storage. *Id.* at 11:20-24.

¹ The specification of the '273 Patent describes the sub-pixel value interpolation scheme employed in TML6. However, TML6 (Exhibit 1005), raised by the Petitioner, is a collection of source code files, as further clarified below in Section II(E)(1). *See infra* Section II(E)(1). Although Petitioner uses Exhibit 1005 as the primary reference for Grounds 1 and 2, Petitioner’s arguments ultimately just rely on the TML6 disclosure in the '273 Patent.

To address the issue of complexity at the decoder, a new direct interpolation approach was adopted into TML6. In the direct interpolation approach of TML6, at the decoder each sub-pixel value could be calculated using one or two 6-tap filters, with the filter coefficients changing based on its sub-pixel coordinates in the horizontal or vertical directions. Ex. 1001 at 12:46-56. Unlike the earlier TML5 approach, each step was performed without truncating or rounding the result of the first 6-tap filter. *Id.* at 12:65-13:18.

At the decoder, this reduced the complexity of all quarter-pixel interpolations. Under the prior TML5 scheme, every quarter-pixel interpolation required at least one 6-tap filter operation (those at unit, quarter-unit locations) plus at least one 2-tap filtering operation. And the worst-case scenario for TML5, the quarter-pixel, quarter-pixel case, required three 6-tap filter operations and three 2-tap filter operations. The TML6 scheme only required two 6-tap filter operations for that case, representing an improvement.

The '273 Patent also discloses the disadvantages of TML6's interpolation methods, which, despite fewer filter operations in some scenarios, work similarly to TML5 "except that maximum precision is retained throughout." *Id.* at 11:27-30. The patent describes that a disadvantage of TML6 is that "high precision arithmetic ... requires more silicon area in ASICs and requires more computations in some CPUs." *Id.* at 13:11-14.

Because the Petition focuses on TML6's interpolation at an encoder of half-half sub-pixels and quarter-quarter sub-pixels, the following explains additional details of the '273 Patent's discussion of the TML6 method for interpolating the half-half sub-pixels and quarter-quarter sub-pixels.

TML6 Half-Half Sub-Pixel Interpolation. TML6 interpolates half-half sub-pixels using a predetermined, *vertical* 6-tap filter. Ex. 1001 at 11:56-62. Figure 13(c) of the '273 Patent, below, illustrates an example of vertically interpolating a half-half sub-pixel (labeled "c" and highlighted in green) by using the values of (previously calculated) half-pixels b_1 - b_6 (outlined in green).

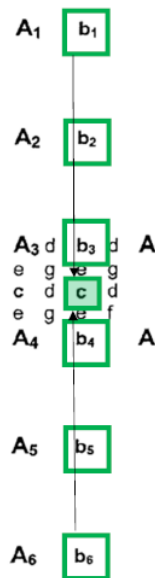


Figure 13(c)

Ex. 1001 at Fig. 13(c) (annotated); *see id.* at 11:56-63 (showing the equation used for TML6's vertical 6-tap filter).

TML6 Quarter-Quarter Sub-Pixel Interpolation. In TML6, each quarter-quarter sub-pixel is interpolated using four pixels or sub-pixels. To derive these values, TML6 requires three separate, predetermined 6-tap filter computations before the quarter-quarter sub-pixel is interpolated. The series of images below depict the three 6-tap filter computations and interpolation of four surrounding pixels and sub-pixels to calculate the quarter-quarter sub-pixel located at quarter unit horizontal and quarter unit vertical.

First, as an example, Figure 13(b) of the '273 Patent depicts how the six full pixels A₁-A₆ (outlined in pink) are used to interpolate the half-pixel “b” (located at half unit horizontal and unit vertical coordinates and highlighted in green) with a horizontal 6-tap filter. *Id.* at 11:35-45.

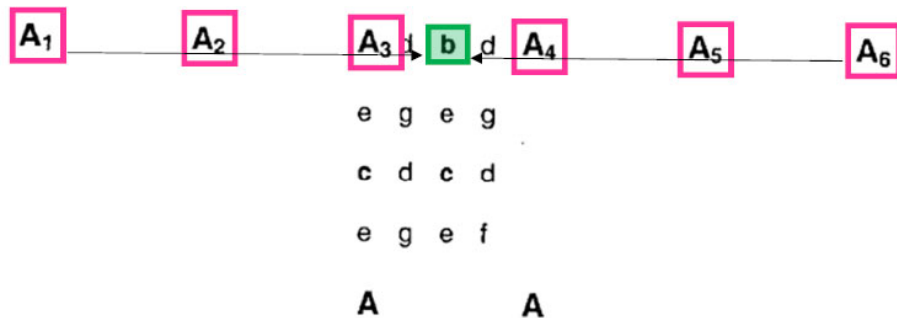


Figure13(b)

Ex. 1001 at Fig. 13(b) (annotated); *see id.* at 11:35-45 (showing the equation used for TML6’s horizontal 6-tap filter).

Second, Figure 13(c) of the '273 Patent illustrates the interpolation of the half-pixel “c” (located at unit horizontal and half unit vertical coordinates and highlighted in green) by vertically adjacent six full pixels, labeled A_1 - A_6 (outlined in pink), using a vertical 6-tap filter. *Id.* at 11:46-56.

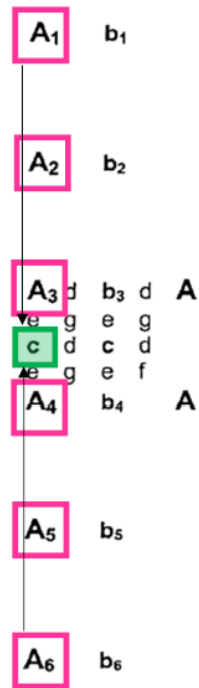


Figure 13(c)

Ex. 1001 at Fig. 13(c) (annotated); *see id.* at 11:46-56 (showing the equation used for TML6’s vertical 6-tap filter).

Third, in a manner similar to that illustrated above and depicted in the Figure 13(c) reproduced below, the half-half sub-pixel “c” (highlighted in green) is interpolated by a vertical 6-tap filter using the six half-pixels above and below (outlined in green). *Id.* at 12:56-63.

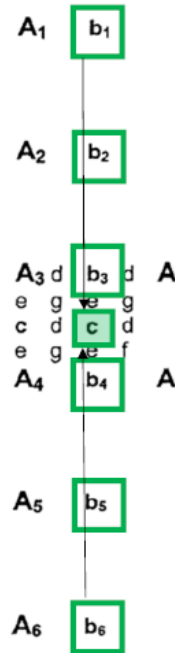


Figure 13(c)

Ex. 1001 at Fig. 13(c) (annotated); *see id.* at 11:56-63 (showing the particular equation used for TML6's vertical 6-tap filter).

Finally, after processing these three 6-tap filter computations, the values for full pixel A_3 (outlined in pink), half-pixel b_3 (outlined in green), half-pixel c (outlined in green at left), and half-half sub-pixel c (outlined in green at right) are used to calculate the quarter-quarter sub-pixel labeled "g" (highlighted in blue).

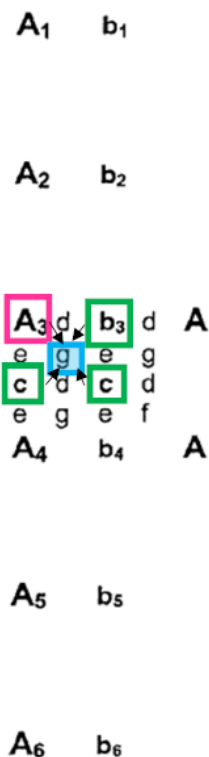


Figure 13(c)

Ex. 1001 at Fig. 13(c) (annotated); *see id.* at 12:34-40 (showing the equation used for TML6's interpolation of quarter-quarter sub-pixels).

While 6-tap filters provide precision, the 6-tap filter calculations are computationally and memory intensive, which slows the video compression and decompression process. *See* Ex. 1001 at 13:11-18, 44:26-34. High precision arithmetic, such as that needed to apply 6-tap filters, can also require greater silicon area and increase computations. *Id.* at 13:13-14.

C. Invention of '273 Patent

The invention described in the '273 Patent offers substantial improvements over the prior art. One difference between the '273 Patent and the TML5 and TML6 approaches is that the '273 Patent uses a 2-tap filter of *two* diagonally adjacent sub-pixels or a diagonally adjacent pixel and sub-pixel using lower precision arithmetic for quarter-quarter sub-pixels. In turn, the '273 Patent decreases the number of calculations needed to produce accurate sub-pixel predictions.

Unlike TML5, the invention of the '273 Patent allows interpolation of all quarter-pixels “from original image pixels or $\frac{1}{2}$ resolution sub-pixel positions using linear interpolation.” *Id.* at 43:46-53. This eliminates “the reduction in precision of those $\frac{1}{4}$ resolution sub-pixel values which occurs in TML5” which results from repeated bilinear interpolation and rounding.² *Id.* at 43:53-57. Furthermore, “the number of calculations (and therefore the number of processor cycles) required to

² In TML5, since some of the quarter-resolution sub-pixels are calculated from other quarter-resolution sub-pixels (that have already been rounded) the precision of those sub-pixels is different from quarter-resolution sub-pixels that are calculated (e.g., from half-resolution sub-pixels). This results in inconsistent precision between different sub-pixel locations. This is avoided by the method of the '273 Patent.

obtain a value for those $\frac{1}{4}$ resolution sub-pixels in the decoder is reduced compared with TML5.” *Id.* at 43:60-64.

Similarly, the '273 Patent provides improvements over TML6. The invention of the '273 Patent “does not require high precision arithmetic to be used in the calculation of all sub-pixels.” *Id.* at 44:9-11. Specifically, “lower precision arithmetic can be used” to interpolate quarter-pixels because they “are calculated from original image pixels or $\frac{1}{2}$ resolution sub-pixel values using linear interpolation[.]” *Id.* at 44:11-16. Additionally, “the interpolation of any sub-pixel value is performed using only the minimum number of steps required to obtain a correctly interpolated value[, which is] ... implemented in a block based manner, that is, intermediate values common for all the sub-pixels to be interpolated in a particular NxM block are calculated only once.” *Id.* at 46:45-53. This “reduces the overall area of silicon that must be dedicated to the interpolation function” and “generally leads to an increase in the speed at which calculations can be performed.” *Id.* at 44:16-22.

As an example, the quarter-quarter sub-pixel (located at quarter unit horizontal and quarter unit vertical) is interpolated using a 2-tap filter of *two* diagonally adjacent sub-pixels or a diagonally adjacent pixel and sub-pixel using lower precision arithmetic. *Id.* at 46:1-5. In Figure 14(a), quarter-quarter sub-pixel

labeled *h* (highlighted in blue) may be interpolated by taking the average of two half-pixels (labeled *b* and outlined in green). *Id.*

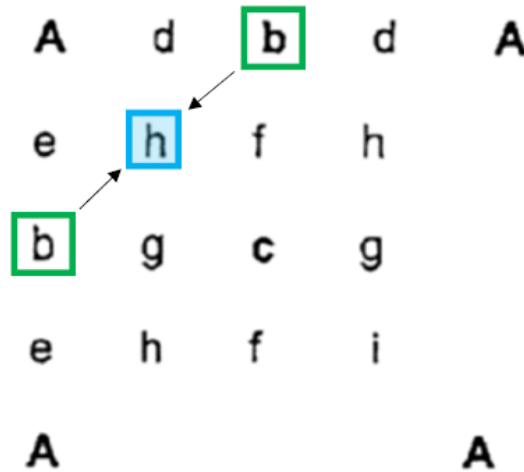


Fig. 14(a)

Ex. 1001 at Fig. 14(a) (annotated); *see id.* at 46:1-5 (showing the equation used for interpolating quarter-quarter sub-pixel *h*).

This change allows over a 50% reduction in encoder memory requirements compared to the TML6 method for the quarter-pixel case and a 75% reduction for the eighth-pixel case. *See* Ex. 1001 at 44:9-33, 46:31-41 (describing advantages over TML6). At the decoder, only the steps necessary to determine the value identified by the motion vector need to be performed, and fewer intermediate pixels need to be determined as compared with TML5. This approach offers a significant reduction in complexity compared to TML5. There is also an improvement over the TML6

method at the decoder for certain sub-pixel cases, but slightly more complexity for others.

D. Prosecution History

The '273 Patent, titled “Method for Sub-Pixel Value Interpolation,” was filed as Application No. 11/839,205 on August 15, 2007, and issued on October 11, 2011. The application resulting in issuance of the '273 Patent was a continuation of Application No. 11/090,717 (that resulted in issuance of United States Patent No. 7,280,599 (Ex. 2006)), which was a continuation of Application No. 09/954,608 (that resulted in issuance of United States Patent No. 6,950,469 (Ex. 2003)). The Examiner initially rejected the claims as non-statutory double patenting over U.S. Patent Nos. 7,280,599 (the “’599 Patent”) and 6,950,469 (the “’469 Patent). Ex. 1002 at 243-244, 298-299. The applicant amended the claims and filed a terminal disclaimer to the '599 Patent and the '469 Patent. *Id.* at 258-288, 307-337. In view of the terminal disclaimers, the Examiner issued notice of allowance on May 13, 2010. *Id.* at 375-377.

The '599 Patent—the parent of the '273 Patent—was filed as Application No. 11/090,717 (the “’717 Application”) on March 25, 2005, and issued on October 9, 2007. Ex. 2006. During prosecution, the Examiner asserted a nonstatutory double patenting rejection over the '469 Patent. Ex. 2005 at 209-210. Instead of filing a terminal disclaimer over the parent case, Patent Owner canceled the claims without

prejudice and added new claims. *Id.* at 216-232. Following entry of the new claims, the '717 Application was allowed without rejection. *Id.* at 241-244.

Before the '717 Application was filed, Patent Owner filed Application No. 09/954,608 on September 17, 2001, which issued as the '469 Patent on September 27, 2005. Ex. 2003. The Examiner issued no rejections or office actions during his evaluation of the '469 Patent claims and issued a Notice of Allowance on September 9, 2004. Ex. 2004 at 307-309.

E. Petitioner's Prior Art References

1) TML6 (Ex. 1005)

Petitioner's primary prior art reference (Ex. 1005) is a set of eleven source code files. Ex. 1005 at 3, 4, 35, 48, 69, 101, 129, 135, 137, 155, 164. To clarify, what the Petitioner refers to as the "TML6" reference is not a single reference but rather a compilation of eleven source code files put together by Petitioner. While referring to Ex. 1005 as the "TML6 Source Code Files" would more accurately reflect its content, for purposes of this Preliminary Response, Ex. 1005 will continue to be referred to as TML6 to align with the language of the '273 Patent.

The source code files of TML6 were developed by multiple contributors to the VCEG. *See* Ex. 1008 at ¶ 19. Dr. Wenger explains that, during the standardization process, individuals would prepare technical proposals that were submitted to VCEG, and "[p]roponents of adopted technical proposals were required

to implement their accepted technology into the TML software[.]” *Id.* at ¶ 31. Accordingly, Ex. 1005 includes eleven separate files authored by eleven different contributors.

The Petition does not argue that the source code files of TML6 disclose any functionality of TML6 beyond what is described in detail in the ’273 Patent itself. Ex. 1008 at ¶ 31. The Petition and its accompanying expert report trace each cited aspect of the TML6 to a disclosure within the ’273 Patent specification. Petition at 14-17; Ex. 1003 at ¶¶ 48-50, 65-69, 70-79, 96-101. Therefore, while the TML6 comprises eleven separate source code files, the functionality on which Petitioner relies on is fully disclosed and distinguished in the background of the ’273 Patent.

The ’273 Patent includes a clear and precise description of the interpolation scheme of the TML6 encoder. Ex. 1001 at 11:25-12:45. There is no doubt that the Examiner considered TML6 during the prosecution of the ’273 Patent, as the prior art TML6 interpolation methods were a key focus in the background of the invention. The Examiner was, therefore, aware of the operation of TML6 and found the asserted claims neither anticipated nor obvious over this reference during prosecution.

2) Fandrianto (Ex. 1006)

The Petition also relies on U.S. Patent No. 5,594,813 (“Fandrianto”), which was filed on February 19, 1992, and issued on January 14, 1997. Fandrianto is a patent primarily focused on hardware logic and memory operations, offering in-

depth discussions on the physical and logical layout of its different memories, as well as detailed explanations of its data path elements and addressing schemes. *See* Ex. 1006 at 11:38-20:36. The discussions of Fandrianto's architecture that relate to interpolation focus on moving pixel data between memories or accessing pixel data using Fandrianto's Pixel Random Access Memory, rather than detailing a video coding scheme. *Id.* at 3:55-10:58. Fandrianto's close attention to how pixel data is moved around its architecture is necessary because the architecture uses small memories and works in blocks of pixel information that are large compared to those memories. However, Fandrianto's disclosures of motion estimation of sub-pixels in video compression techniques were long obsolete by 2001. *See id.* at Abstract. The examiner of the '273 Patent's grandparent—the '469 Patent—also examined Fandrianto.³ He recognized the improvements of the '469 Patent over TML6 and Fandrianto as he expressly identified Fandrianto as a relevant reference during prosecution of the '469 Patent and issued the '469 Patent over it. Ex. 2004 at 310.

In addition, the Examiner considered the Fandrianto prior art reference (discussed in more detail below). During prosecution of the '469 Patent, Patent Owner disclosed U.S. Patent No. 5,901,248 (Ex. 2007), which is a continuation of

³ The lead examiner on the '469 Patent, Chris Kelley, is credited as the assistant examiner on Fandrianto. *See* Ex. 2003, Ex. 1006.

Petitioner's Fandrianto reference (U.S. Patent No. 5,594,813) (Ex. 1006) that shares substantially the same specification as Fandrianto, including disclosures nearly verbatim to the disclosures relied on in the Petition. Ex. 2004 at 311; Ex. 2007. When issuing his Notice of Allowance for the '469 Patent, the examiner, not Applicant, identified Fandrianto as a relevant reference and initialed the information disclosure statement listing the '248 Patent. Ex. 2004 at 310-311. The examiner of the '469 Patent was intimately familiar with Fandrianto as he was an examiner of record for Fandrianto. *See* Ex. 1006; *see also* Ex. 2003. Moreover, in prosecuting the '273 Patent, Patent Owner again disclosed the '248 Patent, which the Examiner reviewed and signed before issuing his Notice of Allowance. Ex. 1002 at 383-387. Thus, the Examiner issued the '273 Patent over both prior art references cited by Petitioner.⁴

⁴ It is well settled that "[t]he examiner will consider information which has been considered by the Office in a parent application ... when examining: (a) a continuation application ..." MPEP § 609.02(II)(2); *see also Microsoft Corp. v. IPA Techs. Inc.*, IPR2019-00839, Paper 9, 14 (P.T.A.B. Nov. 8, 2019) (holding that an asserted reference was considered during prosecution of a challenged patent because the reference was discussed by the Examiner during prosecution of a parent application (citing MPEP § 609)).

F. Person of Ordinary Skill in the Art (POSITA)

A person of ordinary skill in the art (“POSITA”) for the ’273 Patent would be an electrical and/or computer engineer with one to two years of experience relating to video coding hardware and/or software. Petitioner contends that a POSITA “would have had a (1) Bachelor’s degree in electrical engineering, computer engineering, computer science, or a comparable field of study such as physics, and (2) approximately two to three years of practical experience with video encoding/decoding. Additional experience can substitute for the level of education, and vice-versa.” Petition at 10-11. Under either definition of POSITA, the asserted Grounds do not establish a reasonable likelihood that any claim of the ’273 Patent is invalid.

G. Claim Construction

Patent Owner’s response does not depend on claim construction at this stage. Patent Owner reserves the right to advance its own construction for any claim term should an IPR be instituted.

H. Claim Listing

For the sake of this analysis, Patent Owner will use Petitioner’s limitation labels provided in the Petition’s listing of Challenged Claims. Petition at v-xxxiv.

III. THE BOARD SHOULD NOT INSTITUTE *INTER PARTES* REVIEW

The Board should not institute *inter partes* review for three reasons.

First, the Board should exercise its discretion and deny institution under 35 U.S.C. § 325(d) because Petitioner’s prior art references are cumulative of art already considered during prosecution of the ’273 Patent’s file history and expressly distinguished in the ’273 Patent’s specification.

Second, the Board should deny institution on the merits under 37 C.F.R. § 42.108(c) because the Petitioner has failed to meet its burden of showing a reasonable likelihood of unpatentability for any of the Challenged Claims of the ’273 Patent. Not only do Petitioner’s prior art references fail to disclose the invention claimed in the ’273 Patent, but Petitioner also relies solely on obviousness arguments without establishing a sufficient motivation to combine the references.

Third, the Board should exercise its discretion under 35 U.S.C. § 314(a) and *Fintiv*, to avoid unnecessary waste of administrative resources and promote fairness in the consistency of decisions within the patent system. The parallel proceeding in the District of Delaware involves the same parties and each of the *Fintiv* factors either weighs in favor of discretionary denial or is neutral.

A. Petitioner’s Ground for Invalidity is Cumulative and Should Be Rejected under 35 U.S.C. § 325(d)

The Board may deny institution under Section 325(d) where the petition includes “the same or substantially the same prior art or arguments [that] previously were presented to the Office.” 35 U.S.C. § 325(d); *see also Unified Patents Inc. v. Berman*, IPR2016-01571, Paper 10, 9 (P.T.A.B. Dec. 14, 2016). The Grounds raised

by Petitioner are cumulative of art and arguments already considered by the Examiner. There is a strong presumption, then, that the Examiner considered and approved the Challenged Claims over the art and arguments raised in the Petition, and in the absence of some showing of error in that process institution should be denied.

Determining whether to exercise discretion under Section 325(d) involves a two-part analysis, considering: (1) whether the same or substantially the same art or arguments were presented to the Patent Office during the original prosecution; and (2) whether the Petitioner has demonstrated that the Patent Office erred in a manner material to the patentability of the Challenged Claims. *Advanced Bionics, LLC v. Med-El Elektromedizinische Geräte GMBH*, IPR2019-01469, Paper 6, 10 (P.T.A.B. Feb. 13, 2020) (“*Advanced Bionics*”) (precedential).

The *Becton, Dickinson* factors offer valuable insight into the application of the *Advanced Bionics* two-part framework. The *Becton, Dickinson* factors include: (a) the similarities and material differences between the asserted art and the prior art involved during examination; (b) the cumulative nature of the asserted art and the prior art evaluated during examination; (c) the extent to which the asserted art was evaluated during examination, including whether the prior art was the basis for rejection; (d) the extent of the overlap between the arguments made during examination and the manner in which Petitioner relies on the prior art or Patent

Owner distinguishes the prior art; (e) whether Petitioner has pointed out sufficiently how the Examiner erred in its evaluation of the asserted prior art; and (f) the extent to which additional evidence and facts presented in the Petition warrant reconsideration of prior art or arguments. *Becton, Dickinson & Co. v. B. Braun Melsungen AG*, IPR2017-01586, Paper 8, 17-18 (P.T.A.B. Dec. 15, 2017) (informative).

Factors (a), (b), and (d) pertain to the similarities of the prior art references and arguments of the Petition and those before the Patent Office. These three factors inform step (1) of the *Advanced Bionics* analysis. *Advanced Bionics*, IPR2019-01469, Paper 6 at 10. Whereas, step (2), factors (c), (e), and (f), focuses on potential error made by the Patent Office or new information that bears on the prior art and corresponding arguments. *Id.*

Petitioner relies on TML6 and Fandrianto for Ground 1, and adds a third reference, knowledge of a POSITA, for Ground 2. *See* Petition at 1-2. As described in more detail below, the substance of TML6 and Fandrianto was expressly disclosed and considered during examination. Ex. 1001 at 11:25-13:27; Ex. 1002 at 383-387. Petitioner does not explain how the Examiner erred in evaluating these references, nor does Petitioner try to provide additional evidence or facts to justify reconsideration. Petition at 125-127. First, the Petition argues that “[t]here is [] no evidence that TML6 was provided to the Office by the applicant, such as on an IDS.”

Petition at 126. This misses the point. Patent Owner disclosed TML6 in the specification, which the Examiner would have read. At best, the Petition focuses on a minor detail regarding a function in one of the source code files. The critical issue, however, is whether the substantive disclosures of TML6 were adequately considered. They were. Second, the Petition argues that the *combination* of TML6 and Fandrianto was not considered. *Id.* at 126-127. This ignores the fact that the same examiner handled both Fandrianto and the '273 Patent's grandparent, the '469 Patent, which distinguishes this case from the line of cases Petitioner cites to in support of its argument. *See id.* at 126-127. Accordingly, the two-part analysis of *Advanced Bionics* and the *Becton, Dickinson* factors weigh highly in favor of denial of institution. Therefore, the Board should use its discretion under Section 325(d) and deny institution.

1) The *Same* Prior Art References as Relied upon by Petitioner Were Presented to the Office and Considered by the Examiner (*Advanced Bionics* Step (1))

Since the substance of Petitioner's prior art references was considered by the Examiner during prosecution of the '273 Patent, the Board should exercise its discretion to deny institution of the Petition under § 325(d). *Advanced Bionics*, IPR2019-01469, Paper 6 at 10. First, the substance of TML6 is described in the '273 Patent's discussion of TML6. Second, Fandrianto's family member, the '248 Patent, is listed on the face of the '273 Patent and reviewed by the Examiner.

Grounds 1 and 2 rely on a combination of TML6 and Fandrianto, however the substance of both references was considered by the Examiner during prosecution. MPEP § 609.01. The question before the Board is whether “the same or *substantially the same prior art or arguments* previously were presented to the office.” 35 U.S.C. § 325(d) (emphasis added). 325(d) does not require that a document was presented to the Office verbatim and in identical form to how it is later presented to the Board in a Petition. *See e.g. Universal Imaging Indus., Inc. v. Lexmark Int’l, Inc.*, IPR2019-01383, Paper 7, 17 (P.T.A.B. Feb. 27, 2020) (declining to institute *inter partes* review in part because the challenged patent specification called attention to the prior art reference asserted in the petition by “stating that it is ‘related’ to the application being prosecuted). Indeed, one of the *Becton, Dickinson* factors is “the similarities and *material differences* between the asserted art and the prior art involved during examination. *Becton, Dickinson*, IPR2017-01586, Paper 8 at 17 (emphasis added). Thus, under *Becton, Dickinson*, the question is whether there is a material difference between TML6 as described in the ’273 Patent’s specification (which the Examiner undoubtedly considered) and the TML6 source code files as relied on by the Petition. There is not.

To manufacture a difference between the TML6 source code files and the functional description of those files in the ’273 Patent’s specification, the Petition highlights a source code function named *oneforthpix()*. Petition at 126. This is a red

herring. The name of a particular function in source code is not material to the arguments in the Petition. Indeed, the TML6 functionality relied on in the Petition is described in detail in (columns 11 and 12) of the '273 Patent's specification. *See e.g.* Ex. 1001 at 11:56-60; Ex. 2001 at ¶ 69. The Petition makes no argument that how the functionality is implemented in source code or what the source code functions are called is relevant to patentability. Moreover, to the extent the Petition intended to take the position that the particular implementation details and naming conventions of the TML6 source code files is material to patentability, then the Petition also fails because the TML6 source code files are 11 separate files. *See supra* Section II(E)(1).

There also can be no dispute that Fandrianto was identified during prosecution of the '273 Patent. During prosecution of the '273 Patent, Patent Owner disclosed U.S. Patent No. 5,901,248 (the "'248 Patent"), which is a continuation of Petitioner's Fandrianto reference (U.S. Patent No. 5,594,813). Ex. 1002 at 383-387. When issuing the Notice of Allowance, the Examiner confirmed, with the signing of his initials in the Information Disclosure Statement, his review of the '248 Patent. *Id.*; *see also Advanced Bionics*, IPR2019-01469, Paper 6 at 7-8 ("Previously presented art includes art made of record by the Examiner, and art provided to the Office by applicant, such as on an Information Disclosure Statement."). Remarkably, the Primary Examiner of the '469 Patent, the '273 Patent's grandparent patent, was

deeply knowledgeable with Fandrianto because he served as an examiner for that patent as well. *See* Ex. 2003 (listing Chris Kelley as the Primary Examiner; Ex. 1006 (listing Chris Kelley as the Assistant Examiner). Consequently, there can be no debate that Fandrianto was expressly considered by the Examiner during prosecution, as the '469 Patent and the '599 Patent have substantially the same disclosures.

Accordingly, Petitioner's prior art references for Grounds 1 and 2 were the same references as the references presented to and considered by the Patent Office during prosecution of the '273 Patent and its grandparent patent, the '469 Patent. Thus, step (1) of the *Advanced Bionics* framework is met.

For the same reasons outlined above, *Becton, Dickinson* factors (a), (b), and (d) also support denying institution. *Advanced Bionics*, IPR2019-01469, Paper 6 at 10 ("The factors set forth in *Becton, Dickinson* should be read broadly, however, to apply to *any* situation in which a petition relies on the same or substantially the same art *or* arguments previously presented to the Office during a proceeding pertaining to the challenged patent.") (emphasis added). Factor (a), which focuses on the similarities between the art, and factor (b), which considers the cumulative nature of the asserted art and the prior art evaluated during examination, parallel the analysis of step (1) of the *Advanced Bionics* framework and thus favor denial of institution. Factor (d) is duplicative here because the Petitioner relies on the same references.

Advanced Bionics, IPR2019-01469, Paper 6 at 20 (determining the Board “need not reach whether the same or substantially the same arguments previously were presented to the Office,” having already determined the petition on the same or substantially the same prior art as previously presented to the Office) (internal citations omitted).

2) Petitioner Has *Not* Alleged Any Error Made by the Office in Examining the Same Prior Art References (*Advanced Bionics* Step (2))

With the first part of the *Advanced Bionics* framework satisfied, Petitioner must next demonstrate that the “Office erred in a manner material to the patentability of challenged claims.” *Advanced Bionics*, IPR2019-01469, Paper 6 at 8.

The Petition asserts conclusory statements, lacking sufficient support, as to why the Examiner erred or overlooked any issue related to TML6 and Fandrianto. *See* Petition at 125-127. Nor does the Petition supply any additional evidence or facts that warrant reconsideration. *Id.*; *see also Unified Patents Inc.*, IPR2016-01571, Paper 10 at 12 (“Petitioner fails to present any argument distinguishing the Examiner’s prior consideration of [the prior art] or to provide a compelling reason why we should readjudicate substantially the same prior art and arguments as those presented during prosecution and considered by the Examiner. This would not be an efficient use of Board resources in this manner.”)

Instead, Petitioner overlooks the extensive review by the Examiner of the substance of TML6 and Fandrianto and simply argues that “[t]he Examiner did not substantively consider either TML6 or Fandrianto during prosecution.” Petition at 125. First, because the ’273 Patent details the teachings of TML6 and expressly distinguishes the invention over those teachings, the Examiner unavoidably had to thoroughly evaluate the ’273 Patent’s inventive aspects with respect to TML6 as a primary reference point. Second, Petitioner argues that the ’273 Patent’s specification fails to include detailed information about TML6 and, therefore, was not considered by the Examiner. Regardless of whether there is any truth to this, the argument is irrelevant because Petitioner fails to rely on portions of TML6 that are not included in the specification as part of the Petition’s arguments.

Fandrianto was also considered by the Examiner. Contrary to Petitioner’s argument, the Examiner, during prosecution, an Information Disclosure Statement listing a family member of the Fandrianto reference, cited by Patent Owner, indicating he approved the ’273 Patent over Fandrianto’s disclosures. Petition at 125; Ex. 1002 at 383-387; *see also Universal Imaging*, IPR2019-01383, Paper 7 at 21 (denying institution under § 325(d) because the Examiner signed the information disclosure statement indicating that all references had been considered including the prior art relied upon by petitioner, which was cited in the Information Disclosure Statement, in the patent, and explained in the patent specification); MPEP § 609.01.

Therefore, Petitioner has failed to show any error in the Examiner's evaluation of the same prior art references asserted in its Petition, and step (2) of the *Advanced Bionics* framework favors denial of institution. *Advanced Bionics*, IPR2019-01469, Paper 6 at 9 (“If reasonable minds can disagree regarding the purported treatment of the art or arguments, it cannot be said that the Office erred in a manner material to patentability.”).

Likewise, *Becton, Dickinson* factors (c), (e), and (f) weigh in favor of denying institution for the same reasons. Factors (e) and (f), which evaluate “the petitioner’s evidence of previous Office error,” focus on the same issues addressed by *Advanced Bionics* step (2). *Advanced Bionics*, IPR2019-01469, Paper 6 at 10. As described above, the Petitioner offered no sufficient evidence of previous error.

Factor (c) further informs this analysis by focusing on the extent of the record developed by the Office in reviewing the disclosed prior art. *Id.* When the file history record “is not well developed or silent,” a petitioner may show a material error by explaining how the “Office erred by overlooking something persuasive[.]” *Id.* at 10. However, when “the petitioner fails to make a showing of material error, the Director generally will exercise discretion not to institute *inter partes* review.” *Id.* at 9. Having alleged no error at all, Petitioner has not met its burden.

Therefore, under both the *Becton, Dickinson* factors and the *Advanced Bionics* framework, the Board should exercise discretion under 35 U.S.C. § 325(d) to deny institution.

B. Petitioner Has Failed to Establish a Reasonable Likelihood That Any Challenged Claims Is Unpatentable Under 37 C.F.R. § 42.108(c)

Petitioner has failed to meet its burden with respect to the Challenged Claims in the Petition. Pursuant to 37 C.F.R. § 42.108(c), Petitioner is required to demonstrate a reasonable likelihood that “at least one of the claims challenged in the petition is unpatentable” to warrant institution of an *inter partes* review for that claim. Petitioner has not done so for Grounds 1 and 2 because Petitioner has not pled a motivation to combine the TML6 other than simply stating “treating TML6 as a single prior art reference is justified and appropriate.” Petition at 13.

Additionally, Petitioner relies on TML6 in view of Fandrianto and in further view of the knowledge of a POSITA to prove its invalidity ground against the ’273 Patent. Petitioner proposes combining Fandrianto with TML6, as well as with the knowledge of a POSITA, to render the Challenged Claims obvious. Specifically, Petitioner seeks to use Fandrianto to address deficiencies in TML6’s disclosure of the diagonal interpolation steps required by elements 1[a], 31[a], 32[a], 33[a], 64[a], 65[a], 68[a], 69[a], 71[a], 73[a], 75[a], 76[a], 79[a], 82[a], and 83[a]. Petition at 40-51, 111-122.

1) TML6 in View of Fandrianto and in Further View of the Knowledge of a POSITA Does Not Render the Challenged Claims Obvious (Grounds 1 and 2)

a) Petitioner fails to allege motivation to combine the separate, distinct source code files of TML6

As described above, Petitioner's primary reference, TML6, comprises numerous individual source code files authored by multiple people. *See supra* Section II(E)(1). TML6 is thus not a single reference but rather a collection of several references. As previously stated, Petitioner fails to offer any motivation to combine the multiple source code files. For this reason alone, Petitioner has not met its obligations, and the Board should decline to institute. *Securus Techs., Inc. v. Global Tel*Link Corp.*, 701 F. App'x 971, 976-77 (Fed. Cir. 2017 (citing *Transocean Offshore Deepwater Drilling, Inc. v. Maersk Contractors USA, Inc.*, 617 F.3d 1296, 1303-04 (Fed. Cir. 2010)) ("[I]t is not enough to simply show that the [prior art] references disclose the claim limitations; in addition, 'it can be important to identify a reason that would have prompted [the skilled artisan] to combine the elements as the new invention does.'"); *Health Care Logistics, Inc. v. Kit Check, Inc.*, IPR2019-00388, Paper 7 at 15 (P.T.A.B. June 3, 2019) (petitioner must provide "evidence to explain why a person of ordinary skill in the art would have combined the references to arrive at the claimed invention.")).

Notably, a collection of documents, authored by numerous individuals at different times, constitutes multiple references. *See Kyocera Wireless Corp. v. ITC*,

545 F.3d 1340, 1351-52 (Fed. Cir. 2008). For instance, in *Kyocera Wireless*, a collection of eleven technical specifications for the GSM standard, which was written by hundreds of different authors over a span of several years, did not function as a single prior art reference. *Id.* Rather, the Federal Circuit held that each specification that comprised the GSM standard, each having their own title and separate page numbering, “stands as a separate document in its own right.” *Id.*

Likewise, TML6 were prepared by *multiple* different people over a period of several years, and each file constitutes a separate reference.⁵ Ex. 1005 at 4, 35, 48, 69, 101, 129, 135, 137, 155, 164. As Dr. Stephan Wenger explains, the “delegates of the VCEG[,]” the group of ITU-T which published TML6, “met, roughly every quarter” from 2000 to 2001 to discuss the development of TML6. Ex. 1008 at ¶ 15. Prior to each meeting, participants would submit separate proposals to be discussed

⁵ Notably, TML6 is a “test model.” It is a functioning codec representing development of the H.264 Standard at a particular point in time. Only a small part of the source code is thus devoted to the technical feature of sub-pixel value interpolation. The rest of the source code files are therefore not particularly relevant. The whole codec is designed to work together with the interpolation scheme that existed at the time, but only certain parts define the interpolation process itself. This works as described in the ’599 Patent.

during the meetings, some of which formed the basis for different portions of TML6. *Id.* at ¶ 20. VCEG meetings included “approximately 50 participants.” *Id.* at ¶ 19. The proposals submitted were generally authored not only by these various fifty participants, but also usually from collaboration with participants’ “numerous colleagues at their company.” *Id.* at ¶ 35. Therefore, each TML6 source code file is a separate document, and Petitioner’s primary reference is actually a compilation of numerous references. *See CA, Inc. v. Simple.com, Inc.*, 780 F. Supp. 2d 196, 254 (E.D.N.Y. 2009) (applying *Kyocera Wireless* and finding that multiple source code files for the “JavaScript Bible” cannot constitute a single prior art reference).

The Petition relies on TML6 as its primary reference for Grounds 1 and 2. Since Petitioner failed to provide a motivation to combine the numerous source code files of TML6, Petitioner has not met its burden, and the Petition should be denied.

b) Petitioner fails to allege a sufficient motivation to combine TML6 and Fandrianto

The Petition identifies four motivations to combine Fandrianto with TML6. Petition at 21-28. First, the Petitioner opines that TML6 and Fandrianto are in the same field of video coding and address similar subject matter. Petition at 22. Second, Petitioner opines that Fandrianto provides an express motivation to try a variety of techniques for interpolating $\frac{1}{4}$ sub-pixels. *Id.* Third, Petitioner opines that a POSITA would be motivated to interpolate multiple values for the same sub-pixel location. *Id.* at 23-25. Fourth, Petitioner opines that combining TML6 and Fandrianto would

yield predictable results and that combining Fandrianto's approach for quarter pixel interpolation would be a simple substitution of one known method for another known method. *Id.* at 24-28.

Petitioner's first motivation that "TML6 and Fandrianto are in the same field ..., address the same problem ..., and solve that problem by interpolating half and quarter sub-pixels" is incorrect. *Id.* at 22. As previously discussed, TML6 is source code for a complete video coder implementation,⁶ whereas Fandrianto discloses a programmable architecture with an application in motion estimation. While both references relate to video, the similarities do not go far beyond that. Fandrianto mostly focuses on a hardware scheme to move pixel data around in a memory area

⁶ Essentially, TML6 is a software implementation (as submitted by Amazon, it is a set of source code files). In developing these tools, the numerous different implementors would not typically consider any particular hardware configuration, but, rather, would focus on producing a working "test model." Possible hardware optimization would be outside their remit and would be left to those implementing the codec in, for example, specific commercial encoding/decoding devices.

with very limited capacity.⁷ *See supra* Section II(E)(2). By the time the invention of the '273 Patent was developed, the hardware described in Fandrianto was obsolete. Ex. 2001 at ¶ 67. Meaning, Fandrianto nor the Fandrianto reference itself identifies a video coding standard that uses the interpolation steps described by Fandrianto. Therefore, a POSITA looking for guidance on how best to modify TML6 would not consider a document detailing outdated hardware architecture to be relevant or similar to a software-implemented codec.

Petitioner's second motivation that "Fandrianto provides an express teaching that would have led a POSITA to combine its method of interpolating quarter-quarter sub-pixels with TML6's digital video compression functionality" is unfounded. *Id.* To support this argument, Petitioner relies on the following statement: "Various interpolation techniques may be used in the derivation of a given quarter pixel estimation block, depending on various factors such as the amount of memory available[.]" Ex. 1006 at 7:32-35. This sentence essentially states that Fandrianto's architecture can be programmed to perform operations other than the ones described

⁷ Fandrianto therefore relates to a specific implementation in which hardware resources, especially memory, are limited and is thus not applicable across a range of different possible hardware implementations. It would not be needed in situations where memory restrictions did not exist.

if the architecture's memory will accommodate the operation. This provides no express motivation to try alternative techniques, rather it is just a restatement that Fandrianto's disclosure is related to a programmable architecture, not a video coding method. As described in Fandrianto's background section, Fandrianto relates to work done in anticipation of then-future video coding standards under development by CCITT and ISO/MPEG with undetermined motion prediction requirements. *Id.* at 1:13-42. Fandrianto was developed with the expectation that its architecture would support the motion prediction schemes of future standards. *Id.* at 2:3-7. However, this is backwards thinking. Typically, in video coding, the standard is developed first, followed by the development of optimized hardware to support that standard. Inventing video coding techniques designed to match the capabilities of past hardware architectures is a futile endeavor, as leading video coding standards are likely to remain stable across multiple generations of hardware. Based on this perspective, a POSITA would not be motivated to develop new video interpolation methods simply because Fandrianto's architecture was programmable.

Petitioner's third motivation that "a POSITA would have recognized that Fandrianto's alternative method of interpolating quarter-quarter sub-pixels reflects a design choice between finite options with well-understood tradeoffs of improved accuracy and computational efficiency" is not a design choice to increase computational efficiency. Petition at 23-24. As explained above, video coding

interpolation requires a motion vector to uniquely identify the value to be used for prediction. Performing multiple (even if finite) distinct procedures to calculate a result for the same sub-pixel location is either wasteful (if the results are, by design, the same) or would require more steps in the interpolation process to determine the correct value, wasting storage or bandwidth capacity. Instead, a POSITA would be motivated to avoid either calculating the same result more than once or creating an interpolation scheme where the same motion vector leads to different results depending on the calculation method, thus giving purpose to performing the various procedures.

Petitioner's fourth motivation that "[t]he TML6-Fandrianto combination would have yielded predictable results because the combination is a simple substitution of Fandrianto's quarter-quarter sub-pixel interpolation method with TML6's quarter-quarter sub-pixel interpolation method to obtain a predictable result" is wrong. Petition at 24. As discussed, Fandrianto describes hardware architecture with a very limited memory capacity. Fandrianto's hardware architecture also has a fixed 8-bit pixel depth, an Arithmetic Logic Unit ("ALU") that is limited to adding, subtracting, and dividing by 2, a memory access scheme limited to retrieving 8 or 16 neighboring pixels or subpixels from a pixel set based on their interpolation stage. For example, Fandrianto manipulates the retrieved data using a funnel shifter that shifts the pixel group row by an integer number of pixel

values ranging from 0 to 7. Additionally, any operation that mandates more than a single step of the ALU requires an intermediate block to be created, stored, and used as an input for a later step. In contrast, TML6 is a software code with bit depths between 8 and 20 bits based on the stage of interpolation, requires multiplication, division, by numbers other than 2, interpolation with inputs from outside of a 2x2 block of pixels, and capacity to store both a 4N x 4M array of 8-bit pixels and a 2N x 2M array of 18-bit intermediate values for each N x M reference frame. It is hard to imagine two supposedly similar disclosures that would be more challenging to combine or interchange. The Petition also fails to explain how a POSITA would deal with the differences between TML6 and Fandrianto.

c) TML6 in view of Fandrianto does not disclose or render obvious Element [a] in Claims 1, 31, 32, 33, 64, 68, 71, 73, 75, 76, 79, 82, and 83 (step a)

Petitioner's reliance on the combination of TML6, Fandrianto, and the knowledge of a POSITA fails to disclose the requirement of interpolation using two diagonally opposed pixel or sub-pixel values.⁸

⁸ The claims allow for a combination of either “the value of a nearest-neighbouring pixel and the value of the sub-pixel situated at co-ordinates $\frac{1}{2}$, $\frac{1}{2}$ ” or “the values of a pair of *diagonally-opposed* sub-pixels.” Ex. 1001 at Claim 1 (emphasis added).

Step (a) of Claims 1, 31, 32, 33, 64, 68, 71, 73, 75, 76, 79, 82, and 83 requires the interpolation of quarter-quarter sub-pixels from either “the value of a nearest-neighbouring pixel and the value of the sub-pixel situated at co-ordinates $\frac{1}{2}$, $\frac{1}{2}$ ” or “the values of a pair of *diagonally-opposed* sub-pixels.” Ex. 1001 at Claims 1, 31-33, 64, 68, 71, 73, 75-76, 79, 82-83 (emphasis added).⁹ Petitioner incorrectly argues that the combination of TML6 and Fandrianto renders limitation (a) of Claim 1 of the ’273 Patent obvious, by alleging that the TML6/Fandrianto combination discloses diagonal interpolation for a quarter-quarter sub-pixel using either (1) the value of a nearest-neighbouring pixel and the value of the sub-pixel situated at co-ordinates $\frac{1}{2}$, $\frac{1}{2}$ or (2) the values of a pair of *diagonally-opposed* sub-pixels as

⁹ For example, Claim 1 requires:

interpolate a sub-pixel value for a sub-pixel having co-ordinates with odd values of both K and L, according to a predetermined choice of either a weighted average of the value of the nearest-neighbouring pixel and the value of the sub-pixel situated at co-ordinates $\frac{1}{2}$, $\frac{1}{2}$, or a weighted average of the values of a pair of diagonally-opposed sub-pixels having co-ordinates with even values of K and L, including zero, situated within a quadrant of the rectangular bounded region, the quadrant being defined by the sub-pixels having co-ordinates $\frac{1}{2}$, $\frac{1}{2}$ and the nearest neighbouring pixel.

required by the claims. Petitioner recognizes that TML6 does not disclose or render obvious this claim element because TML6 interpolates quarter-quarter sub-pixels from four diagonally adjacent pixels. Petition at 40-43 (“TML6 interpolates ($\frac{1}{4}$, $\frac{1}{4}$) sub-pixels using a weighted average of the aforementioned unit pixel and three half sub-pixels.”). As a result, Petitioner relies solely on Fandrianto to support its argument that limitation (a) is rendered obvious. *Id.* at 43-51.

However, Petitioner’s arguments are flawed. Petitioner incorrectly asserts that Fandrianto teaches quarter-quarter sub-pixel interpolation by using a weighted average of two diagonally located half-pixels A and B, blue and circled pink in the Figure below. *Id.* at 43-44. However, Fandrianto contains no such disclosure. Rather, Fandrianto discloses quarter-quarter sub-pixel interpolation by using a weighted average of *one* diagonal half-pixel and one *vertically* adjacent *quarter*-pixel. The side-by-side figures below compare the Petitioner’s incorrect interpolation with what is disclosed in Fandrianto:

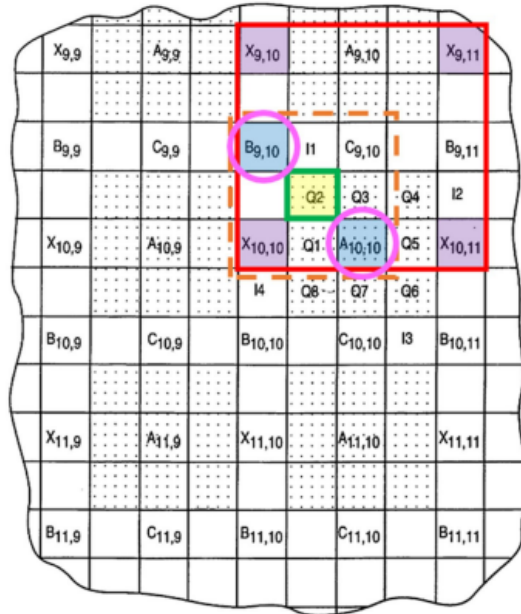
Petitioner's Incorrect Interpretation of Fandrianto

FIG. 5

Petition at 44 (annotations in Petition).

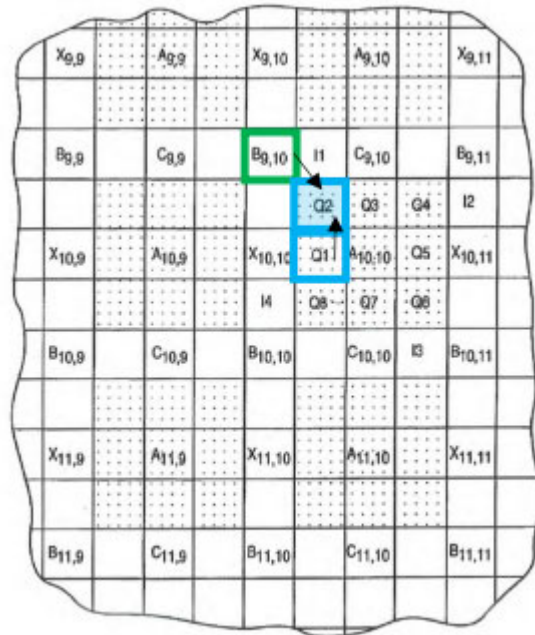
Fandrianto's Interpolation of Q2

FIG. 5

Ex. 1006 at Fig. 5 (annotated).

Petitioner appears to misinterpret the following lines from Fandrianto's specification to support its argument: “[a]s further, example, Q2 pixels may be derived from a diagonal interpolation of the data in A block 72 and B block 74.”¹⁰ Ex. 1006 at 10:56-58; Petition at 43-44. Petitioner's mistake lies in its notion that

¹⁰ When Fandrianto refers to diagonal interpolation, this is in the memory domain (i.e., with respect to memory locations). To understand what this means in terms of the physical interpolation of pixel values, it is necessary to consider the contents of the respective memory locations when Fandrianto's “diagonal interpolation” is performed.

“A block 72” encompasses half-pixel values, such as $A_{10,10}$, when interpolating the Q2 quarter-quarter sub-pixel value. However, as discussed in further detail below, at the time Q2 pixel is derived, “A block 72” stores *quarter* pixel values, and thus Q2 is interpolated using $B_{9,10}$ and Q1 as shown in the above figure on the right.

Therefore, the method of interpolating Q2 disclosed in Fandrianto uses diagonally adjacent half-pixel $B_{9,10}$ (outlined in green above) and vertically adjacent quarter-pixel Q1 (outlined in blue above). Accordingly, Fandrianto does not disclose the claimed interpolation of step (a), which requires interpolation using *two* diagonally adjacent pixels or sub-pixels, in Claims 1, 31, 32, 33, 64, 68, 71, 73, 75, 76, 79, 82, and 83.

i. The Petition’s inaccurate description of Fandrianto

Prior to addressing the misstatements in the Petition, it is critical to note that the architecture described in Fandrianto includes two types of memory. Ex. 1006 at 3:55-62. The first memory type, “DP memory,” stores the “best match” block. *Id.* The best match block is a known pixel value, usually calculated earlier in the interpolation process, that acts as a base to interpolate the next set of pixels or sub-pixels. *Id.* at 3:39-44. The best match block may include full or half-pixel values depending on the stage of interpolation. *Id.* at 4:18-21, 7:38-44. The second type of memory, “DPCM memory,” stores temporary values which *change* throughout the various sub-pixel interpolation stages. *See e.g. id.* at 5:6-9. The DPCM memory is

divided into four blocks (X block, A block, B block, and C block) to store various pixel and sub-pixel values. *Id.* at 5:33-44. Since the values stored in the DPCM memory change, the values stored in each of these blocks are not constant during the interpolation process.

One major shortcoming in the Petition is that it ignores the difference between the memory locations and the values stored in these memory locations and overlooks how the information stored in each memory changes. Consequently, the Petitioner fails to account for the fact that the “A block 72” memory stores quarter-pixel values Q1-Q8 at the time that quarter-quarter sub-pixel Q2 is interpolated.

Fandrianto provides a detailed description of the values that are stored in the DP memory and each memory block of the DPCM memory during quarter-pixel interpolation. *Id.* at 7:27-55. First, a best match block, which may be either a full pixel or half-pixel, “is copied from the DPCM memory 130 into a free block of the DP memory 124, which at this point in the process may be the D block 82 or any additional memory block.” *Id.* at 7:38-42. In Fandrianto, the best match block for quarter-pixel interpolation is A block 72 of the DPCM memory. *Id.* at 8:20-24. The values contained in A block 72 are therefore moved into the D block 82 of the DP memory. *Id.* at 8:29-33 (“[T]he pixels of the best match block now stored in the D block 82 are referred to as $A_{r,c}$.”). Meaning, the “D block 82” is used to store the values labeled $A_{0,0} \dots A_{1,16}$. Fandrianto explains that “this frees up the A block 72 to

hold the current quarter pixel interpolated block, the pixels of which for convenience are referred to as $Q_{r,c}$, *Id.* at 8:29-36, where “ $Q_{r,c}$ ” refers to the various quarter-pixels labeled Q1-Q8 in Figure 5. *See* Fandrianto, Figure 5.

Thus, Fandrianto clearly states that the values stored in *A Block 72* are labeled $Q_{r,c}$, not $A_{r,c}$. Accordingly, as detailed further in the following paragraphs, when Fandrianto teaches “the Q2 pixels may be derived from a diagonal interpolation of the data in the *A Block 72*,” “A block 72” does not refer to the half-pixel $A_{10,10}$. *Id.* at 10:56-58 (emphasis added). Rather, it refers to a quarter-pixel, labeled $Q_{r,c}$.

As an example, Fandrianto describes interpolating quarter-quarter pixels in order from Q1 to Q8 and storing the results in the A block. *Id.* at 8:29-10:50. Fandrianto discloses using horizontal interpolation for the first quarter-pixel, Q1, using full pixel values from the X block in the DPCM memory and half-pixel values in the D block from the DP memory. *See id.* at 8:29-41, Figure 5. As discussed above, the D block includes half-pixel values labeled $A_{r,c}$, located at half unit horizontal and unit vertical positions. *Id.* at 5:38-41, 8:29-33. Figure 5 of Fandrianto, shown below, depicts the interpolation method of Q1 (highlighted in blue) with inputs of full pixel $X_{10,10}$ (outlined in pink), stored in the X block of memory, and half-pixel $A_{10,10}$ (outlined in green), from the D block of memory.

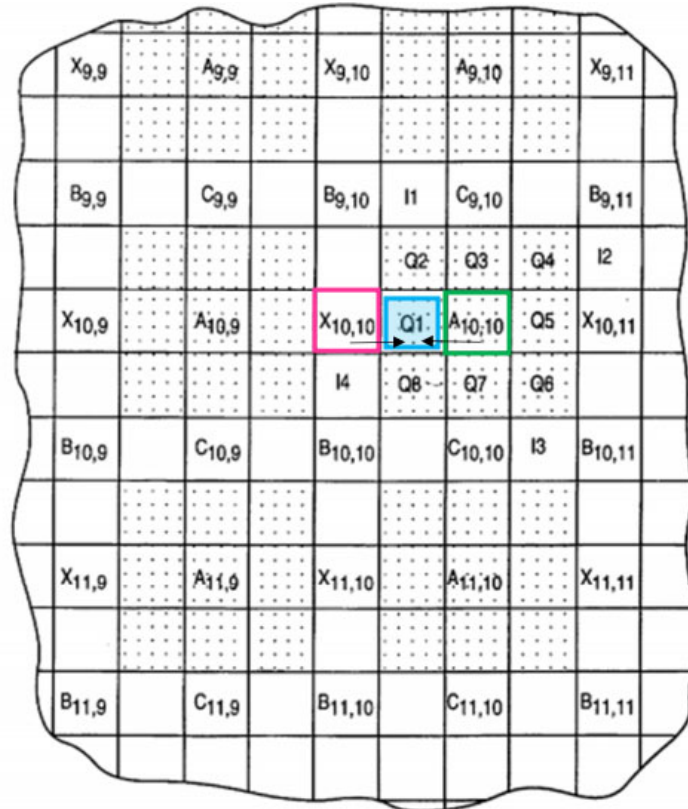


FIG. 5

Ex. 1006 at Fig. 5 (annotated).

After Q1 is interpolated, the value for Q1 is then “*stored in the A block 72.*” *Id.* at 8:37-67 (emphasis added). Then, Fandrianto describes interpolating the “Q2 pixel.” *Id.* at 8:58-67. Fandrianto discloses that the Q2 pixel could be interpolated using a “diagonal” interpolation.¹¹ While referred to as “diagonal” interpolation, this interpolation method is different from what is taught in the ’273 Patent. “Diagonal”

¹¹ The default method described by Fandrianto for interpolating this pixel is by “a vertical interpolation of the Q1 pixels with the results of a horizontal interpolation of the data in the B block 74 and the C block 76.” Ex. 1006 at 8:58-67.

as used in Fandrianto is referring to the arrangement of the memory blocks rather than the subpixels themselves.

Fandrianto states the following: “As a further example, the Q2 pixels may be derived from a diagonal interpolation of the *data* in the A block 72 and the B block 74.” *Id.* at 10:56-58 (emphasis added). During interpolation of quarter-pixels, the “A block 72” holds “the current *quarter pixel* interpolated block.” *Id.* at 8:33-35 (emphasis added). The “current quarter pixel interpolated block” right before calculating Q2 is Q1.¹² The “B block 74” referred to in Fandrianto’s alternate interpolation method stores the half-pixel values from half-pixel interpolation, corresponding to the diagonally adjacent $B_{9,10}$ from Figure 5. *See id.* at 6:6-8 (“Pixels $B_{r,c}$ ($r=0, \dots, 16$; $c=0, \dots, 17$) of the B block 74 are vertically interpolated at half-pixel locations from the X block 70.”). The table below provides an overview of the data stored in the relevant DP and DPCM memory blocks when interpolating Q2:

¹² Ex. 1006 at 8:33-40 (“This frees up the A block 72 to hold the current quarter pixel interpolated block, the pixels of which for convenience are referred to as $Q_{r,c} \dots Q1$ pixels is generated from a horizontal interpolation of the data in the X block 70 and the D block 82, and *stored in the A block 72[.]*”) (emphasis added).

DP & DPCM Memory Blocks	Stored Values for After Interpolating Q1
A block (DPCM)	quarter-pixel value located at quarter unit horizontal and unit vertical (labeled “Q1” in Figure 5 of Fandrianto)
B block DPCM	half-pixel values located at unit horizontal and half unit vertical (labeled $B_{r,c}$ in Figure 5 of Fandrianto)
D block (DP)	half-pixel values located at half unit horizontal and unit vertical (labeled $A_{r,c}$ in Figure 5 of Fandrianto)

Ex. 1006 at 8:4-57.

Fandrianto, therefore, does not disclose diagonal interpolating using two diagonally opposed pixel or sub-pixel values. Instead, as shown in the figure below on the right, the method of interpolating Q2 (highlighted in blue) with two adjacent sub-pixel values involves diagonally adjacent half-pixel $B_{9,10}$ (outlined in green) and vertically adjacent quarter-pixel Q1 (outlined in blue). Ex. 2001 at ¶ 59.

Petitioner’s Incorrect Interpretation of Fandrianto

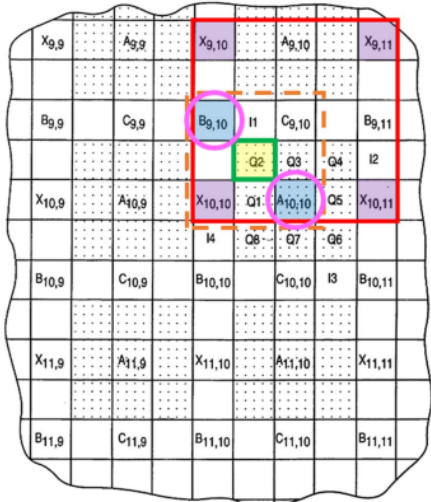


FIG. 5

Petition at 44 (annotations in Petition).

Fandrianto’s Interpolation of Q2

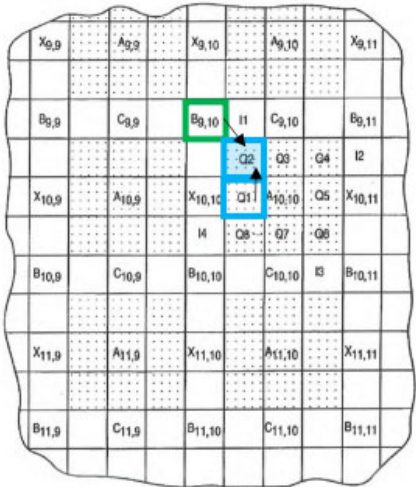


FIG. 5

Ex. 1006 at Fig. 5 (annotated).

As explained above, there is no support for Petitioner's misinterpretation depicted on the left above. Furthermore, Fandrianto discloses that $A_{10,10}$ is stored in D block 82 and thus would not have been used in the interpolation of Q2. D block 82 stores the best match block from the half-pixel interpolation stage and which was *previously* stored in A block 72 during *half*-pixel interpolation. Ex. 1006 at 8:29-33 (First, the best match block is moved from A block 72 of the DPCM memory 130 into the D block 82 of the DP memory 124. In conformance with FIG. 5, however, the pixels of the best match block now stored in D block 82 are referred to as $A_{r,c}$."). Meaning, after half-pixel interpolation is completed, the values of A block 72, including $A_{10,10}$ are moved to D block 82 for the quarter-pixel interpolation. Thus, the values used to interpolate Q2 are not the values of half-pixels located at half unit horizontal and unit vertical (*i.e.*, $A_{10,10}$). Rather are values used to interpolate Q2 are the quarter-pixel values of Q1 that were stored in "A Block 72" during the previous stage as described above.

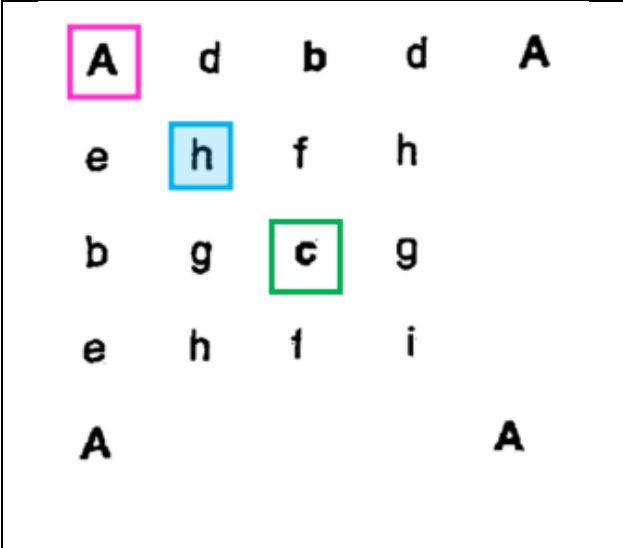
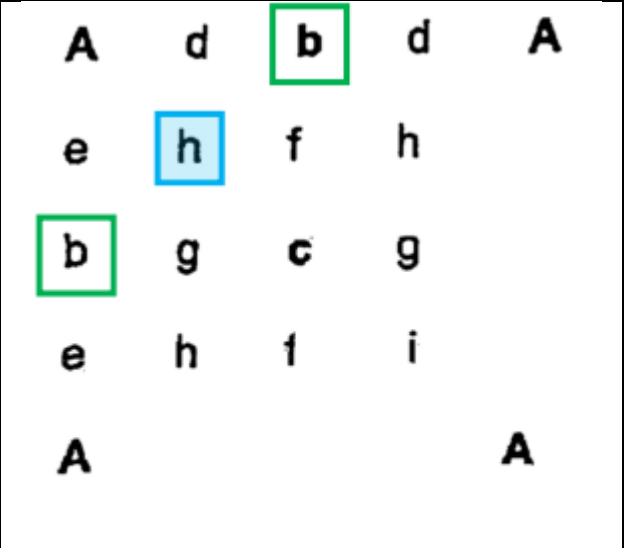
ii. The combination of TML6 and Fandrianto does not disclose or render obvious Element [a] in Claims 1, 31, 32, 33, 64, 68, 71, 73, 75, 76, 79, 82, and 83 (step a)

As explained in Section II(B)(2) above, step (a) requires the interpolation of quarter-quarter sub-pixels from either "the value of a nearest-neighbouring pixel and the value of the sub-pixel situated at co-ordinates $\frac{1}{2}$, $\frac{1}{2}$ " or "the values of a pair of *diagonally-opposed* sub-pixels." Ex. 1001 at Claims 1, 31-33, 64, 68, 71, 73, 75-76,

79, 82-83 (emphasis added). The Petitioner relies on Fandrianto's interpolation of the pixel Q2 to meet limitation step (a) but as described in the prior section, the method of interpolating Q2 disclosed in Fandrianto uses diagonally adjacent half-pixel B_{9,10} and *vertically adjacent quarter-pixel Q1*. Accordingly, Fandrianto does not disclose the claimed interpolation of step (a).

1. Step (a) of Claims 1, 31, 32, 33, 64, 68, 71, 73, 75, 76, 79, 82, and 83 requires two diagonally located pixels or sub-pixels

Step (a) requires using either “the value of a nearest-neighbouring pixel and the value of the sub-pixel situated at co-ordinates $\frac{1}{2}, \frac{1}{2}$ ” or “the values of a pair of *diagonally-opposed* sub-pixels.” See e.g. Ex. 1001 at Claim 1 (emphasis added). The two figures below represent these two options. The figure on the left shows how the “nearest-neighbouring pixel” (labeled *A* and outlined in pink) and the “sub-pixel situated at co-ordinates $\frac{1}{2}, \frac{1}{2}$ ” (labeled *c* and outlined in green) are diagonally located with respect to quarter-quarter sub-pixel *h* (highlighted in blue). The figure on the right shows how the pair of sub-pixels (labeled *b* and outlined in green) are diagonally-opposed and located diagonally with respect to quarter-quarter sub-pixel *h* (highlighted in blue).

 Fig. 14(a)	 Fig. 14(a)
Ex. 1001 at Fig. 14(a) (annotated)	Ex. 1001 at Fig. 14(a) (annotated)

Thus, the claim language is unambiguous that under either option, *both* the first *and* second sub-pixel or pixel values in the interpolation must be located diagonally with respect to the quarter-quarter sub-pixel being interpolated.

Additionally, the specification supports the plain language of the claims, requiring that *both* sub-pixel or pixel values used in the interpolation of the quarter-quarter sub-pixel must be located diagonally with respect to the quarter-quarter sub-pixel. Indeed, the specification continually characterizes the diagonal interpolation as “linear interpolation along a diagonal line linking $\frac{1}{2}$ resolution sub-pixels neighbouring the $\frac{1}{4}$ resolution sub-pixel h being interpolated.” Ex. 1001 at 36:39-43; *see also id.* at 42:59-62, 47:14-17 (“According to the method of the invention, $\frac{1}{4}$ resolution sub-pixel h is calculated by *linear interpolation* from its two closest neighbouring $\frac{1}{2}$ resolution sub-pixels *in the diagonal direction.*”) (emphasis added).

The figures in the patent also depict that both of the sub-pixel or pixel values used in the interpolation of the quarter-quarter sub-pixel must be located diagonally. See *e.g. id.* at Figures 15, 21(a)-(b).

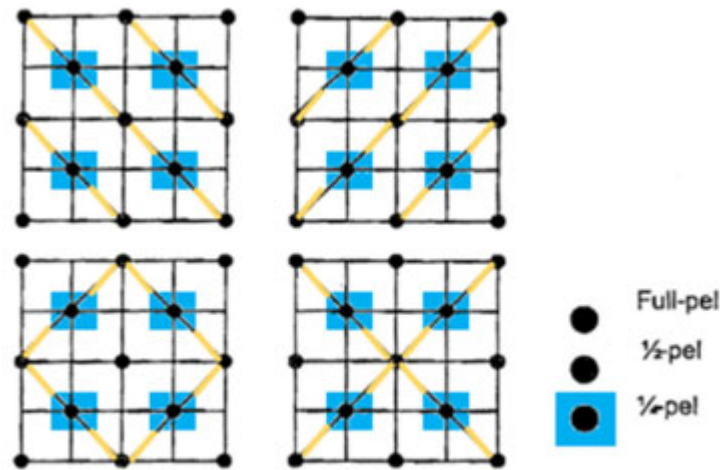


Fig. 15

Ex. 1001 at Fig. 15 (annotated such that quarter-pixels are blue and diagonals are yellow).

Thus, there is no support in the claims or specification that only *one* of the sub-pixel or pixel values used in the interpolation of the quarter-quarter sub-pixel located diagonally with respect to the quarter-quarter sub-pixel is sufficient to meet the limitation “such that the first *and* second sub-pixels or pixels are *located diagonally*.” In fact, the specification explains that the “1/4 resolution sub-pixels ... are interpolated diagonally in order to reduce the dependency on other 1/4-pixels.” Ex. 1001 at 37:46-49.

As a result, based on the plain language of the claims, and as supported by the specification, step [a] requires that both sub-pixel or pixel values used in the interpolation must be located diagonally with respect to the quarter-quarter sub-pixel being interpolated.

2. Fandrianto does not disclose diagonal interpolation of step (a) using two diagonally located pixels or sub-pixels

As discussed previously in Section III(B)(2)(i), Fandrianto's "diagonal" interpolation method uses "the *data* from A block 72 and the B block 74." Ex. 1006 at 10:56-58 (emphasis added). During interpolation of quarter-pixels, the "A block 72" stores "the current *quarter pixel* interpolated block." *Id.* at 8:33-35 (emphasis added). The "current quarter pixel interpolated block" right before calculating Q2 is Q1. As shown below, Q1 is vertically below Q2 and not diagonal to Q2.

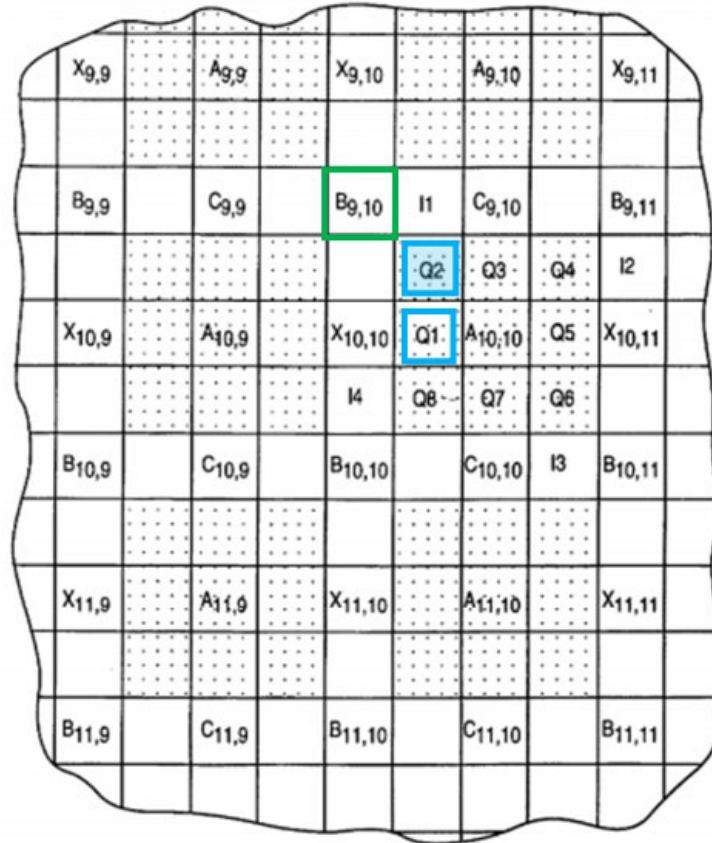


FIG. 5

Ex. 1006 at Fig. 5 (annotated).

Therefore, Fandrianto discloses interpolation using quarter-pixel values where only *one* of the two sub-pixel values is located diagonally with respect to the quarter-quarter sub-pixel being interpolated. Accordingly, the Petition fails to demonstrate that the requirement that either two diagonally adjacent sub-pixels or a pixel and diagonally adjacent sub-pixel are used to interpolate the relevant sub-pixels as required by the '273 Patent claims. The Petition, thus, fails to show how the combination of TML6, Fandrianto, and the knowledge of a POSITA renders obvious step (a) of the '273 Patent as well. Ex. 2001 at ¶ 59.

2) TML6 in View of Fandrianto Does Not Render Obvious Claims 1, 4-17, 19-26, 28-29, 31, 33, 36-49, 51, 53-59, 61-62, 64-78, and 82-83 (Ground 1)

For the same reasons outlined above for Claim 1, the remaining claims challenged under Ground 1 are not obvious over TML6 in view of Fandrianto.

First, Claims 4-17, 19-26, and 28-29 are all dependent on Claim 1. Thus, for the same reasons stated above with respect to Claim 1, these dependent claims are not rendered obvious by the combination of TML6 and Fandrianto. *Callaway Golf Co. v. Acushnet Co.*, 576 F.3d 1331, 1344 (Fed. Cir. 2009) (“A broader independent claim cannot be nonobvious where a dependent claim stemming from that independent claim is invalid for obviousness.”).

Second, for independent Claim 31, Petition alleges Claim 31 “is substantially the same as Claim 1 but is directed to $N=2$ [.]” Petition at 111. Petitioner’s argument as to Claim 31 therefore must also fail. When $N=2$, the methods of Claim 1 direct interpolation of quarter-pixels in step (a) (e.g., $K/2^N$, where $K=1$, $N=2$, $= 1/4$; $L/2^N$, where $L=1$, $N=2$, $= 1/4$). Petitioner merely incorporates its prior arguments with respect to Claim 1, and thus the Petition fails for the same reasons described above.

Third, for independent Claim 33 (and its challenged dependents at claims 36-49, 51, 53-59, and 61-62), Petitioner alleges Claim 33 “is substantively the same as Claim 1, except it is written in terms of ‘[a]n interpolator[’.]” *Id.* at 111-112. Petitioner merely argues that “TML6 and Fandrianto each disclose interpolating sub-

pixels from other pixels and/or previously interpolated sub-pixels and are thus interpolators[,]” which is not sufficient to invalidate the claim for obviousness. *Id.* at 112. Furthermore, Petitioner alleges independent Claim 83 “is substantively the same as Claim 33, except it is written in terms of “[a] network apparatus comprising an interpolator[.]”” *Id.* at 119. Thus, the Petition fails for the same reasons described above. Petitioner’s arguments would also fail for the challenged dependent claims 36-49, 51, 53-59, and 61-62 (Claim 33).

Fourth, for independent Claim 64 (and its challenged dependents at claims 65-67), Petitioner alleges Claim 64 “is substantively the same as Claim 1, except it is written in terms of “[a] video encoder comprising an interpolator[.]”” *Id.* at 113-114. Petitioner only indicates that “TML6 encodes/decodes video data” and “Fandrianto also discloses a video encoder/decoder” without additional explanation, which is not sufficient to invalidate the claim for obviousness. *Id.* Additionally, Petitioner alleges that independent Claim 68 “is substantively the same as Claim 64 except it is directed to a ‘still image encoder’ rather than a ‘video encoder.’” *Id.* at 115. Further, Petitioner alleges that independent Claim 73 “is substantively the same as Claim 68, except it is written in terms of “[a] still image decoder’ rather than “[a] still image encoder.”” *Id.* at 117. Therefore, the Petition fails for the same reasons described above. Petitioner’s arguments would also fail for the challenged dependent claims 65-67 (Claim 64), 69-70 (Claim 68), and 74 (Claim 73).

Fifth, for independent Claim 71 (and its challenged dependent at claim 72), Petitioner alleges Claim 71 “is substantively the same as Claim 1, except it is directed to ‘[a] video decoder comprising an interpolator[’.]” *Id.* at 117. Petitioner merely incorporates its prior arguments with respect to Claim 72 and thus the Petition fails for the same reasons described above.

Sixth, for independent Claim 75, Petitioner alleges Claim 75 “is substantively the same as Claim 1, except it is written in terms of ‘[a]n interpolator ... comprising[] circuitry[.]’” Petitioner simply argues that TML6 and Fandrianto each include circuitry, which is not sufficient to invalidate the claim for obviousness. *Id.* at 117-118. Moreover, Petitioner asserts that Claim 76 “is substantially the same as Claim 75 but is directed to the case where $N=2$.” Claim 76 fails for the same reasons as Claim 31 described above. Petitioner’s arguments would also fail for the challenged dependent claims 76-78 (Claim 75).

Lastly, for independent Claim 82, Petitioner alleges Claim 82 “is substantively the same as Claim 1, except it is written in terms of “[a] computer program ... embodied on a computer readable storage medium, the computer program ... comprising computer program code.” *Id.* at 119. Petitioner only indicates that “TML6 is source code and thus satisfies this limitation” and “Fandrianto discloses that its architecture’s controller ‘is operated by microcode, but may be software controlled if desired” without additional explanation, which is not sufficient to

invalidate the claim for obviousness. *Id.* Thus, the Petition fails for the same reasons described above.

3) TML6 in View of Fandrianto and in Further View of the Knowledge of a POSITA Does Not Render Obvious Claims 32, 52, and 79-81 (Ground 2)

Ground 2 of the Petition asserts that a combination of TML6, Fandrianto, and the knowledge of a POSITA renders Claims 32, 52, and 79-81 obvious. Petition at 1-2, 120. Ground 2 fails for at least two reasons.

First, for independent Claims 32 and 79, Petition alleges Claims 32 and 79 are “substantially the same as Claim[s] 31 [and 33, respectively,] but [are] directed to ‘eighth resolution’ rather than ‘quarter resolution ... interpolation.’” Petition at 120, 122. Petitioner’s arguments as to Claims 32 and 79 therefore must also fail. When $N=3$, the methods of Claim 1 direct interpolation of quarter-pixels in step (a) (e.g., $K/2^N$, where $K=1$, $N=3$, $=1/8$; $L/2^N$, where $L=1$, $N=3$, $=1/8$). Petitioner merely incorporates its prior arguments with respect to Claims 1, 31, and 33, and thus the Petition fails for the same reasons described above. Petitioner’s arguments would also fail for the challenged dependent claims 80-81 (Claim 79).

Second, Claim 52 is dependent on Claim 33. Thus, for the same reasons stated above with respect to Claim 33, this dependent claim is not rendered obvious by the combination of TML6, Fandrianto, and the knowledge of a POSITA.

C. The Board Should Exercise Discretion under 35 U.S.C. § 314 to Deny Institution

Based on the facts presented herein and the current law following *Fintiv*, the Board should exercise its discretion under 35 U.S.C. § 314(a) to deny institution of the Petition because the parallel proceeding in the District of Delaware involves the same parties and each *Fintiv* factors either weigh in favor of discretionary denial or is neutral.

The Board is keenly aware of “the potential for abuse of the review process by repeated attacks on patents.” *General Plastics Indus. Co., Ltd. v. Canon Kabushiki Kaisha*, IPR2016-01357, Paper 19, 16-17 (P.T.A.B. Sept. 6, 2017) (precedential). The Board, therefore, often exercises its discretion to deny institution under 35 U.S.C. § 314(a) when there is a parallel proceeding with the same parties and covering the same issues. *See NHK Spring Co. v. Intri-Plex Techs., Inc.*, IPR2018-00752, Paper 8, 19-20 (P.T.A.B. Sept. 12, 2018) (precedential). In *Apple, Inc. v. Fintiv*, the Board set out six factors to evaluate whether “the efficiency, fairness, and the merits support the exercise of authority to deny institution in view of an earlier trial date in the parallel proceeding”: (1) whether the court granted a stay or evidence exists that one may be granted if a proceeding is instituted; (2) proximity of the court’s trial date to the Board’s projected statutory deadline for a final written decision; (3) investment in the parallel proceeding by the court and the parties; (4) overlap between issues raised in the petition and in the parallel

proceeding; (5) whether the petitioner and the defendant in the parallel proceeding are the same party; and (6) other circumstances that impact the Board's exercise of discretion, including the merits. IPR2020-00019, Paper 11 at 6 (P.T.A.B. Mar. 20, 2020) (precedential).

Factor 1. The District of Delaware action will not be stayed pending the result of an IPR, and Amazon has not requested such a stay. Thus, *Fintiv* factor 1 weighs in favor of denying institution.

Factor 2. *Fintiv* factor 2 is neutral. The projected statutory deadline for a final written decision is February 14, 2026. No trial date has been set in the district court. As such, prognosticating about a trial date would be speculative, but Patent Owner recognizes some Board decisions have viewed this circumstance as weighing against exercising discretion to deny institution.

Factor 3. Instituting this Petition would waste the investment made by the Parties and the District Court in the parallel proceeding. Nokia filed its complaint in the District of Delaware on October 31, 2023. Granting institution would be a waste of administrative resources, as the Court has spent significant time reviewing Amazon's 101 motions filed thirteen months ago on October 31, 2023. Ex. 1010. Thus, *Fintiv* factor 3 weighs in favor of denying institution or is neutral.

Factor 4. As the Delaware court has been analyzing Amazon’s 101 motion against the ’273 Patent, any remaining issues that Amazon will raise are unknown. Thus, *Fintiv* factor 4 is neutral.

Factor 5. The parties in this IPR and the parties in the co-pending litigation are identical, so this factor weighs in favor of discretionary denial. *Sotera Wireless, Inc. v. Masimo Corp.*, IPR2020-01019, Paper 12 at 19 (P.T.A.B. Dec. 1, 2020) (precedential); *Fintiv*, IPR2020-00019, Paper 15 at 15 (P.T.A.B. May 13, 2020) (informative). This factor may not warrant denial on its own, but it certainly weighs in favor of denial. *Sotera*, IPR2020-01019, Paper 12 at 19; *Fintiv*, IPR2020-00019, Paper 15 at 15 (“[T]his factor weighs in favor of discretionary denial.”). Thus, *Fintiv* factor 5 weighs in favor of denying institution.

Factor 6. Additional circumstances also counsel in favor of discretionary denial in this case. First, the ’273 Patent already being expired favors denial. Beyond the parties, there is limited public interest in the validity of the ’273 Patent, and the Board’s limited resources are better spent on patents having a longer lifespan and broader public impact. Second, previous IPRs, ITC investigations, and District Court cases have been filed against the ’273 Patent that raise the same art and similar arguments. *See Fintiv*, IPR2020-00019, Paper 11 at 16 (“[F]actors unrelated to parallel proceedings that bear on discretion to deny institution include filing of serial petitions, parallel petitions challenging the same patent, and considerations

implicated by 35 U.S.C. § 325(d).”). Third, in an earlier case, the Brazil patent office provided an opinion that it believed “US 5,594,813 (D1) [Fandrianto], TML6 (D2), US 5521642 (D3), and EP 0576290 (D4) do not constitute grounds for modifying the scope of protection and rights conferred by this patent [the Brazilian counterpart to the ’469 Patent].” Ex. 2008.

Overall, the Board should exercise its discretion to deny the Petition.

IV. CONCLUSION

For the above-stated reasons, Patent Owner requests that the Board deny institution of the Petition.

Dated: November 27, 2024

Respectfully submitted,

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CERTIFICATION OF WORD COUNT

The undersigned hereby certifies that the portions of the above-captioned **PATENT OWNER'S PRELIMINARY RESPONSE** specified in 37 C.F.R. §42.24 has 13,673 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: November 27, 2024

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CERTIFICATION OF SERVICE

The undersigned hereby certifies that a copy of this **PATENT OWNER'S PRELIMINARY RESPONSE** pursuant to 37 C.F.R. § 42.10(b) has been served on Petitioner via email on the following counsel of record for Petitioner:

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