

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

TESLA, INC.

Petitioner,

v.

INTELLECTUAL VENTURES II LLC

Patent Owner.

Case No. IPR2025-00339

U.S. Patent No. 7,916,180

PATENT OWNER'S RESPONSE

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PATENT OWNER’S EXHIBIT LIST

Ex. 2001	Petitioner’s Answer to Complaint and Counterclaim, dated June 20, 2024, in <i>Intellectual Ventures II LLC v. Tesla, Inc.</i> , C.A. 1:24-cv-00884-ADA (W.D. Tex.)
Ex. 2002	Docket from District Court Litigation, <i>Intellectual Ventures II LLC v. Tesla, Inc.</i> , C.A. 1:24-cv-00884-ADA (W.D. Tex.)
Ex. 2003	Scheduling Order from District Court Litigation, <i>Intellectual Ventures II LLC v. Tesla, Inc.</i> , C.A. 1:24-cv-00884-ADA (W.D. Tex.)
Ex. 2004	Defendant’s Second Supplemental Preliminary Invalidity Contentions, dated January 9, 2025, in District Court Litigation, <i>Intellectual Ventures II LLC v. Tesla, Inc.</i> , C.A. 1:24-cv-00884-ADA (W.D. Tex.)
Ex. 2005	U.S. Patent No. 6,455,831 for “CMOS Foveal Image Sensor Chip”
Ex. 2006	U.S. Patent No. 8,068,140 (Avago)
Ex. 2007	U.S. Patent No. 7,804,536 for “Variable Pixel Clock Electronic Shutter Control”
Ex. 2008	Specifications for Cypress CMOS Image Sensor (2007)
Ex. 2009	EP 1 896 891 for “Adaptive Optical Plane With Rolling Shutter”
Ex. 2010	U.S. Patent No. 7,777,796 for “Solid-State Image Pickup Apparatus Including A Global Shutter Function And Control Method Therefor”
Ex. 2011	Cambridge Dictionary, definition of “during”
Ex. 2012	Uyttendaele, Matthew, Ashley Eden, and Richard Skeliski. “Eliminating ghosting and exposure artifacts in image mosaics.” <i>Proceedings of the 2001 IEEE Computer Society Conference on Computer Vision and Pattern Recognition. CVPR 2001</i> . Vol. 2. IEEE, 2001.
Ex. 2013	Declaration of Eli Saber
Ex. 2014	Resume of Eli Saber
Ex. 2015	U.S. Patent Appl. Publ. No. 2005/0128509 (Tokkonen)
Ex. 2016	U.S. Patent No. 7,123,298 (Schroeder)
Ex. 2017	U.S. Patent No. 5,691,765 (Schieltz)
Ex. 2018	U.S. Patent No. 4,323,925 (Abell)
Ex. 2019	U.S. Patent No. 7,770,799
Ex. 2020	Declaration of Dr. Eli Saber In Support Of Patent Owner Response
Ex. 2021	Cambridge Dictionary, definition of “During or for?”
Ex. 2022	Collins Dictionary, definition of “during”
Ex. 2023	Merriam-Webster Dictionary, definition of “for”

Ex. 2024	McLauchlan et al., Image Mosaicing Using Sequential Bundle Adjustment, <i>Image and Vision computing</i> 20.9-10 (2002): 751-759
Ex. 2025	U.S. Patent No. 6,031,569
Ex. 2026	EP Patent Publication EP 0 792 494 B1
Ex. 2027	Davis, Mosaics of Scenes With Moving Objects, <i>Proceedings. 1998 IEEE Computer Society Conference on Computer Vision and Pattern Recognition (Cat. No. 98CB36231)</i> . IEEE, 1998
Ex. 2028	U.S. Patent No. 6,285,172
Ex. 2029	U.S. Patent No. 8,045,935
Ex. 2030	Resume of Eli Saber

I. INTRODUCTION

The Petition challenges claims 1-3, 10-12, 22-25, 28, 30 and 32-33 (“Challenged Claims”) of U.S. Patent No. 7,916,180 (“‘180 Patent,” Ex. 1001) under three Grounds. Claims 1 and 22 are the only Challenged Claims that are independent. Petitioner has failed to carry its burden of proof with respect to any of the Challenged Claims for at least the following reasons.

First, claim 1 recites a processing component that is configured to “independently control simultaneous data acquisition with each of the plurality of channels,” and claim 22 includes virtually identical limitations. These limitations require data acquisition “with each of the plurality of channels” to occur at the same time. In Ground 1, the Petition relies solely on Matsushima for these claim limitations. However, the Petition has failed to establish that Matsushima expressly or inherently discloses “simultaneous data acquisition with each of the plurality of channels,” as claimed.

Second, claim 22 recites “independently controlling simultaneous data acquisition with each of the first and second channels during a frame.” This claim language requires that simultaneous data acquisition with the channels be controlled independently at some point between the beginning and the end of the exposure interval during which the image sensors capture a single image. Petitioner’s analysis skips over the temporal aspect of this control requirement, namely that it occur

“during a frame.” There is no evidence that any of the control applied by Matsushima or Yu (relied on in Ground 1) occurs “during a frame” -- as opposed, e.g., before the frame.

Third, all of the Challenged Claims require “independent” control of integration time for each channel. In Ground 1, the Petition fails to demonstrate that Matsushima discloses “independent” control of integration time for each channel, or that it would not have been obvious to fill this gap in Matsushima by combining the reference with Yu.

Fourth, Ground 3 advances a combination of references that includes Labaziewicz, which was filed after the provisional application to which the ‘180 Patent claims priority. The Petition’s arguments why the Challenged Claims are not supported by the provisional application lack merit. As a result, Ground 3 fails to demonstrate unpatentability because the Petition failed to demonstrate that Labaziewicz is prior art.

For at least these reasons, and as explained more fully below, the patentability of the Challenged Claims should be confirmed.

II. THE SPECIFICATION OF THE ‘180 PATENT

A. Background of the ‘180 Patent

The Background of the ‘180 Patent discussed several challenges associated with implementing a “zoom” feature in digital cameras. One challenge involved the

power and time required to move the optical elements associated with a zoom lens, which limited the ability of “optical zoom” to acquire multiple fields of view in rapid and/or simultaneous fashion. From the ‘180 Patent:

One obstacle in the challenge to deliver higher image quality is the lens system of digital cameras. The ability to image with different fields of view (zoom in and out) is a highly desired feature. Zoom, as performed by the lens system, is known as “optical zoom”. This desirable ‘zoom lens’ feature adds additional components, size and cost to a lens system. The zoom lens also requires significant power and time to operate. The time to move the optical elements in the zoom lens limits the ability to acquire multiple fields of view in rapid and/or simultaneous fashion. Ex. 1001, 1:46-55 (emphasis added).

Digital cameras provided an alternative to “optical zoom” which the ‘180 Patent described as “electronic zoom.” The ‘180 Patent went on to explain that “electronic zoom” resulted in a pronounced loss of resolution. As the ‘180 Patent explained:

Digital camera suppliers have one advantage over traditional film providers in the area of zoom capability. Through electronic processing, digital cameras can provide ‘electronic zoom’ which provides the zoom capability by cropping the outer regions of an image and then electronically enlarging the center region to the original size of the image. In a manner similar to traditional enlargements, a degree of resolution is lost when performing this process. Further, since digital cameras capture discrete input to form a picture rather than the ubiquitous process of film, the lost resolution is more pronounced. As such, although ‘electronic zoom’ is a desired feature, it is not a direct substitute for ‘optical zoom.’ Ex. 1001, 1:56-66 (emphasis added).

B. Overview of the ‘180 Patent

The first paragraph of the Detailed Description of the ‘180 Patent summarized the invention as follows:

A digital camera system and methods are described below that provide a digital camera in which multiple fields of view (FOV) of an image are simultaneously acquired. The digital camera system includes a digital camera having two or more camera channels each with independent image sensors. The sensor of each camera channel has an active area that includes multiple picture elements (pixels), and image capture includes simultaneous or nearly simultaneous use of the multiple camera channels. Each camera channel and associated optics of that camera channel has a predetermined field of view that can be different from other camera channels of the digital camera system. *Id.*, 3:21-36 (emphasis added).

Figure 3 (reproduced below with annotations) illustrates “a digital camera 200 configured for simultaneous acquisition of multiple fields of view.” *Id.*, 5:45-46. The digital camera subsystem includes four camera channels 260A-260D (red boxes). *Id.*, 5:56-58. As shown in Figure 4 (also reproduced below with annotations), each of the independently controlled camera channels 260A-260D includes an optics component 290A-290D (orange circles), respectively, and a sensor component 292A-292D (green boxes), respectively. *Id.*, 6:19-22.

In addition to operating simultaneously, the ‘180 Patent described the “electrical operation of each camera channel” as being “independent of the other camera channels.” Ex. 1001, 3:49-54. In this regard, the ‘180 Patent states:

The combination of the focal plane or image sensor size along with the optical focal length associated with each image sensor is chosen to provide a desired field of view. The electrical operation of each camera channel is independent of the other camera channels and multiple fields of view can be acquired simultaneously. *Id.*, 3:49-54 (emphasis added).

Next, the ‘180 Patent identified two electrical parameters to be independently controlled “for each camera channel,” namely, “imager frame rate and integration time.” *Id.*, 3:58-60 (emphasis added). Later in the specification, the ‘180 Patent reiterated its disclosure of controlling each channel or field of view both simultaneously and independently. *Id.*, 4:9-15, 5:63-66 and 7:23-27.

The ‘180 Patent explained that the integration time control for each sensor can be accomplished using a technique that was known as rolling mode. *Id.*, 20:48-50; Ex. 2020, ¶42. As explained below, operation of an image sensor in a “rolling mode” involves control during a frame of the start and stop times of the integration period for individual rows of pixels in the sensor. *Id.* An image sensor operating in a “rolling mode” is synonymous with a “rolling shutter,” meaning that the start and end time of the integration interval for each row of the sensor are staggered. *Id.* A diagram illustrating a rolling shutter from the time of the ‘180 Patent is set forth below. Ex.

2006, Figure 4 (annotations added). The vertical axis (labelled scanline index) corresponds to individual rows of pixels (numbered from 1 to M) on the image sensor, while the horizontal axis corresponds to time. *Id.*, 6:1-5; Ex. 2007, Figure 2A, 1:37-42; Ex. 2020, ¶42.

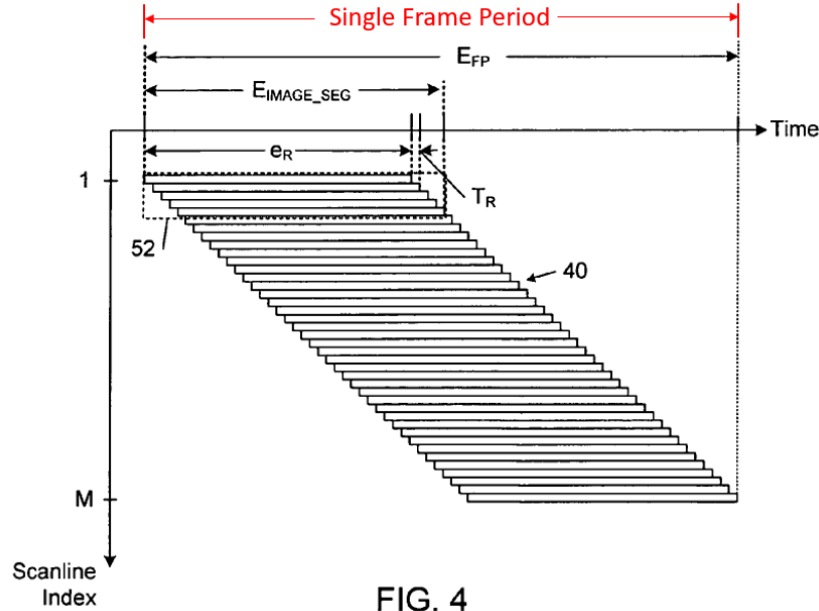


FIG. 4

Ex. 2006, Figure 4. In the diagram above, the time interval labelled e_R , corresponds to the exposure interval for row 1, and T_R corresponds to the time when the information in the first row (or first scanline) is read out. *Id.*, 6:1-5; Ex. 2020, ¶43. As shown above, the start time of the interval for each subsequent row (or scanline) in the sensor is some interval after the start time of the exposure interval for the previous row. Ex. 2006, 6:1-5; Ex. 2007, 1:37-42; Ex. 2020, ¶43. In this example, the integration period for each row (or scanline) is the same, but the start and stop times for each row (or scanline) are different. Ex. 2007, 1:42-45; Ex. 2020, ¶43.

Referring still to the diagram above, the time interval labelled E_{FP} corresponds to the frame exposure period, which extends from the start of the exposure interval of the first row (or scanline) to the stop time of the exposure interval for the last row or scanline. Ex. 2006, 6:5-19; Ex. 2020, ¶44. The time interval labelled E_{FP} is also referred to as a “single frame period” and corresponds to the continuous exposure time over which any of the entire array of pixels is integrating photons. Ex. 2009, 11:49-51 (“A single frame period is the continuous exposure time over which any of the entire array of pixels or plate of film is exposed”). Ex. 2020, ¶44. When an image sensor is operating in the rolling mode (or rolling shutter mode), the start and stop time of the integration interval of individual rows (or scanlines) of pixels is controlled during the frame. Ex. 2020, ¶44. In embodiments of the ‘180 Patent that use the rolling mode, independent integration control during the frame is applied to each camera channel that is simultaneously acquiring a field of view. Ex. 1001, 4:9-15, 5:63-66, 7:23-27 and 20:48-50; Ex. 2020, ¶44. As explained more fully later, such embodiments are the subject of claim 22 of the ‘180 Patent, which recites “independently controlling simultaneous data acquisition with each of the first and second channels during a frame.” Ex. 1001, 25:31-33 (emphasis added); Ex. 2020, ¶44.

For completeness, it bears noting that the ‘180 Patent discloses other embodiments (which are not the subject of claim 22) in which independent control

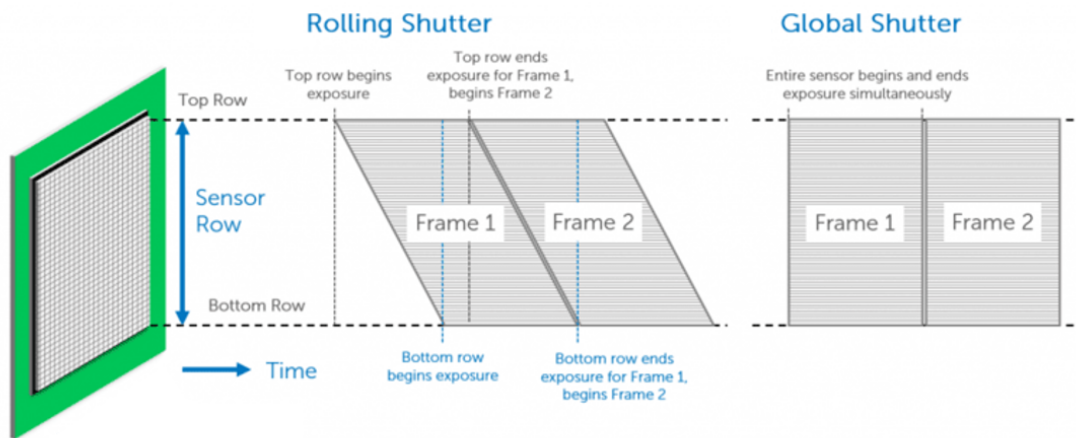
of the simultaneous data acquisition of each of the channels does not occur during the frame.¹ Ex. 2020, ¶45. For example, in connection with Figure 4, the ‘180 Patent discloses the use of “positioners 310 and 320” to “position each of the one or more optics portions (e.g., optics portions 290A-290D) of a camera channel” relative to one of “respective sensor portions 292A-292D.” *Id.*, 8:16-38. Here, control of the position of the optics portions (i.e., moving each optics portion into its proper position) would necessarily need to occur before the frame during which data was acquired with the channels. Ex. 2020, ¶45.

In another example where the simultaneous data acquisition of each of the channels does not occur during the frame, the ‘180 Patent discloses that the image sensors can be operated in a “snap-shot” mode (also referred to as a “global shutter.”)² *Id.*, 20:51. When a snapshot (or global) shutter is used, there is a common exposure period for each of the plurality of rows of pixels which “begins at a common exposure start time ... and ends at a common exposure stop time.” Ex. 2019, 19:4-18; Ex. 2020, ¶46. In contrast to an image sensor operating in the rolling shutter mode where the start and stop times of the integration interval of individual rows of

¹ Unlike claim 22 which recites “independently controlling simultaneous data acquisition with each of the first and second channels during a frame,” claim 1 does not recite independently controlling simultaneous data acquisition “during a frame.”

² See, e.g., Ex. 2007, at 1 (Specifications for Cypress CMOS Image Sensor, 2007) referring to a “snapshot (or global) shutter.”

pixels are controlled during the frame -- in the snapshot (or global) shutter mode, common control signals are applied only at the confines of the frame exposure rather than during the frame, i.e., rather than at some point between the beginning and the end of the exposure interval during which an image sensor captures a single image. Ex. 2020, ¶46. The following diagram illustrates the difference between the rolling shutter and global shutter modes:

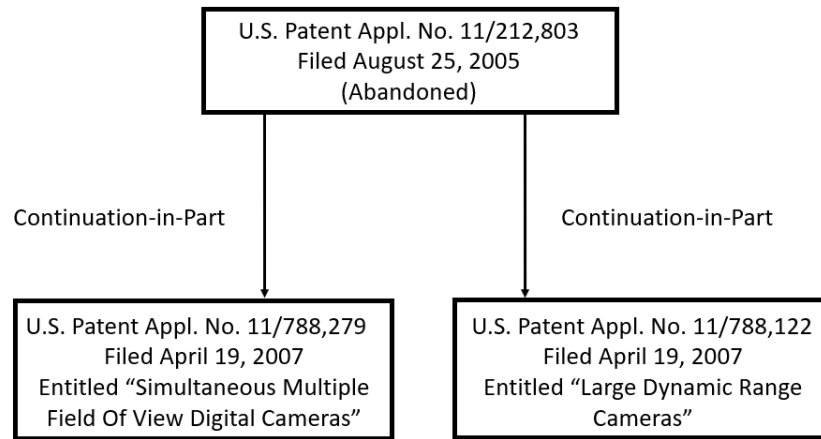


Ex. 2020, ¶46. Significantly, as depicted above, in the rolling shutter mode the start and stop times of the integration interval of individual rows of pixels must necessarily be controlled during the frame time, while in the global shutter mode no such control is used during the frame time. Ex. 2020, ¶47.

III. PROSECUTION HISTORY OF THE '180 PATENT

The specification of the '180 Patent was originally filed as U.S. Patent Application No. 11/788,279 on April 19, 2007 (the '279 Application). Ex. 1002, 351. The '279 Application claimed priority to U.S. Patent Application No.

11/212,803, filed August 25, 2005 (the ‘803 Application). *Id.* As illustrated below, the ‘279 Application was one of two applications filed on April 19, 2007 that claimed priority to the ‘803 Application.



Application No. 11/788,122 was directed to increasing the dynamic range of digital camera systems in scenes with, e.g., highly varying illumination. The disclosure of Application No. 11/788,122 corresponds to U.S. Patent No. 9,232,158 which is the subject of co-pending IPR2025-00222. The other Application filed the same day was the ‘279 Application, which was directed to the formation of multiple high resolution images in which different fields of view acquired simultaneously. Ex. 1001, 3:21-36.

Prior to the abandonment of the ‘803 Application, the Applicant filed the ‘279 Application. The independent claims of the ‘279 Application recited, *inter alia*, the independent control of simultaneous data acquisition using channels having different fields of view to “provide an image having a relatively high resolution” (original

independent claim 1), and “independently controlling simultaneous data acquisition with each of the first and second channels during a frame” (independent claims 17, 22 and 36). Ex. 1002, 389 and 391-392.

In the first Office Action, the Examiner rejected the independent claims as being anticipated by U.S. Patent No. 5,691,765 (Schieltz) (Ex. 2017). Ex. 1002, 188-194. Schieltz disclosed a camera with a fisheye lens for use in surveillance systems. Ex. 2017, 2:22, 3:11-14. In response, the Applicant amended the independent claims to recite first and second fields of view having different angular extents. Ex. 1002, 131, 133-134, 136.

The Examiner next issued a Final Rejection of the independent claims as being obvious over Schieltz in view of U.S. Patent No. 4,323,925 (Abell) (Ex. 2018). Ex. 1002, 99-107. Abell disclosed a system for “arraying a plurality of image sensor modules so that their individual imaging resolutions may be combined to provide high total imaging resolution.” Ex. 2018, 2:6-9.

In a Response After Final Action, the Applicant amended the independent claims to recite the first and second fields of view had different angular widths. Ex. 1002, 82, 84-85, 87. The Applicant argued that “[t]here is no suggestion in *Abell* that the optical configuration of the arrayed lenses results in different angular widths ...” *Id.*, 91.

The Examiner responded with a Notice of Allowance. *Id.*, 56.

IV. CHALLENGED CLAIMS OF THE '180 PATENT

Petitioner challenges independent claims 1 and 22 and dependent claims 2-3, 10-12, 23-25, 28, 30, and 32-33 of the '180 Patent. The challenged independent claims are set forth below.

Starting with independent claim 1, this claim recites:

1. A digital camera comprising:

a plurality of channels, wherein each channel includes an optics component and an array of photo-detectors integrated on a semiconductor substrate, the plurality of channels including a first channel having a first field of view (FOV) comprising a first angular width of a scene imaged by the camera and a second channel having a second FOV comprising a second angular width of the scene imaged by the camera, wherein the first and second angular widths are different; and

a processing component coupled to the plurality of channels, the processing component configured to independently control simultaneous data acquisition with each of the plurality of channels, the processing component configured to combine data of a frame from at least one of the plurality of channels to provide an image having a relatively high resolution.

Claim 1 recites independently controlling simultaneous data acquisition with first and second optical channels, each of which has a field of view with a different angular width.

Turning next to independent claim 22, this claim recites:

22. A method comprising:

configuring a first optics component relative to a first image sensor to form a first channel having a first field of view (FOV) that comprises a first angular width of a scene;

configuring a second optics component relative to a second image

sensor to form a second channel having a second FOV that comprises a second angular width of the scene, wherein the first and second angular widths are different;
independently controlling simultaneous data acquisition with each of the first and second channels during a frame; and
combining data received during the frame from one or more of the first and second channels to provide an image.

Claim 22 recites independently controlling simultaneous data acquisition with first and second optical channels during a frame, where each channel has a field of view with a different angular width.

V. CLAIM CONSTRUCTION

The claim limitations at issue must be construed under *Phillips v. AWH Corp.*, 415 F.3d 1303 (Fed. Cir. 2005). Claim language is not read in isolation. *Phillips*, 415 F.3d at 1315. Rather, the claim language, when read in light of the specification and the prosecution history, elucidates the meaning of the claim language. The plain and ordinary meaning (as would have been understood by one of ordinary skill in art at the time having read the specification) of several claim terms is set forth below.

A. “*simultaneous data acquisition with each of the plurality of channels*” (claims 1 and 22)

Independent claims 1 and 22 both recite the phrase “simultaneous data acquisition with each of the plurality of channels.” The simultaneous aspect of data acquisition with each of the plurality of channels is heavily emphasized in the specification of the ‘180 Patent. Ex. 1001, Title (“Simultaneous Multiple Field Of View Digital Camera”), Abstract (“Digital camera systems and methods are

described that provide digital cameras configured to simultaneously acquire image data via multiple channels ... The processing component is configured to independently control simultaneous data acquisition with each of the channels”), 2:42-43 (“FIG. 3 shows a digital camera configured for simultaneous acquisition of multiple fields of view”), and 2:46-47 (“FIG. 5 is a flow diagram for simultaneous acquisition of multiple fields of view”).

The plain meaning of “simultaneous” in “simultaneous data acquisition with each of the plurality of channels” requires at least some data acquisition with each of the plurality of channels to occur at the same time. For example, the recitation of “simultaneous” in this phrase requires at least some overlap in the data acquisition windows in each of the plurality of channels. Ex. 2020, ¶62.

To be clear, the subject claim language is not met where image capture with the plurality of channels is “nearly simultaneous” (i.e., close in time) but not actually simultaneous (i.e., at the same time). Ex. 2020, ¶63. While the specification of the ‘180 Patent disclosed both “simultaneous or nearly simultaneous” image capture using multiple camera channels, the Challenged Claims recite only “simultaneous data acquisition with each of the plurality of channels.” *Id.*, Ex. 1001, 3:27-28 and 8:63-65. Where, as here, a patent drafter discloses an alternative to the relevant claim language but declines to claim such alternative, the unclaimed subject matter is not covered by the claims. *Johnson & Johnston Assoc. v. R.E. Serv.*, 285 F.3d

1046, 1054 (Fed. Cir. 2002) (en banc) (even though the specification disclosed that “aluminum is currently the preferred material for the substrate, [but] other metals, such as stainless steel or nickel alloys may be used,” the court found that the drafter limited the claim language to “a sheet of aluminum” thereby excluding other embodiments from the scope of the claims); *see also*, *Eagle Pharms. Inc. v. Slayback Pharma LLC*, 958 F. 3d 1171, 1176 (Fed. Cir. 2020) (where the specification discloses unclaimed matter “as an alternative to the relevant claim limitation,” the unclaimed matter is outside the scope of the claim) and *PSC Computer Prods., Inc. v. Foxconn Int’l*, 355 F. 3d 1353, 1356 (Fed. Cir. 2004) (even though the specification disclosed that strap could be made of stainless steel or plastic, the claim language recited a “metal” strap thereby excluding embodiments using plastic from the scope of the claims). Thus, the fact that the ‘180 Patent disclosed “simultaneous or nearly simultaneous” image capture using multiple camera channels, but claimed only “simultaneous” image captures means that the claims do not cover image capture with multiple channels that is only “nearly simultaneous” (i.e., close in time).

B. “during a frame” (claim 22)

Claim 22 recites “independently controlling ... data acquisition ... during a frame.” In this context, a “frame” is digital data corresponding to a single image. *See*, e.g., Ex. 1001, 20:19-21 (referring to “one frame of digital camera data”). Ex. 2020, ¶64. The phrase “during a frame” corresponds to the exposure interval during

which an image sensor captures a single image.” See, e.g., Ex. 2009, 11:49-51 (“A single frame period is the continuous exposure time over which any of the entire array of pixels ... is exposed”).³ Consistent with Patent Owner’s proposed construction, the ‘180 Patent repeatedly speaks of controlling the “frame rate,” which is typically expressed as the number of single images captured by the sensor per second. Ex. 1001, 4:57-60 (“imager frame rate”); 4:9-15 (“independent frame rate”), 5:63-66 (“frame rate”); 7:23-27 (“frame rate”); and Ex. 2020, ¶64.

Petitioner appears to agree with Patent Owner’s interpretation equating “during a frame” to the exposure interval during which an image sensor captures a single image.” Pet., 7-8. However, in its proposed construction of “during a frame,” the Petition omits the connection to the period of time that data for an image is acquired. Ex. 2020, ¶65. Instead, the Petition proposes to construe “during a frame” as simply “during a period of time” (namely, any period of time) -- which effectively reads the limitation out of the claim. Pet., 6. Petitioner needed to take this tactic because none of the references relied on in the Petition show application of the required independent control occurring during the period of time that data is acquired by an image sensor. See, Section IX, *infra*; Ex. 2020, ¶65.

³ See also, Ex. 2006, 6:5-19 (describing the “frame exposure period” in a rolling mode shutter as extends from the start of the exposure interval of the first row (or scanline) to the stop time of the exposure interval for the last row or scanline.)

When used as a preposition, as in the case of claim 22, the term “during” imparts a temporal requirement⁴ and means “at some time between the beginning and the end of a period.” Ex. 2020, ¶66; Cambridge Dictionary, Ex. 2011, 1; Collins Dictionary, Ex. 2022, 1. Thus, “during a frame” as used in claim 22 means “at some point between the beginning and the end of the exposure interval during which an image sensor captures a single image.”

C. “*independently controlling simultaneous data acquisition ... during a frame*” (claim 22)

The plain meaning of the claim language that recites “*independently controlling simultaneous data acquisition* with each of the first and second channels *during a frame*” requires that independent simultaneous *data acquisition be controlled* at some point between the beginning and the end of the exposure interval during which the image sensors capture a single image. Ex. 2020, ¶67.

The Petition erroneously equates the prepositional phrase “*during* a frame” as used in claim 22 with the prepositional phrase “*for* a frame.” Pet., 7-8 (“[a] POSITA would have understood that “*during* a frame” refers to during a period of time that

⁴ Unlike independent claim 22 which recites “independently controlling simultaneous data acquisition with each of the first and second channels *during a frame*,” independent claim 1 has no corresponding temporal requirement. More specifically, claim 1 does not recite the temporal requirement that the independent control occur “during a frame.” Ex. 1001, 24:12-15. Under the doctrine of claim differentiation, this distinction between independent claims 1 and 22 highlights the importance of imparting meaning to the phrase “during a frame” in claim 22.

data for an image frame is acquired.”) However, “during” and “for” mean different things. The term “during” imparts a temporal requirement and means “at some time between the beginning and the end of a period,” while “for” (as used by Petitioner in the preceding quote) is “a function word to indicate purpose.” Compare, Ex. 2011, 1 (Cambridge Dictionary - definition of “during”) and Ex. 2022, 1 (Collins Dictionary -- definition of “during”) with Ex. 2023, 1 (Merriam-Webster -- definition of “for”). By substituting “for” in place of “during” in this manner, the Petition removes the temporal requirement that independent control be applied “during the frame” and erroneously substitutes the more general notion that the purpose of the data acquisition of is “for a frame.”

In the Institution Decision (ID), the Board found that “during a frame,” in claim 22, “modifies the immediately preceding recitation of ‘data acquisition with each of the first and second channels,’ such that it is the data acquisition which occurs during a frame.” ID, 20. The Patent Owner respectfully maintains that the Board’s interpretation of the claim language appears to confuse “during” with “for.” As explained in the Cambridge Dictionary, we use “during” to say when something happens, if it happens in or over a period of time; while we use for to talk about the length of time something lasts. Ex. 2021, 1. The Cambridge Dictionary compares the usage of “during” and “for” as follows:

<u>Usage</u>	<u>Meaning</u>
<i>They went to Florida during the winter.</i>	They went at one point in the winter.
<i>They went to Florida for the winter.</i>	They went from the beginning to the end of the winter.

Ex. 2021, 1. By failing to require that the performance of “independently controlling simultaneous data acquisition” occur “during a frame,” the Board has effectively re-written the language of claim 22 as follows by replacing "during" with “for”:

“independently controlling simultaneous data acquisition with each of the first and second channels for ~~during~~ a frame”

Even if “during a frame” modifies “data acquisition” as suggested by the Board, the claim language nonetheless requires the application of independent control during such data acquisition, i.e., application of independent control at some point between the beginning and the end of the exposure interval during which the image sensors capture a single image. In claim 22, the words “data acquisition” are inextricably tied to the larger phrase that recites “independently controlling simultaneous data acquisition” and thus, if the “data acquisition” occurs “during a frame,” then the application of independent control must also happen “during a frame.” Ex. 2020, ¶71.

Finally, the Board’s suggestion that there is not “sufficient support” in the specification of the ‘180 Patent for requirement that control occur during a frame, is

incorrect. *See*, ID, at 20. The ‘180 Patent explained that the integration time control for each sensor can be accomplished using a technique that was known as *rolling mode*. Ex. 1001, 20:48-50. As explained above, operation of an image sensor in a “rolling mode” involves control during a frame of the start and stop times of the integration period for individual rows of pixels in a sensor. *See*, Section II(B), *supra*; Ex. 2020, ¶71.

For all of these reasons, the meaning in claim 22 of the language that recites “independently controlling simultaneous data acquisition with each of the first and second channels during a frame” requires that independent simultaneous data acquisition be controlled at some point between the beginning and the end of the exposure interval during which the image sensors capture a single image. Ex. 2020, ¶73.

VI. GROUND 1 FAILS TO RENDER CLAIMS 1, 2-3, 10-12, 22-25, 28, 30 AND 32-33 UNPATENTABLE BECAUSE THE PETITION FAILS TO ESTABLISH THAT MATSUSHIMA EXPRESSLY OR INHERENTLY DISCLOSES OR RENDERS OBVIOUS SIMULTANEOUS DATA ACQUISITION WITH EACH OF A PLURALITY OF CHANNELS

Claim 1 recites a processing component that is configured to “independently control simultaneous data acquisition with each of the plurality of channels,” while claim 22 recites “independently controlling simultaneous data acquisition with each of the plurality of channels.” As explained in Section V(B) above, these limitations require that data acquisition “with each of the plurality of channels” occurs at the

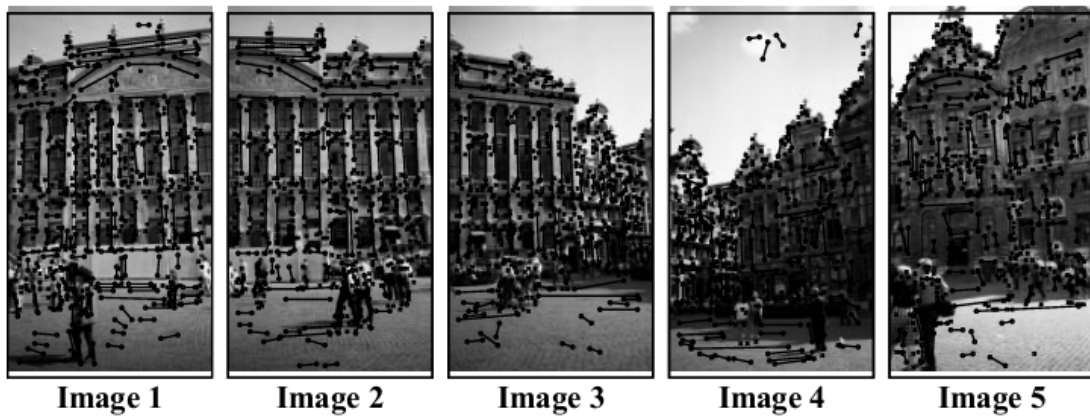
same time. Moreover, the subject claim language is not met where image capture with the plurality of channels is “nearly simultaneous” (i.e., close in time) but not actually simultaneous (i.e., at the same time).

In Ground 1, the Petition relies solely on Matsushima for the claim limitation requiring “simultaneous data acquisition with each of the plurality of channels.” Pet., 21-23 (arguing that the “simultaneous’ requirement of [22.3] is met by Matsushima), 32 (“A POSITA would have been motivated to apply, in Matsushima’s multi-channel digital camera performing simultaneous data acquisition, Yu’s teaching of independent control ...”), 55-56 (arguing that the ‘simultaneous’ requirement of [1.2.2] is met by Matsushima and referring back to arguments for [22.3]). As explained more fully below, the Petition has failed to establish that Matsushima discloses “simultaneous data acquisition with each of the plurality of channels,” as recited in the Challenged Claims.

A. State Of The Art For Combining Images At The Time Of Matsushima

Before getting into the details of Matsushima, it is important to understand how Matsushima relates to the prior art as a whole. At the time of Matsushima, techniques such as mosaicing existed for “effectively increasing the field of view of a camera, by allowing several views of a scene to be combined into a single view.” Ex. 2024, 1. In these techniques, an image sequence (formed by sequential images

taken close in time) were “stitched together” in order to provide a panoramic mosaic, i.e., a composite image with a wider field of view than each individual image in the sequence. *Id.*, 1, 6-8; Ex. 2020, ¶77. The prior art discloses that application of this technique to the following five sequential images taken with a still camera of the Market Square in Brussels:



Id., 6. The prior art mosaicing techniques were then applied to stitch together these sequentially taken images into the composite image shown below having a wider field of view than each individual image in the sequence.



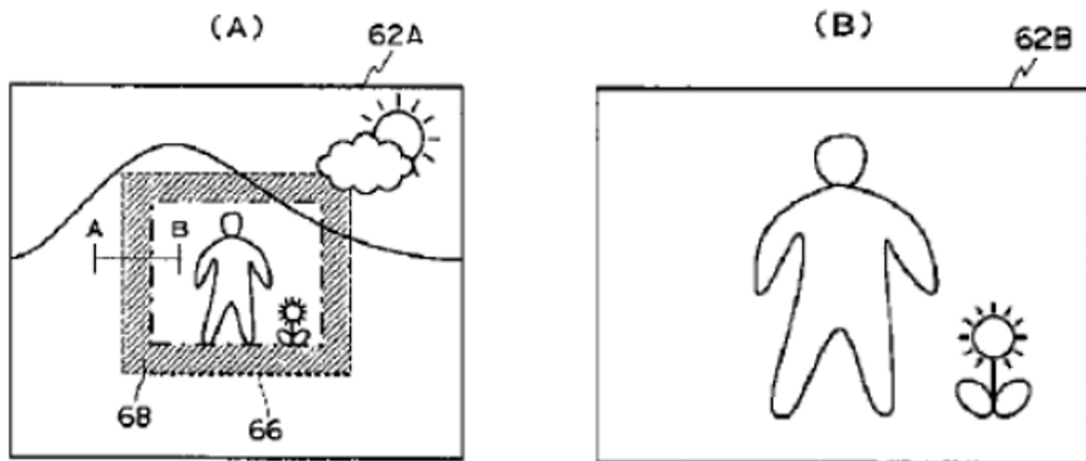
Id., 6. Other references from the time disclosed similar techniques where images taken sequentially were stitched together into a composite image having a wider field of view than each individual image in the sequence. See, e.g., Ex. 2025, 2:16-21, 5:14-19, 6:59-60 and Figure 1 (mosaicing techniques applied in connection with synthesis of four sequentially taken images into a single composite image); Ex. 2026, [0001]-[0002], [0005] and [0010] (disclosing that mosaicing “melds visual information from a set of images taken as a plurality of time instants” into “a single large image”); and Ex. 2027 (disclosing construction of mosaic from image sequences of moving objects).

Significantly, in all of the above techniques, the source images used to synthesize the composite (mosaic) image were taken sequentially -- rather than simultaneously -- and subsequently stitched together to form the composite image.

Ex. 2020, ¶80.

B. Overview of Matsushima

Matsushima discloses “a digital camera having a wide-angle first imaging system and a telephoto second imaging system.” Ex. 1007, 1. The first imaging system captures a first image 62A (left side) with a wide angle lens, and the second imaging system captures a second image 62B (right side) using a telephoto lens with a longer focal length than the lens used in the first imaging system. *Id.*, 1, 3; Ex. 2020, ¶81.



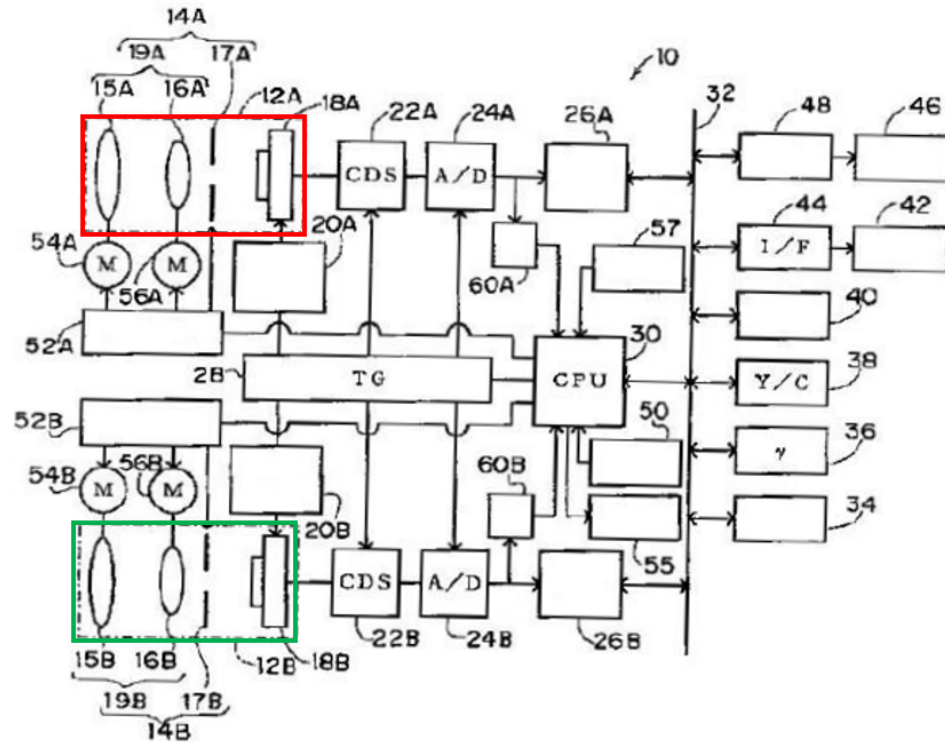
Ex. 1007, 1. The images 62A, 62B (above) are still images of a person posed next to a flower, and they are the only examples of images disclosed in the reference. Ex. 2020, ¶82. Matsushima makes no mention of images with motion or moving objects. *Id.*

Much like the mosaicing prior art that existed at the time of Matsushima

(discussed in Section VIII(A), *supra*), Matsushima forms a composite image “by synthesizing” together captured images 62A, 62B. Ex. 1007, [0048]. For example, Matsushima discloses that image 62B (captured by the second imaging system using the telephoto lens) is then “scaled down to the same magnification” as “captured image 62A taken using the first imaging system” and “synthesized with the captured image 62A taken using the first imaging system.” *Id.*, 1; Ex. 2020, ¶83. As explained in Matsushima:

The synthesizing means synthesizes the first captured image with the image that has been scaled down using the scale-down means. At this time, an image that has been scaled down using the scale-down means is generated from an image taken with the telephoto second imaging system, so the amount of information is greater than the amount of information in the central portion of the first captured image. This enables the image quality in the center of the image to be improved. Ex. 1007, [0011].

Figure 1 of Matsushima (reproduced below) discloses a first imaging system 12A (red box) and a second imaging system 12B (green box).



First imaging system 12A (red box) includes “[i]maging optics 14A” which “are composed of a first lens group 19A with an imaging lens 15A and a focus lens 16A, and an aperture 17A.” Ex. 1007, [0019]. Similarly, the second imaging system 12B (green box) includes “imaging optics 14B” which “are composed of a second lens group 19B with an imaging lens 15B and a focus lens 16B, and an aperture 17B.” *Id.* “Lens group 19A is a wide-angle single focal length lens whose shooting angle α is wider than the shooting angle β of lens group 19B.” *Id.*, [0020]. The first imaging system 12A includes CCD 18A, and the second imaging system includes CCD 18B. *Id.*, [0021]. “CCD 18A and CCD 18B can be ... CCDs of the same size, that is, the same number of pixels.” *Id.*

As explained next, Matsushima does not expressly or inherently disclose that its first imaging system 12A and second image imaging system 12B operate at the same time to simultaneously acquire images. Ex. 2020, ¶89.

C. The Petition Has Failed To Establish Matsushima Expressly Or Inherently Discloses Simultaneous Data Acquisition With Each Of The Plurality Of Channels

The term “simultaneously” does not appear in Matsushima, and Matsushima never states that images 62A and 62B are acquired at the same time. Ex. 2020, ¶87. In alleging that Matsushima discloses “simultaneous data acquisition with each of the plurality of channels,” the Petition (at 21) relies on [0031] of Matsushima, which states:

CPU 30 performs various calculations such as focus evaluation calculations and AE calculations based on the image signals outputted from CCD 18A and CCD 18B, and the driving circuits 52A and 52B of the imaging lenses 15A and 15B, the focus lenses 16A and 16B, and the apertures 17A and 17B are controlled based on these calculations. In other words, when the lens groups 19A and 19B are composed of zoom lenses, the motors 54A and 54B are driven to zoom the imaging lenses 15A and 15B and change the imaging magnification. These motors 54A and 54B can be omitted when a manual zooming configuration or a single focal length lens is used. Ex. 1007, [0031].

Nothing in [0031] of Matsushima discloses that images 62A and 62B are acquired at the same time, or compels the conclusion the images 62A and 62B are acquired in overlapping acquisition windows. Ex. 2020, ¶88. The disclosure in [0031] of Matsushima is consistent with the sequential capturing of images 62A and

62B followed by alignment and stitching the images together as taught in Matsushima and the other references from the time directed to mosaicing. *Id.*

The Petition (at 23-24) also cites to [0021] and Claim 1 of Matsushima for the proposition that Matsushima discloses “simultaneous data acquisition with each of the plurality of channels.” Those portions of Matsushima state:

In addition, CCD 18A and CCD 18B can be, for example, CCDs of the same size, that is, the same number of pixels. Therefore, when the image captured with the first imaging system 12A is the captured image 62A shown in FIG. 3 (A), the image captured by the second imaging system 12B is the scaled-up captured image 62B at the center of FIG. 3 (A), as shown in FIG. 3 (B). Ex. 1007, [0021].

* * *

[Claim 1] A digital camera comprising: a first imaging system including a first image sensor for imaging a subject and a first lens for forming an image of the subject on the first image sensor; a second imaging system including a second image sensor for imaging the subject and a second lens with a focal length longer than the first lens for forming an image of the subject on the second image sensor; a scale-down means ... ; and a synthesizing means for correcting ... Ex. 1007, 2.

Again, nothing in the above passages of Matsushima discloses that images 62A and 62B are acquired at the same time, or compels the conclusion the images 62A and 62B are acquired in overlapping acquisition windows. Ex. 2020, ¶90. The disclosures in the above passages of Matsushima are consistent with the sequential capturing of images 62A and 62B followed by alignment and stitching the images together as taught in Matsushima and the other references from the time directed to

mosaicing. *Id.*

The Petition also argues that Matsushima discloses “simultaneous data acquisition with each of the plurality of channels” because, according to Petitioner, “images 62A and 62B are captured at the same time to avoid image discrepancies due to motion or other artifacts.” Petition, 23 (emphasis added). However, Matsushima does not say that images 62A, 62B are captured at the same time, nor does Matsushima even mention images involving motion or motion artifacts. Ex. 2020, ¶91. On the contrary, the images 62A, 62B as depicted in Matsushima are still images of a person posed next to a flower, and they are the only examples of images disclosed in the reference. *Id.* Moreover, even if Matsushima had disclosed that it was applicable to motion images (to be clear, it did not), that fact does not compel the conclusion that images 62A, 62B are captured at the same time. *Id.* For example, as discussed in Section VIII(A), *supra*, it was well known at the time of Matsushima how to stitch together source images taken sequentially in cases where the source images involved motion. *Id.*; Ex. 2027 (disclosing synthesis of composite image (mosaic) from image sequences of moving objects). Thus, Matsushima does not require simultaneous image capture to function as intended. Ex. 2020, ¶91.

Next, in alleging that Matsushima discloses “simultaneous data acquisition with each of the plurality of channels,” the Petition (at 24) cites to [0027] of Matsushima, which states:

A timing signal generating circuit (TG) 28 provides appropriate timing signals to the CCD drive circuits 20A and 20B, the CDS circuits 22A and 22B, and the A/D converters 24A and 24B in response to commands from the CPU 30, and each circuit is driven synchronously by timing signals applied from the timing signal generating circuit 28. Ex. 1007, [0027].

For several reasons, this passage does not disclose simultaneous data acquisition with a plurality of channels. First, Matsushima discloses that these timing signals are used to control the timing of the retrieval of information from the CCDs, rather than the acquisition of data by each CCD. *See*, Ex. 1007, [0023] (“The accumulated signal charges are retrieved by CCD drive pulses applied by CCD drive circuits 20A and 20B, and are sequentially output from CCD 18A and CCD 18B”); Ex. 2020, ¶94. Second, Matsushima states only that the timing signal generator 28 provides “appropriate timing signals to the CCD drive circuits 20A and 20B” -- the reference never states that it provides simultaneous timing signals to the CCD drive circuits. Ex. 2020, ¶95. Third, even if Matsushima had been referring to image acquisition signals in [0027] (as opposed to data retrieval signals), Matsushima’s disclosure that “each circuit is driven synchronously by timing signals applied from the timing signal generating circuit 28” is not equivalent to a disclosure that such circuits are driven simultaneously. The fact that two circuits operate synchronously means only that the operation of both circuits is based on a common clock signal -- not that the circuits are necessarily driven simultaneously. Ex. 2020, ¶96, *citing*, Ex.

2028, 1:15-24 and 1:60-65 (explaining that synchronous circuits are one that “operate in a synchronous manner relative to a system clock” such that each circuit operates in a fixed relationship with each other) and Ex. 2029, 30:58-65 (“Generally, synchronization is used to obtain a fixed relationship among ... two or more signals”).

Finally, in alleging that Matsushima discloses “simultaneous data acquisition with each of the plurality of channels,” the Petition (at 25) relies on the fact that block 102 in Figure 7 of Matsushima states “Capture images.” However, the phrase “Capture images” is not an express or inherent disclosure that the images are captured simultaneously. Again, the phrase “Capture images” is completely consistent with the sequential capturing of images 62A and 62B. Ex. 2020, ¶97.

In summary, there can be no dispute that Matsushima fails to expressly disclose that images 62A, 62B are taken at the same time. Matsushima simply does not say that. In addition, to the extent the arguments in the Petition are interpreted as alleging that it is inherent in Matsushima that images 62A, 62B are taken at the same time, it is clear for the reasons explained above that nothing in Matsushima compels the conclusion that images 62A, 62B are taken at the same time.⁵ Ex. 2020, ¶98.

⁵ “The mere fact that a certain thing may result from a given set of circumstances is not sufficient to establish inherency.” *Par Pharm., Inc. v. TWi Pharm., Inc.*, 773 F.3d 1186, 1194-95 (Fed. Cir. 2014). Rather, “the limitation at issue necessarily must be present in order to be inherently disclosed by the reference.” *Southwire Co. v. Cerro*

D. The Petition Has Failed To Establish That Matsushima Renders Simultaneous Data Acquisition With Each Of The Plurality Of Channels Obvious

In addition to alleging that Matsushima discloses “simultaneous data acquisition with each of the plurality of channels,” the Petition alleges without further explanation that Matsushima renders this limitation obvious. Petition, 21 (“As shown in FIGS. 1-3 below, Matsushima discloses or renders obvious ... simultaneous data acquisition with each of the first and second channels during a frame”). However, other than arguing that Matsushima in fact discloses this limitation, the Petition advances no separate argument that Matsushima renders this limitation obvious. More specifically, other than making the conclusory assertion at the beginning and end of its analysis of [22.3] and [1.2.2] that Matsushima renders obvious the limitation reciting “simultaneous data acquisition with each of the plurality of channels,” the Petition provides no further explanation why Matsushima renders this limitation obvious. *See*, Petition, at 21-30, 55-56.

The Petition’s conclusory assertions of obviousness are insufficient to carry Petitioner’s burden of demonstrating by a preponderance of the evidence that Matsushima renders obvious the limitation reciting “simultaneous data acquisition with each of the plurality of channels.” A petitioner cannot satisfy its burden of

Wire LLC, 870 F.3d 1306, 1310-11 (Fed. Cir. 2017). Petitioner has not demonstrated that it is *inherent* in Matsushima that images 62A, 62B are taken at the same time.

proving obviousness by employing “mere conclusory statements,” but “must instead articulate specific reasoning, based on evidence of record, to support the legal conclusion of obviousness.” *In re Magnum Oil Tools Int’l, Ltd.*, 829 F.3d 1364, 1380 (Fed. Cir. 2016).

E. Ground 1 Fails To Carry Its Burden Of Proof With Respect To Any Of The Challenged Claims

For the reasons set forth above, the Petition has failed to meet its burden of establishing that Matsushima discloses or renders obvious the requirement of “*simultaneous* data acquisition with each of the plurality of channels” in independent claims 1 and 22. The arguments in Ground 1 challenging dependent claims 2-3, 10-12, 23-25, 28, 30 and 32-33 are deficient because they rely on the same mappings for independent claims 1 and 22 discussed above.

VII. GROUND 1 FAILS TO RENDER CLAIMS 22, 23-25, 28, 30 and 32-33 UNPATENTABLE BECAUSE MATSUSHIMA-YU FAILS TO DISCLOSE INDEPENDENTLY CONTROLLING SIMULTANEOUS DATA ACQUISITION DURING A FRAME

Claim 22 recites “independently controlling simultaneous data acquisition with each of the first and second channels *during a frame*.” As set forth in Section V, *supra*, the meaning of this claim language requires that simultaneous *data acquisition with the channels be controlled independently* at some point between the beginning and the end of the exposure interval during which the image sensors capture a single image.

As explained above, operation of an image sensor in a “rolling mode” (illustrated again below) as disclosed in the ‘180 Patent is an example of controlling data acquisition ... during a frame. Ex. 1001, 20:48-50; Ex. 2020, ¶101.

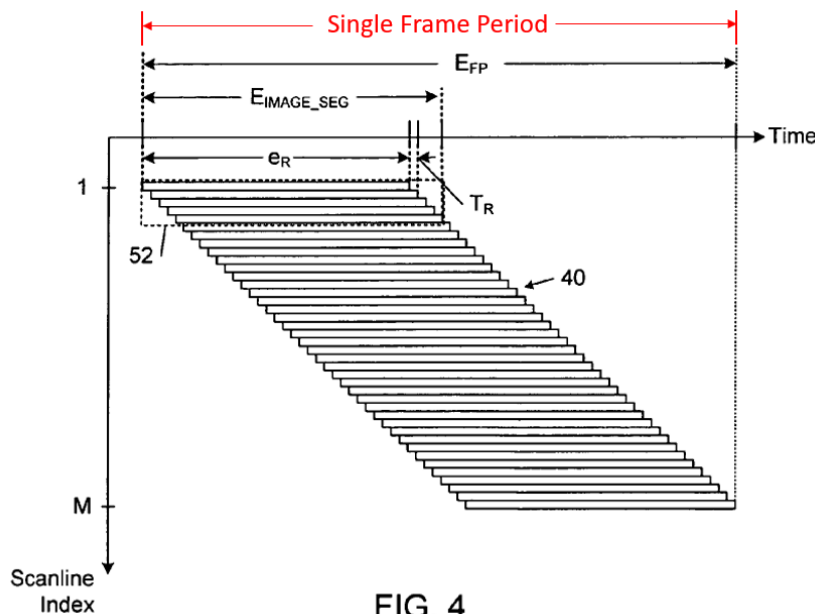


FIG. 4

Ex. 2006, Figure 3. In the rolling mode, the start time of the interval for each subsequent row (or scanline) in the sensor is some interval after the start time of the exposure interval for the previous row. *Id.*, 6:1-5; Ex. 2007, 1:37-42; Ex. 2020, ¶102. Thus, when an image sensor is operating in the rolling mode, the start and stop time of the integration interval of individual rows (or scanlines) of pixels is controlled during the frame. See Section II(B), *supra*; Ex. 2020, ¶102. By contrast, a sensor can be operated in a “snap-shot” mode (also referred to as a “global shutter”) where common control signals are applied only at the confines of the frame exposure rather than during the frame, i.e., rather than at some point between the beginning and the

end of the exposure interval during which the image sensor captures a single image. See, Section II(B), *supra*; Ex. 2020, ¶102.

In Ground 1, the Petition alleges that the limitation in claim 22 reciting “independently controlling simultaneous data acquisition ... during a frame” is met by Matsushima alone, or in combination with Yu. Petition, 21-34. However, Petitioner’s analysis skips over the temporal aspect of this control requirement, namely that it occur “during a frame.” There is no evidence that any of the control applied by Matsushima or Yu occurs “during a frame” -- as opposed, e.g., before the frame. Ex. 2020, ¶103. Set forth below is an analysis of each of the disclosures from Matsushima and Yu that were relied on in the Petition for the limitation in question.

A. Control of Matsushima’s Lenses And Apertures Does Not Occur “During A Frame”

The Petition maps each of (i) calculations performed by Matsushima’s CPU that control “the driving circuits 52A and 52B of the imaging lenses 15A and 15B, the focus lenses 16A and 16B, and the apertures 17A and 17B” and (ii) the operation of Matsushima’s automatic focus (AF) function, to the limitation requiring application of independent control “during a frame.” Petition, 21 and 26. However, there is no evidence that any of this control occurs “during a frame,” i.e., at a point between the beginning and the end of the exposure interval during which the image sensor captures an image. See, Section II(B), *supra*. On the contrary, a POSITA

would have expected any adjustments to Matsushima's lens (e.g., autofocus) and apertures to occur *before* the exposure interval during which the image sensor captures a single image. Ex. 2020, ¶104.

B. Matsushima's Timing Signals Do Not Control Data Acquisition "During A Frame"

The Petition also maps the "timing signals" disclosed in [0027] of Matsushima to the limitation requiring application of independent control "during a frame." Petition, 24. For multiple reasons, this passage fails to disclose independent control of *data acquisition* "*during a frame*." First, Matsushima discloses that these timing signals are used to control the timing of the *retrieval* of data from the CCDs, not the *acquisition of data* by each CCD. See Ex. 1007, [0023]; Ex. 2020, ¶106. Second, the Petition provides no evidence that these timing signals apply control "during a frame," i.e., at a point *between the beginning and the end of the exposure interval* during which the image sensor captures an image. See Section II(B), *supra*. On the contrary, a POSITA would have understood that Matsushima's timing signals for retrieving data from the CCDs could occur after the exposure interval during which the image sensor captures a single image. Ex. 2020, ¶107.

C. Pressing Matsushima's "Release Button" Does Not Independently Control Data Acquisition With First And Second Channels "During A Frame"

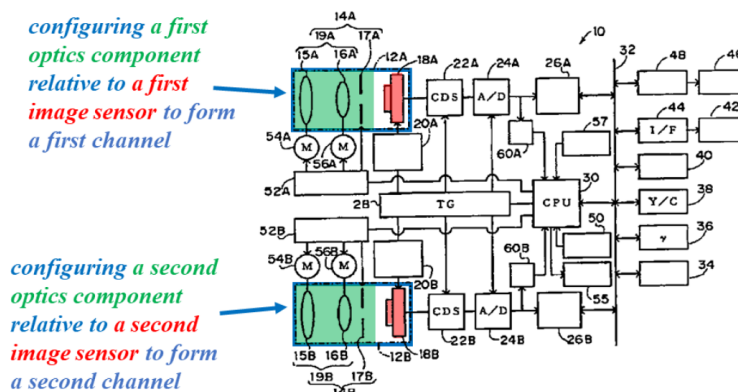
The Petition also maps the pressing of Matsushima's "release button" to the application of independent control "during a frame." Petition, 24-25. Pressing

Matsushima’s release button does not equate to the application of independently controlling data acquisition with each of the first and second channels “during a frame.” First, there is no evidence that depression of the release button independently controls the first and second channels. Rather, to the extent actuation of the release button is “control,” it is common control -- rather than independent control -- with respect to the first and second channels. Ex. 2020, ¶109. Second, actuation of the release button does not occur “during a frame,” i.e., at a point between the beginning and the end of the exposure interval during which the image sensor captures a single image. See, Section II(B), *supra*; Ex. 2020, ¶110. On the contrary, a POSITA would have understood that actuation of the release button would necessarily need to occur before the exposure interval during which the image sensor captures an image. *Id.*

D. Matsushima’s Correlated Double Sampling Circuit, A/D Converters And Integration Circuits Do Not Independently Control Data Acquisition With First And Second Channels “During A Frame”

The Petition also maps Matsushima’s “correlated double sampling circuits 22A and 22B, and analog-to-digital (A/D) converters 24A and 24B” and “integration circuits 60A and 60B” to the limitation requiring application of independent control of data acquisition with each channel “during a frame.” Petition, 25 and 28. This mapping fails because Matsushima’s correlated double sampling circuits 22A and 22B, analog-to-digital (A/D) converters 24A and 24B, and integration circuits 60A

and 60B are not part of the first and second channels as mapped in the Petition. As shown in the image from the Petition reproduced below, the channels simply do not include correlated double sampling circuits 22A and 22B, analog-to-digital (A/D) converters 24A and 24B and integration circuits 60A and 60B.



Pet., 19. Because the correlated double sampling circuits 22A and 22B, analog-to-digital (A/D) converters 24A and 24B and integration circuits 60A and 60B are not part of the first and second channels, it is clear that any control of these components does not amount to “independently controlling simultaneous data acquisition with each of the first and second channels ...,” as claimed. Ex. 2020, ¶112.

In addition, the correlated double sampling circuits 22A and 22B, analog-to-digital (A/D) converters 24A and 24B, and integration circuits 60A and 60B are downstream of the CCDs 18A and 18B that acquire the images. Ex. 2020, ¶113. The Petition provides no evidence that the correlated double sampling circuits 22A and 22B, analog-to-digital (A/D) converters 24A and 24B, and integration circuits apply control “during a frame,” i.e., at a point between the beginning and the end of the

exposure interval during which the image sensor captures an image. *See*, Section II(B), *supra*. Ex. 2020, ¶113.

E. Matsushima Fails To Teach Control Of Integration Time Or Exposure Time For Its Imaging Systems “During A Frame”

There is no evidence that such integration time control is applied “during the frame,” i.e., at a point between the beginning and the end of the exposure interval during which the image sensor captures an image. Ex. 2020, ¶114. Matsushima does not disclose that its integration control operates in a “rolling mode” (or using a “rolling shutter”) where the start and stop time of the integration interval of individual rows (or scanlines) of pixels is controlled during the frame. Nor is such an implementation inherent in Matsushima. *Id.* For example, a sensor can be operated in a “snap-shot” mode (also referred to as a “global shutter”) where common control signals are applied only at the confines of the frame exposure rather than during the frame, i.e., at some point between the beginning and the end of the exposure interval during which the image sensor captures a single image. *Id.* Thus, Matsushima fails to disclose (expressly or inherently) integration time control that is applied “during the frame.” *Id.*

F. The Petition Presents No Evidence That Yu Independently Controls Data Acquisition With First And Second Channels “During A Frame”

1. Overview of Yu

Yu is directed to “digital photography,” and to a digital camera that takes

digital photographs (still images) with colors and details that more closely replicate that of film cameras. Ex. 2020, ¶115. In the “Description of Related Art,” Yu describes the capability of film-photography to produce high-resolution images and vivid colors, and explained the shortcomings of existing digital photography techniques that lacked the high-resolution and vivid colors produced by film. Ex. 1005, 1:12-2:16. Yu positioned its invention as having “been made in consideration of the above described problems and needs” in order to improve the image resolution and color ranges of existing digital cameras by providing “film-like true color” images “without incurring substantial costs.” Ex. 1005, 2:23-49.

2. There Is No Evidence That Yu Controls Data Acquisition With First And Second Channels “During A Frame”

There is no evidence that integration time control in Yu is applied “during the frame,” i.e., at a point *between the beginning and the end of the exposure interval* during which the image sensor captures an image. Ex. 2020, ¶118. Yu does not disclose that its integration control operates in a “rolling mode” (or using a “rolling shutter”) where the *start and stop time* of the integration interval of individual rows (or scanlines) of pixels is *controlled during the frame*. *Id.* Nor is such an implementation inherent in Yu. As described in Section IX(F)(1), *supra*, Yu is directed to a digital camera that takes digital photographs (*still* images) with colors and details that more closely replicate that of *film* cameras. Thus, Yu’s sensor would

have been expected to operate in a “snap-shot” mode (also referred to as a “global shutter”) where common control signals are applied only at the confines of the frame exposure rather than during the frame, i.e., at some point between the beginning and the end of the exposure interval during which the image sensor captures a single image. Ex. 2020, ¶118. Thus, Yu fails to disclose (expressly or inherently) integration time control that is applied “during the frame.”

G. Ground 1 Fails To Carry Its Burden Of Proof With Respect To Claims 22, 23-25, 28, 30 and 32-33

For the reasons set forth above, the Petition has failed to meet its burden of establishing that Matsushima or Yu discloses “independently controlling simultaneous data acquisition with each of the first and second channels during a frame” as set forth in independent claim 22. The arguments in Ground 1 challenging dependent claims 23-25, 28, 30 and 32-33 are predicated on the mapping of claim 22 discussed above, and thus, Ground 1 has failed to meet its burden with respect to dependent claims 23-25, 28, 30 and 32-33.

VIII. GROUND 1 FAILS TO RENDER CLAIMS 1, 2-3, 10-12, 22-25, 28, 30 AND 32-33 UNPATENTABLE BECAUSE MATSUSHIMA ALONE FAILS TO DISCLOSE INDEPENDENT CONTROL OF INTEGRATION TIME AND IT WOULD NOT HAVE BEEN OBVIOUS TO COMBINE MATSUSHIMA AND YU AS PROPOSED IN THE PETITION

Ground 1 is separately flawed because Matsushima fails to disclose “independent” control of integration time for each channel, and it would not have

been obvious to fill this gap in Matsushima by combining the reference with Yu as proposed in the Petition.

A. The Text Of Matsushima Describes A Common Exposure Time For Both Imaging Systems

Matsushima's exposure control mechanism uses the same charge accumulation time for both CCDs, indicating that integration time is not independently managed for each sensor. Ex. 2020, ¶120. Matsushima's automatic exposure (AE) control relies on a single luminance value to determine a common aperture setting and shutter speed, which are then applied uniformly to both imaging systems. *Id.* The common integration time control for both imaging systems in Matsushima fails to meet the limitations in claims 1 and 22 requiring that data acquisition with the channels be independently controlled. *Id.*

In Matsushima, "CPU 30 performs various calculations such as focus evaluation calculations and AE [automatic exposure] calculations." Ex. 1007, [0031]. However, Matsushima makes clear that a single charge accumulation time is used for both CCD 18A and 18B in Matsushima's two imaging systems. Ex. 2020, ¶121. From Matsushima:

For AE control, the subject luminance (imaging EV value) is determined based on integration of the R, G, and B signals in a single frame by the integration circuits 60A and 60B, and the aperture value and shutter speed are determined based on this imaging EV value. The apertures 17A and 17B are driven via the drive circuits 52A and 52B, and the CCD 18A and CCD 18B charge accumulation time is controlled

using an electronic shutter to reach the determined shutter speed. ...

During imaging and recording, the AF operation is performed when the release button is “half-pressed,” and the metering operation is repeated several times to obtain the exact imaging EV. The final aperture value and shutter speed for imaging is then determined based on the imaging EV. The apertures 17A and 17B are then driven to the final aperture value when the release button is “fully press”, and the charge accumulation time is controlled by the electronic shutters at the determined shutter speed. *Id.*, [0034]-[0035] (emphasis added).

The fact that Matsushima refers to “the charge accumulation time” (in the singular) of both “the CCD 18A and CCD 18B” indicates that the same charge accumulation time is used for both devices. Ex. 2020, ¶122. Matsushima’s references to “the subject luminance” (singular), one EV value (singular), “the final aperture value” (singular) used for both apertures 17A and 17B, and “the determined shutter speed” (singular), likewise indicate that one luminance (EV value) is determined for the subject, and a common aperture value as well as a common shutter speed are used in both imaging systems. *Id.* Matsushima’s use of a common accumulation time for both of its CCDs fails to disclose “independently” controlling simultaneous data acquisition with each of the first and second channels,” as recited in claims 1 and 22. *Id.*

1. The Testimony Of Petitioner’s Expert Alleging That Matsushima Uses Different Integration Times Is Unsupported By The Reference

The assertions by Petitioner’s expert that Matsushima discloses images with

different integration times is unsupported by the disclosure of Matsushima. The passages relied on in the expert declaration do not reference independent integration time control between the two imaging systems. Instead, Matsushima consistently refers to the subject luminance and the charge accumulation time only in the singular, indicating that a single exposure value is used for both CCDs. Ex. 2020, ¶123.

Petitioner's expert stated:

99. Matsushima performs independent control of aperture and charge accumulation time for each channel to achieve “optimal exposure adjustment” for image acquisition, because the AE control is based on independently determined imaging EV values of the channels with different FOVs, e.g., *different EV values for each channel*, where the corresponding portions of the FOVs of the same scene have different brightness. Ex.1007, [0017]. The AE control is performed by independently controlling charge accumulation times for the channels, based on the independent determination of *the first subject luminance* for the first FOV and the second subject luminance for the second FOV. Ex.1007, [0034]. Matsushima describes that the first subject luminance of shooting angle α and *the second subject luminance* of shooting angle β are determined independently (by circuit 60A for first channel, and 60B for second channel independently). Ex.1007, [0034] (AE control is based on the subject luminance (imaging EV value) according to the scene of the respective FOV).

Ex. 1003, ¶99 (emphasis added). The assertions that Matsushima has “different EV values for each channel” and that in Matsushima there is “a first subject luminance” and “a second subject luminance” are not supported (either expressly or inherently) in Matsushima. Ex. 2020, ¶125. The only citations (to paragraphs [0017] and [0034]

of Matsushima) provided by Petitioner’s expert do not disclose “different EV values for each channel” -- the actual text discloses “this EV value” (singular). *Id.* Nor does the text of Matsushima describe “a first subject luminance” and “a second subject luminance” -- instead, the actual text of Matsushima refers to “the subject luminance” (again, singular). *Id.*

Later, Petitioner’s expert alleges:

102. In Matsushima, the charge accumulation time/integration times of the two channels would have independent values, because the first and second channels are controlled independently based on captured images of different subject luminance with different FOVs. Ex.1007, [0034]. For example, the first sensor imaging the larger FOV (see 62A including the sun, the sky and other background objects) has a different subject illuminance (e.g., a higher subject illuminance) from the second sensor imaging the smaller FOV (see 62B including a person and a flower), thereby a different integration time (e.g., a shorter integration time) is determined for the first channel. (Emphasis added).

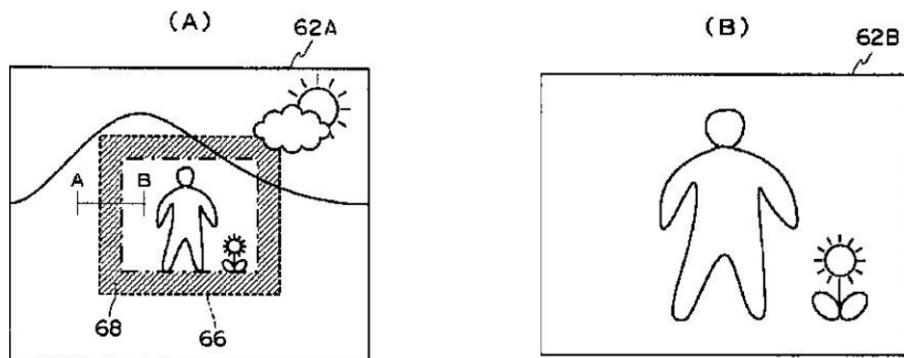
The text of Matsushima (e.g., at [0034]-[0035]) says just the opposite. Ex. 2020, ¶127. Specifically, those portions of Matsushima describe “the subject luminance” (singular) and “the charge accumulation time” (singular) -- rather than different subject luminances or different integration times. *Id.* The reasoning proposed by Petitioner’s expert is not grounded in the actual words of Matsushima.

2. Given The Known Obstacles To Synthesizing Digital Images With Different Exposures, Interpreting Matsushima As Disclosing Different Integration Times Would Be Inconsistent With The Prior Art As A Whole

Petitioner’s argument that Matsushima’s images 62A and 62B have different

exposure times—and that this equates to different integration times—is both inconsistent with Matsushima’s disclosure and contrary to the understanding of the prior art. Ex. 2020, ¶128. Matsushima explicitly describes a synthesis process aimed at achieving a natural boundary between images of different resolutions. However, Matsushima’s solution is not applicable to merging images with different exposures. *Id.* More specifically, prior research, including studies on image mosaics, highlighted the difficulty of blending images with differing exposures without producing unnatural seams. *Id.*

As shown in Figures 4A and 4B of Matsushima (reproduced below), Matsushima disclosed that “a scaled down image 66 is generated from a captured image 62B” by scaling down image 62B “to the same magnification (shooting angle) as the captured image 62A,” and then “both images are synthesized by replacing the image in the center of the captured image 62A corresponding to the scaled down image 66, with the scaled down image 66.” Ex. 1007, [0049]; Ex. 2020, ¶129.



Matsushima recognized that “simply replacing the image in the center of the captured image 62A with the scaled down image 66 may result in an unnatural boundary between the two images,” and stated that “correction data is generated to correct the image in the peripheral regions 68 based on the image data in the peripheral region 68 (shaded region) of the scaled down image 66 and the image data in the peripheral region 68 of the captured image 62A.” Ex. 1007, [0050]-[0051] (emphasis added). The “correction data” is used so that “the boundary between the captured image 62A and the scaled down image 66 can be kept from becoming unnatural.” *Id.*, [0057]; Ex. 2020, ¶130. Matsushima’s “correction data” is represented by the “correction curve” illustrated in Figure 5 of the reference, which functions to “blend” the areas of overlap. Ex. 2020, ¶130.

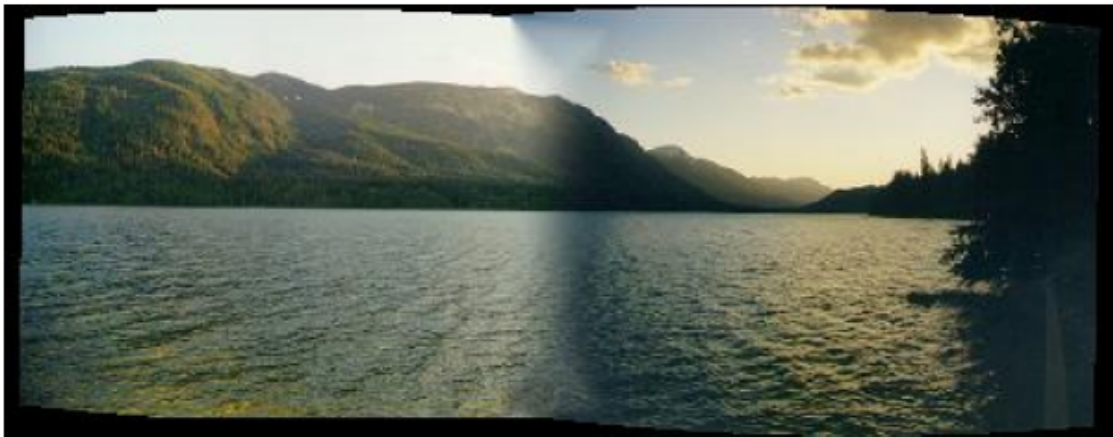
Matsushima does not state that its techniques were useful for synthesizing images with different exposures. This is not surprising, because synthesizing images with different exposures in a manner that resulted in a natural boundary was a known problem that Matsushima did not even attempt to address. Given the depth of work relating to synthesizing images with different exposures in a manner that resulted in a natural boundary (explained next), it strains credulity that Matsushima would have addressed and solved this problem without referring to it anywhere in Matsushima’s actual disclosure. Ex. 2020, ¶131.

As explained in one paper from the time (authored by researchers at Harvard

and Microsoft), synthesizing images with different exposures in a manner that resulted in a natural boundary was a known problem:

When capturing images to create mosaics, automatic cameras often change their exposure settings. Even if the images are blended in the areas of overlap, if the exposure difference between images is too high, it will give the panorama a creased look around the edges of the overlap. Feathering [10] the effect of the blend into the rest of the image will help remove creases, but the exposure change will still be too abrupt to appear natural. (Figure 7) Uyttendaele, Matthew, Ashley Eden, and Richard Skeliski. “Eliminating ghosting and exposure artifacts in image mosaics.” *Proceedings of the 2001 IEEE Computer Society Conference on Computer Vision and Pattern Recognition. CVPR 2001*. Vol. 2. IEEE, 2001. Ex. 2012, 4 (emphasis added).

The unnatural boundary after synthesis of the images with different exposures is illustrated in Figure 7(A) of the paper (reproduced below):



(A)

Id., 6. Figure 7(A) (above) shows a two image mosaic where two images with different exposures have been blended and feathered. *Id.*, 4, 6. The boundary between the two images is highly noticeable and far from a “natural” boundary. This is precisely the case between images 62A and 66 called for in Matsushima. *Id.*, 6

(referring to “the sharp transition between images in the center of the mosaic”); Ex. 2020, ¶134.

The paper discussed two methods for potentially ameliorating the unnatural boundary shown in Figure 7(A), neither of which resulted in a natural boundary. Ex. 2020, ¶135. One method, referred to as a “block based exposure adjustment,” resulted in the image shown in Figure 7(B) of the paper (reproduced below):



(B)

After “block based exposure adjustment,” the boundary between the two images is still highly noticeable and far from “natural” boundary between images 62A and 66 called for in Matsushima. *Id.*

The other method for potentially ameliorating the unnatural boundary method involved the application of an “exposure compensation algorithm” and resulted in the image shown in Figure 7(C) of the paper (reproduced below):



(C)

While somewhat improved, the boundary between the two images is still noticeable and far from the “natural” boundary between images called for in Matsushima. Ex. 2020, ¶136.

Thus, in addition to deviating from the actual text of Matsushima, Petitioner’s reading of Matsushima is inconsistent with the state of the art, which recognized that achieving a natural boundary⁶ between images with different exposures was

⁶ Avoiding an unnatural boundary between image seams was central to Matsushima, which, like Yu, was directed to images like those captured with film that would be pleasing to the eye. Ex. 2020, ¶137, note 6. By contrast, the ‘180 Patent was directed to “visual imaging tasks including search, detection, recognition and tracking” associated with “active vision systems of autonomous or semi-autonomous host systems” ranging from “robots, unmanned vehicles, self-navigating cars, automatic assembly and product inspection systems ... smart weapons and missile defense systems.” Ex. 1001, 3:32-34 and 3:64-4:9. While high resolution images are required for these machine vision applications, there is no requirement that the images be pleasing to the eye. Ex. 2020, ¶137, note 6.

problematic. For these additional reasons, the Petitioner has failed to demonstrate that Matsushima expressly or inherently discloses independent control of the integration time of each channel. Ex. 2020, ¶137.

Respectfully, the Board’s assertion that “a person of ordinary skill in the art at the time of the invention would have possessed the skill and ability to address any unnatural boundary concerns” in a composite image synthesized from images with different exposures, “particularly because Matsushima discloses a technique for generating and using correction data to prevent any unnatural boundary,” is incorrect and unsupported by any evidence. ID, 22 (emphasis added). More specifically, Matsushima did not disclose a technique for generating and using correction data to prevent any unnatural boundary. Ex. 2020, ¶138. Rather, Matsushima taught only how to correct an unnatural boundary that resulted from combining images of different resolutions, not how to correct an unnatural boundary that resulted from combining images taken with different exposures. *Id.* Synthesizing images with different exposures in a manner that resulted in a natural boundary was a known problem that Matsushima did not even purport to solve. *Id.*; Ex. 2012. A POSITA would have understood that application of Matsushima’s techniques would not have corrected the unnatural boundary that would have been introduced by the synthesis of images with different exposures. Ex. 2020, ¶138.

B. It Would Not Have Been Obvious To Combine Matsushima With Yu As Proposed In The Petition

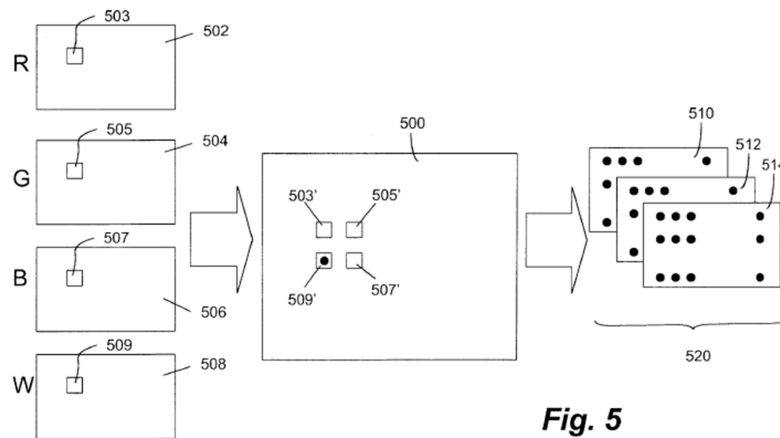
The Petition argues in the alternative that it would have been obvious to apply Yu's independent integration time control to Matsushima in order to increase the dynamic range of Matsushima. Petition, 32. As explained below, a POSITA would not have been motivated to combine the references for that purpose.

1. Yu's Pixel Technique For Increasing Dynamic Range Is Not Compatible With The Images Of Different Fields Of View Stitched Together In Matsushima

A POSITA would have recognized that Yu's technique for increasing dynamic range was not compatible with the images of different fields of view captured and stitched together by Matsushima.

a) Yu's Technique For Increasing Dynamic Range

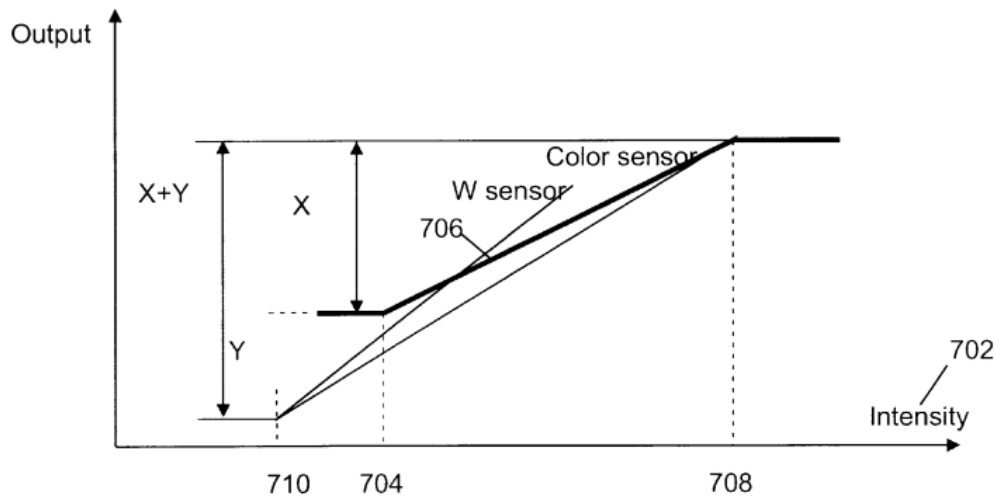
Turning first to Yu's technique for increasing dynamic range, Figure 5 of Yu illustrates "a virtual color image 500 formed by combining four intensity images 502, 504, 506 and 508." Ex. 1005, 7:47-50. In the disclosed example, images 502, 504, 506 correspond to color images captured by sensors 302, 304, 306, while image 508 corresponds to a black and white image captured by sensor 308. *Id.*, 7:50-52, 8:6-11 and 9:4-6.



Yu explains that while the pixels in images 502, 504, 506 and 508 may be “very closed positioned” they “are not in registration, which means that four respective pixels at the same coordinates in images 502, 504, 506 and 508 ”do not correspond to the same spatial point in a scene.” *Id.*, 7:66-8:5. Yu therefore applies a registration process wherein each pixel in color images 502, 504, 506 are spatially aligned (or registered) with a corresponding pixel in black and white image 508. *Id.*, 8:6-58; Ex. 2020, ¶142.

Following registration of the pixels in the images, Yu discloses a process where a pixel in the black and white intensity image 508 is used to increase the dynamic range of one or more spatially aligned pixels in color images 502, 504 and 506. *Id.*, 9:4-6; Ex. 2020, ¶143. Yu explains that, unlike sensors 302, 304, 306 which are each coated with a color filter, the black and white sensor 308 is not coated with any color filters which gives sensor 308 a larger dynamic range than that of sensors 302, 304 and 306. Ex. 1005, 9:19-23; Ex. 2020,

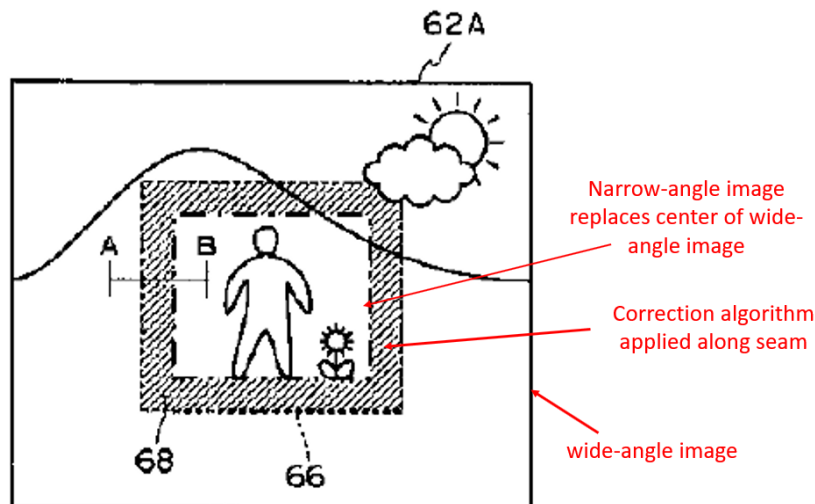
¶143. Yu depicts this difference in dynamic range in Figure 7 (below):



As shown above, one of the color sensors has a dynamic range of “X” while the black and white sensor has a dynamic range of “Y.” Ex. 1005, 9:19-23. Yu’s approach for expanding the dynamic range of a given color pixel is simply to add any “extra dynamic range Y level” sensed by the black and white sensor to “what the color sensor cannot sense.” *Id.*, 9:29-40; Ex. 2020, ¶144. Therefore, Yu’s process for expanding the dynamic range in any given area of an image is dependent upon there being a plurality of spatially aligned pixels (captured by different sensors) in the area of interest. Without such spatially aligned pixels, Yu would not be able to increase the dynamic range of one image (e.g., a color image) by adding the “extra dynamic range Y level” sensed by the black and white sensor to “what the color sensor cannot sense.” Ex. 1005, 9:29-40; Ex. 2020, ¶144.

b) Yu's Technique For Increasing Dynamic Range Is Incompatible With The Different Images Captured And Stitched Together In Matsushima

Matsushima's technique for image synthesis stands in contrast to Yu's technique where a plurality of *spatially aligned pixels captured by different sensors* are used to expand the dynamic range. In Matsushima, the region in the center of the wide-angle image 62A is simply replaced by a scaled-down version of narrow-angle image 62B, and then correction algorithm (that has nothing to do with increasing dynamic range) is applied in a narrow region on the seam where the images come together. Ex. 1007, [0049]-[0059]; Ex. 2020, ¶145.



Completely lacking from Matsushima's techniques are *spatially aligned pixels captured by different sensors*, as needed to increase dynamic range in Yu. Ex. 2020, ¶146. Rather, in Matsushima, only pixels captured for narrow-angle image 62B are positioned in the center of the composite image, and only pixels captured

for the wide-angle image 62A surround the center region with the scaled-down version of the narrow-angle image. As a result, there is no region in Matsushima's composite image where spatially aligned pixels captured by different sensors even exist. Since the application of Yu's dynamic range extension technique is predicated on the existence of spatially aligned pixels captured from different sensors, there is no way of applying Yu's technique for extending dynamic range to the images with different fields of view captured and stitched together by Matsushima. *Id.*

In short, a POSITA would not have been motivated to apply Yu's independent integration time control to Matsushima in order to increase the dynamic range of Matsushima because the references cannot be combined to achieve this result. Ex. 2020, ¶147. The Petition ignores this problem and instead offers only conclusory allegations that Matsushima-Yu would have been a combination of prior art elements "according to known methods" because "Matsushima-Yu would have involved routine knowledge well within the skill of a POSITA." Petition, 33-34. However, other than these conclusory assertions, the Petition offers no explanation how a POSITA could have applied Yu's technique to Matsushima in order to increase the dynamic range when Yu's dynamic range extension technique is predicated on the existence of spatially aligned pixels captured from different sensors, which simply do not exist in Matsushima. Ex. 2020, ¶147. Thus, in addition to failing to carry its burden that a POSITA would have been motivated to combine

Matsushima and Yu, the Petition fails to demonstrate that a POSITA would have had a reasonable expectation of success in doing so.

2. A POSITA Would Not Have Been Motivated To Combine Yu And Matsushima As Alleged Because Doing So Would Have Destroyed The Intended Purpose Of Matsushima

The stated purpose of Matsushima was to prevent any unnatural boundary in a synthesized image. Ex. 1007, [0004]-[0007] (“[Problem to Be Solved by the Invention]. However, the conventional technology experiences a problem in which the boundary between an image taken with a wide-angle lens and an image taken with a telephoto lens is unnatural, causing a deterioration in image quality. ... It is an object of the present invention to solve these problems by providing a digital camera that can prevent unnatural boundary regions ...”) (emphasis added). For the reasons explained in Section X(A)(2), *supra*, if images 62A, 62B have different exposures, an unnatural boundary will be introduced between the peripheral region of Matsushima’s composite image formed from the wide-angle image taken at one exposure and the scaled-down version of narrow-angle image taken at another exposure. Ex. 2020, ¶148; Ex. 2012, 7. Introduction of such an unnatural boundary into Matsushima would defeat the primary purpose of Matsushima, which is to prevent unnatural boundaries. Even where references are combinable, obviousness fails if the proposed modification “renders the device inoperable for its intended purpose” or changes its “principle of operation.” *DePuy Spine, Inc. v. Medtronic*

Sofamor Danek, Inc., 567 F.3d 1314, 1326 (Fed. Cir. 2009); *In re Gordon*, 733 F.2d 900, 902 (Fed. Cir. 1984). For this additional reason, the obviousness arguments in Ground 1 fail.

In the Institution Decision, the Board did not agree that a synthesized image that may have unnatural boundaries would have discouraged a person of ordinary skill in the art from combining the teachings of Matsushima and Yu, given Petitioner's assertion of the advantages of Matsushima's synthesized image having increased overall dynamic range and improved sharpness of scene objects compared to the input images. ID, 22. The Board appeared to weigh the supposed benefits of the combination asserted in the Petition against the disadvantages of an unnatural boundary, and found that the alleged benefits of the combination outweighed the disadvantages of introducing an unnatural boundary into Matsushima's composite image. Respectfully, the Petition failed to introduce any evidence whatsoever that, from the perspective of a POSITA, the alleged benefits of the combination outweighed the disadvantages of introducing an unnatural boundary into Matsushima's composite image and thus, there is no evidence of record that could support such a finding. To be clear, from the perspective of a POSITA, the disadvantages of introducing an unnatural boundary into Matsushima would have far outweighed the alleged benefits of the combination, as the proposed combination would have eviscerated the explicitly stated purpose of Matsushima by introducing

into Matsushima the very thing the reference sought to prevent -- namely, an unnatural boundary. Ex. 2020, ¶149.

For these further reasons, Ground 1 fails to carry its burden.

IX. GROUND 2 FAILS TO RENDER DEPENDENT CLAIMS 28 AND 30 UNPATENTABLE

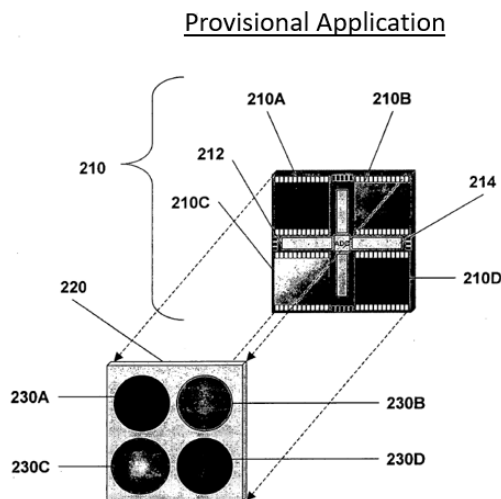
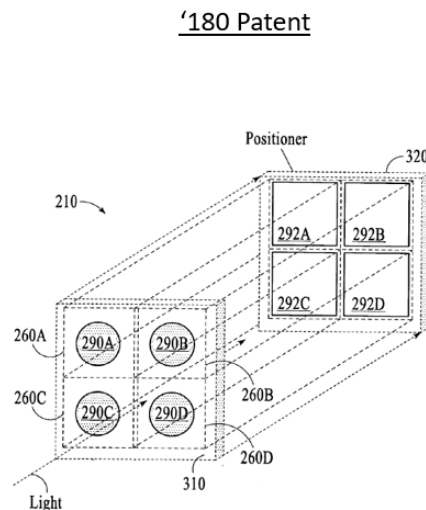
As set forth in Sections VIII-X, *supra*, Ground 1 fails to carry its burden with respect to independent claim 22. In Ground 2, the mappings for dependent claims 28 and 30 are deficient because they rely on the same flawed mapping of independent claim 22 to Matsushima-Yu in Ground 1.

X. GROUND 3 FAILS TO RENDER CLAIMS 22-23, 28 AND 30 UNPATENTABLE

A. Ground 3 Fails Because Labaziewicz Is Not Prior Art

Ground 3 alleges that claims 22-23, 28 and 30 are obvious over Choi, Labaziewicz and Yu. Ground 3 fails because Labaziewicz (Ex. 1010) is not prior art. Labaziewicz was filed February 18, 2005, which is after the filing date on August 25, 2004 of U.S. Provisional Application No. 60/604854 (the “Provisional Application”) (Ex. 1047). The ‘180 Patent claims priority to the Provisional Application. The Petition’s arguments that the Challenged Claims are not supported by the Provisional Application lack merit.

Set forth below is a diagram depicting aspects of Figure 3 of the Provisional Application (left side) (Ex. 1047, 22) and aspects of Figure 4 of the ‘180 Patent.



The Provisional Application disclosed that “[p]referred embodiments include three of more arrays of photodetectors, wherein the signal processing circuitry processes the signals from each array and then combines the signals from all of the arrays to produce a composite image.” Ex. 1047, 4-5 (emphasis added). In connection with Figure 3 (depicted in part on the left above), the Provisional Application stated that the device shown includes multiple “arrays (210A - 210 D)” and “lenses 230A-D” and that the lenses will “differ from one another in size and shape.” *Id.*, 7-8 (emphasis added). The Provisional Application also explained that the depth of the mounting hole (in the camera frame) “may be different for each lens and is a result of the specific focal length for the particular lens tailored for each array.” *Id.*, 12 (emphasis added). The Provisional Application went on to explain that the “invention allows for exposure control to occur for each array and targeted band of wavelengths differently” and that there may be “different integration times

for each array enhancing both dynamic range as well as color specificity.” *Id.*, 10 (emphasis added).

The Petition argues that “no written description exists” in the Provisional Application for “providing multiple channels with different FOVs.” Petition, 4. That assertion is false. The Provisional Application discloses multiple “arrays (210A - 210 D)” and multiple “lenses 230A-D.” Each pairing between one of these arrays with its corresponding lens is a channel, and thus the Provisional Application clearly discloses multiple channels. In addition, the Provisional Application discloses that the lenses will “differ from one another in size and shape” and that the depth of the mounting hole (in the camera frame) “may be different for each lens and is a result of the specific focal length for the particular lens tailored for each array.” *Id.*, 7-8, 12 (emphasis added). The Provisional Application thus disclosed that each channel could have a lens with a different focal length. Focal length is directly related to field of view in that, as the focal length increases, the field of view narrows, and as focal length decreases, the field of view widens. Ex. 2020, ¶153. Thus, by disclosing that each channel could have a lens with a different focal length, the Provisional Application inherently disclosed multiple channels with different fields of view. *Id.*

Next, the Petition argues that “no written description exists” in the Provisional Application for “configuring multiple optics components relative to multiple sensors respectively to form these multiple channels.” Petition, 4. That assertion is also

incorrect. The Provisional Application discloses multiple “arrays (210A - 210 D)” (each of which is a sensor) and multiple “lenses 230A-D.” Each pairing between one of these arrays and its corresponding lens is a channel. Thus, the Provisional Application clearly discloses “multiple optics components relative to multiple sensors respectively to form multiple channels.” Ex. 2020, ¶154. The Petition argues incorrectly that the Provisional Application discloses only “a single sensor” because the Provisional Application refers to arrays (210A - 210 D) collectively as a sensor. This argument is specious, because under any reasonable definition of sensor, each array (210A - 210 D) also comprises a sensor. *Id.* The disclosure in the Provisional Application that the “invention allows for exposure control to occur for each array and targeted band of wavelengths differently,” underscores the fact that each array (210A - 210 D) also comprises a sensor. Ex. 1047, 10 (emphasis added); Ex. 2020, ¶154.

Finally, the Petition argues that the Provisional Application does not provide support for “combining data captured with the channels with different FOVs.” Petition, 5. Again, that assertion is incorrect. As explained above, the Provisional Application disclosed each channel could have a lens with a different focal length, (which inherently discloses multiple channels with different fields of view) and signal processing circuitry that “processes the signals from each array and then combines the signals from all of the arrays to produce a composite image.” Ex. 1047,

4-57-8 and 12; Ex. 2020, ¶155. Thus, the Provisional Application provides clear support for combining data captured with the channels with different FOVs.

For the above reasons, the Petition has failed to demonstrate that the Challenged Claims lack support in the Provisional Application. As a result, Ground 3 fails to demonstrate Labaziewicz (Ex. 1010) is prior art.

B. Ground 3 Fails Because Yu Fails To Disclose Controlling Simultaneous Data Acquisition “During A Frame”

With respect to independent claim 22, Ground 3 relies on Yu for the limitation reciting “*independently* controlling simultaneous data acquisition with each of the first and second channels *during a frame*.” Pet., 84-85. As explained in Section IX(F)(2), *supra*, Yu fails to meet this limitation. Ex. 2020, ¶156. The mappings for dependent claims 23, 28, and 30 in Ground 3 fail because they are dependent upon the mapping for claim 22, which is deficient.

XI. CONCLUSION

Petitioner has not met its burden to demonstrate that the Challenged Claims are unpatentable.

Respectfully submitted,

Dated: October 17, 2025

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CERTIFICATE OF COMPLIANCE WITH WORD COUNT

Pursuant to 37 C.F.R. § 42.24(d), I certify that this Response complies with the type-volume limits of 37 C.F.R. § 42.24(b)(1) because it contains 13,949 words, excluding the parts of this Patent Owner's Response that are exempted by 37 C.F.R. § 42.24(a), according to the word processing system used to prepare this Patent Owner's Response.

Respectfully submitted,

Dated: October 17, 2025

By: /Daniel H. Golub/
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CERTIFICATE OF SERVICE,

The undersigned certifies that pursuant to 37 C.F.R. § 42.6(e), a copy of the foregoing **PATENT OWNER'S RESPONSE** was served via email (as consented to by counsel) on October 17, 2025 to lead and backup counsel of record for Petitioner as follows:

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