

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. IPR2025-00222
U.S. Patent No 9,232,158

PATENT OWNER'S RESPONSE

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PATENT OWNER'S EXHIBIT LIST

EX2001	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.)
EX2002	Docket from District Court Litigation, <i>Intellectual Ventures II LLC v. Tesla, Inc.</i> , C.A. 1:24-cv-00884-ADA (W.D. Tex.)
EX2003	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.)
EX2004	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.)
EX2005	Declaration of Dr. Eli Saber
EX2006	Resume of Dr. Eli Saber
EX2007	U.S. Patent Publ. 2005/0128509 (Tokkonen)
EX2008	U.S. Patent No. 7,123,298 (Schroeder)
EX2009	U.S. Patent Publ. 2004/0155175 (McNulty)
EX2010	Patent Owner Preliminary Response in IPR2022-01338, Paper #7.
EX2011	Mrinal Kr. Mandal, <i>Multimedia Signal And Systems</i> , Springer, 2003, 3rd Edition (December 31, 2002), ISBN10-1402072703.
EX2012	Yong Rui, Thomas S. Huang, and Sharad Mehrotra. "Constructing table-of-content for videos." <i>Multimedia systems</i> 7 (1999): 359-368.
EX2013	Boreczky, John S., and Lawrence A. Rowe. "Comparison of video shot boundary detection techniques." <i>Journal of Electronic Imaging</i> 5.2 (1996): 122-128.
EX2014	Yong Rui, Thomas S. Huang, and Sharad Mehrotra. "Exploring video structure beyond the shots." <i>Proceedings. IEEE International Conference on Multimedia Computing and Systems (Cat. No. 98TB100241)</i> . IEEE, 1998.
EX2015	U.S. Patent No. 8,108,890, assigned to Apple.
EX2016	Uyttendaele, Matthew, Ashley Eden, and Richard Szeliski. "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.
EX2017	Declaration of Dr. Eli Saber

I. INTRODUCTION

Petitioner has not shown any challenged claim unpatentable. The ‘158 Patent solves the real-world problem of scenes with widely varying illumination by independent, per-sensor focal-plane control of “integration time,” expressly defined by the inventors as “the time the image sensor collects and integrates signal from the scene,” implemented at the sensor by a charge-integration switch (focal-plane shutter). EX1001, 3:65–4:6; 4:46–56. Read with that definition, claim 1 requires a processor that controls an integration time of each sensor/channel—i.e., per-sensor independence, not one common setting. EX1001, 4:38–45; 5:3–18; 7:36–39. Moreover, the ‘158 Patent expressly defines “integration time control” as recited in claim 1 as “focal plane shutter control,” meaning that the “integration time control” is applied at the focal plane of the image. *Id.*, 4:45–48. Finally, as part of its express definition of “integration time control,” the ‘158 Patent specifies that “integration time control” is performed “by controlling a switch (e.g., charge integration switch) coupled or connected to the sensor or a photo-detection mechanism of a sensor” which regulates the time the image sensor collects and integrates light. *Id.*, 4:38–50. The Petition fails to demonstrate that these requirements are met by the relied on references.

Ground 1 (Matsushima). Matsushima meters one imaging Exposure Value (EV), chooses the aperture and the shutter speed (singular), and then controls “the CCD 18A and CCD 18B charge accumulation time ... to reach the determined shutter speed.” EX1007, ¶¶0034–0035. Matsushima drives both paths identically rather than employing the independent per-sensor integration-time control required by the ‘158 Patent. EX1007, ¶¶0023–0024, 0027. Petitioner’s attempted insertion of “respectively” into ¶0034 of Matsushima is unsupported by any evidence and entitled to little weight. 37 C.F.R. § 42.65(a). Matsushima teaches a common-value regime (one EV → one shutter) applied to both CCDs, not per-sensor independent integration time control.

Ground 2 (Yu + Miyazaki). Neither Yu nor Miyazaki expressly or inherently disclose “integration time control” applied at “*focal plane* shutter control” “*by controlling a switch* (e.g., charge integration switch) *coupled or connected to the sensor or a photo-detection mechanism of a sensor*” which regulates the time the image sensor collects and integrates light. Moreover, the Petition’s proposal for incorporating Miyazaki’s exposure control into Yu would not have been appealing to a POSITA. Miyazaki uses a combined mechanical shutter *and* electronic shutter system for exposure control. Implementing Miyazaki’s combined mechanical shutter and electronic shutter as to achieve independent “integration time control” for each of Yu’s “channels” would not have been feasible or desirable. As a practical

matter, it would not have been feasible or desirable to have four separate and distinct mechanical shutters, each of which required independent control, within an integrated system. Given the number of required moving parts, and the timing requirements for actuating those moving parts, petitioner has offered no evidence that such a design could have been implemented, even if a POSITA would have wanted to do so (to be clear, petitioner has also provided no evidence that a POSITA would have wanted to do so.)

II. THE SPECIFICATION OF THE ‘158 PATENT

A. Background of the ‘158 Patent

The Background of the ‘158 Patent discusses the problem of capturing a scene with “*highly varying illumination*,” and the need for sensors with an “*intrascene dynamic range*” over 4,000:1 to capture such scenes. From the ‘158 Patent:

... Examples of high dynamic range scenes include an indoor room with a window view of the outdoors, an outdoor scene with mixed shadows and bright sunshine, and evening or night scenes combining artificial lighting and shadows. In a typical charge coupled device (CCD) or CMOS active pixel sensor (APS), the available dynamic range is in a range of 1,000:1 to about 4,000:1. Unfortunately, many outdoor and indoor *scenes with highly varying illumination* have a dynamic range significantly greater than 4,000:1. Image sensors with *intrascene dynamic range* significantly greater than 4,000:1 are required to meet many imaging requirements. EX1001, 1:45-56 (emphasis added).

The Background of the ‘158 Patent went on to discuss existing techniques for increasing “[t]he dynamic range of an image sensor ... by using multiple exposure

times and/or integration times.” *Id.*, 1:57-2:1. In explaining the shortcomings of one of these existing techniques, the Background of the ‘158 Patent explained that the technique suffered from “temporal aliasing” when attempting to capture motion in the scene. From the ‘158 Patent:

... U.S. Pat. Nos. 4,647,975, 5,168,532, and 5,671,013 disclose the use of a selection rule to combine information from the most suitable of the multiple images. The merged pixel information or value is then multiplied by a suitable factor that corrects for the respective exposure times. This method however exhibits undesirable temporal aliasing if the scene or camera is moving because the two or more images having different exposure times are captured using the same image sensor and thus are not captured concurrently. *Id.*, 1:58-2:5 (emphasis added).

After discussing existing techniques, the ‘158 Patent concluded that, “[d]espite improvements in solid-state image sensor and digital camera technology, the light signal or brightness range of scenes often exceeds the dynamic range of the sensor.” *Id.*, 2:6-8 (emphasis added).

The Background of the ‘158 Patent concluded by discussing the light characteristics associated with scenes, and the requirement of an intrascene dynamic range of approximately 10,000:1 to capture scenes with highly varying illumination.

From the ‘158 Patent:

Typical scenes imaged by digital cameras have light levels that span a range including low light (1-100 lux), moderate light (100-1000 lux), and bright light (1000-1,000,000 lux) under outdoor conditions. ... To cover a single scene that might involve indoor lighting (100 lux) and outdoor lighting (100,000 lux), the required intrascene dynamic range is approximately 10,000:1, corresponding to 80 dB (14-bits). This

exceeds the dynamic range of a single image sensor using a single integration time (typically 3,100:1 corresponding to 70 dB (12-bits)). EX1001, 2:28-40 (emphasis added).

B. Overview of the ‘158 Patent

As noted in the Background, the ‘158 Patent is directed to expanding the dynamic range of a camera for capturing “scenes with highly varying illumination.” *Id.*, 1:52-53 (emphasis added). In contrast to prior techniques, which suffered from temporal aliasing when attempting to capture motion in such a scene, the techniques disclosed in the ‘158 Patent minimized such temporal aliasing. From the ‘158 Patent:

... Image capture by the camera is performed using the multiple camera channels, and each camera channel is controlled during a frame under an independent integration time. The integration time for each channel can be automatically controlled and/or controlled in response to a user input. A wide range of integration times are available for use in an embodiment. The images obtained in each channel under the different integration times are obtained simultaneously or nearly simultaneously, so undesirable temporal aliasing from moving scenes or camera motion is minimized. *Id.*, 3:47-57 (emphasis added).

Thus, in order to address the shortcomings of prior art techniques, the ‘158 Patent disclosed a camera with an integration time controller for independently controlling the integration time of each camera channel in a scene. *Id.*, 5:3-15. Significantly, the ‘158 Patent expressly defined “integration time” in the context of such a scene. EX2017, ¶38. From the ‘158 Patent:

... Conventional digital cameras may have a maximum photo-signal storage capacity that limits the dynamic range of the particular system. The photo-signal charge is stored on a capacitor within the pixel area.

The charge handling capacity is limited by the maximum voltage swing in the integrated circuitry and the storage capacitance within the pixel. The amount of integrated photo-charge is directly related to the time the image sensor collects and integrates signal *from the scene*. This is known as integration time. *Id.*, 3:65-4:6 (emphasis added).

Thus, the invention of the ‘158 Patent expands the “*intrascene*” dynamic range limitations of conventional cameras through the use of multiple *independent camera channels*. EX2017, ¶39. As stated in the ‘158 Patent:

The digital camera subsystem 210, also referred to herein as the “DCS” 210, *includes one or more camera channels (e.g., four camera channels 260A-260D) and replaces (and/or fulfills one, some or all of the roles fulfilled by) the lens assembly 110*, the color filter 112 and the image sensor 116 of the digital camera 100 described above. EX1001, 6:54-59. (emphasis added).

These independent camera channels, including independent control of the integration time of each channel, are featured prominently at the beginning of the Detailed Description as part of the overview of the disclosed embodiments. In this regard, the ‘158 Patent states:

Digital camera systems and methods are described below that provide an expanded effective single-frame dynamic exposure range. The digital camera systems and methods, collectively referred to herein as digital camera systems, generally include two or more camera channels. *Each channel includes an optics component and an image sensor* having an active area including multiple picture elements (pixels).

* * *

The digital cameras described herein overcome this dynamic range limitation through the use of multiple camera channels, including multiple optics and image sensors on a single integrated circuit (IC) or semiconductor Substrate. *The multiple camera channels* are configured

to image the same field of view *simultaneously*, and *each operates independently* ...

* * *

A digital camera according to an embodiment includes multiple (e.g., two or more) closely spaced image sensor camera channels integrated on or in a common semiconductor substrate. Each sensor camera channel has its own optics, photo-detection and readout mechanism that includes a plurality of picture elements (pixels) with independent signal integration time control ... EX1001, 3:39-45; 4:18-24; and 5:12-15 (emphasis added).

Figure 3 (reproduced below, with annotations) illustrates an example of independent camera channels 260A-260D according to the claimed invention. As illustrated in Figure 3, each one of the camera channels 260A-260D includes respective independent optics (Reference Numeral 290A-D – in red box) and a respective independent sensor portion (Reference Numerals 292A-D - in green box). EX1001, 7:17-39; EX2017, ¶41.

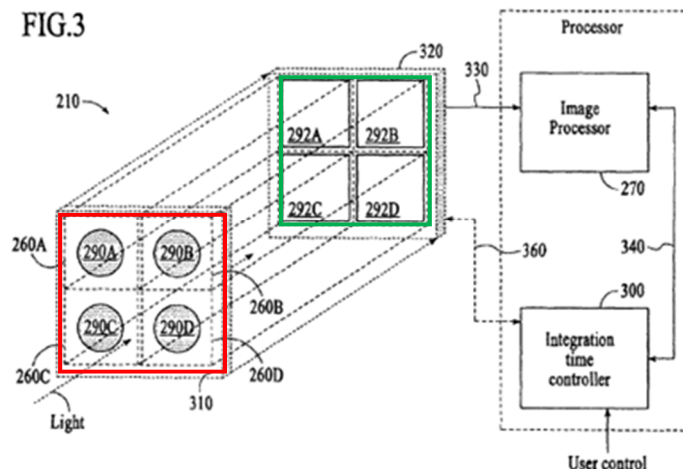


Figure 3 further illustrates a processor that includes an integration time controller (Reference Numeral 300) for independently controlling the integration time of each camera channel. EX2017, ¶42. As explained in the patent:

... The camera systems include a processing component coupled to the channels. The processing component is configured to separately and simultaneously control an integration time of each channel. The integration time of at least one channel is controlled relative to the integration time of at least one other channel so that an image formed by combining data of a frame received simultaneously from the channels has a relatively large dynamic range.

A digital camera according to an embodiment includes multiple (e.g., two or more) closely spaced image sensor camera channels integrated on or in a common semiconductor substrate. Each sensor camera channel has its own optics, photo-detection and readout mechanism that includes a plurality of picture elements (pixels) with independent signal integration time control. *Id.*, 5:3-18 (emphasis added).

See also, *id.*, 7:36-39 (“[e]ach camera channel has a selectable integration, and the integration time setting between channels is selected to cover a range of incident light level onto the digital camera”); *id.*, 8:32-38 (“The digital camera subsystem 210 further includes ... an integration time controller portion 300 (referred to as controller 300). The controller is a component of the variable integration time that provides integration time control for each of the camera channels.”) (emphasis added).

Accordingly, in the claimed invention, incident light independently passes through the optics specific to each channel and is received by a corresponding independently controlled sensor in the respective channel. EX2017, ¶43.

C. “Exposure Control” And “Integration Time Control” As Described In The ‘158 Patent

While the ‘158 Patent expressly defined “integration time” in the context of a *scene*, e.g., with varying illumination, the ‘158 Patent associated “exposure control” with the taking of *photographs*. EX2017, ¶44. The express definition of “integration time” and the description of exposure control from the ‘158 Patent are contrasted below:

“Exposure Control” (Photographs)	“Integration Time Control” (Scenes)
“Exposure is the total amount of light allowed to fall on a sensor during the process of taking a <i>photograph</i>. <u>Exposure control</u> is control of the total <u>amount of light incident on a sensor</u> during the process of taking a <i>photograph</i>.” EX1001, 4:37-40 (emphasis added).	... The amount of integrated photo-charge is directly related to the time the image sensor collects and integrates signal <u>from the scene</u>. <u>This is known as integration time</u>. EX1001, 3:65-4:6 (emphasis added). <u>In contrast to exposure control</u>, which is used by conventional digital cameras to manage dynamic range, the digital camera systems of an embodiment use <u>integration time control to control the time the electrical signal is integrated on a charge storage device (capacitance) within a sensor (pixel)</u>, as described herein. Integration time control, also referred to as “focal plane shutter” control, controls <u>the time the electrical signal is integrated or accumulated by controlling a switch (e.g., charge integration switch) coupled or connected to the sensor</u> or a photo-detection mechanism of a sensor. EX1001, 4:41-51 (emphasis added).

The specification of the ‘158 Patent thus differentiates between controlling light captured during the process of taking a *photograph* - and “integration time control” which the ‘158 Patent defines as the time the image sensor collects and integrates signal from a *scene*. EX2017, ¶45.

III. 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.

A. “an integration time of each sensor” (claim 1), “an integration time of each channel” (claim 9), and “an integration time for each of a plurality of channels”(claim 15)

As the Federal Circuit has explained:

When a patentee explicitly defines a claim term in the patent specification, the patentee’s definition controls. *See, Phillips v. AWH Corp.*, 415 F.3d 1303, 1321 (Fed. Cir. 2005) (en banc) (“[T]he specification’ acts as a dictionary when it expressly defines terms used in the claims” (quoting *Vitronics Corp. v. Conceptronic, Inc.*, 90 F.3d 1576, 1582 (Fed. Cir. 1996)); *id.* at 1316 (“[O]ur cases recognize that the specification may reveal a special definition given to a claim term by the patentee that differs from the meaning it would otherwise possess. In such cases, the inventor’s lexicography governs.”); see also *Honeywell Int’l, Inc. v. Universal Avionics Sys. Corp.*, 493 F.3d 1358, 1361 (Fed. Cir. 2007) (“When a patentee defines a claim term, the patentee’s definition governs, even if it is contrary to the conventional meaning of the term.”); *3M Innovative Props. Co. v. Avery Dennison Corp.*, 350 F.3d 1365, 1374 (Fed. Cir. 2003) (“Because 3M expressly acted as its own lexicographer by providing a definition of embossed in the specification, the definition in the specification controls the meaning of embossed, regardless of any potential conflict with the term’s ordinary meaning as reflected in technical dictionaries.”). Here, Martek explicitly defined the term “animal” in the ‘244 patent: “The term ‘animal’ means any organism belonging to the kingdom Animalia.” ‘244 Patent col.5 ll.11-12. That definition controls. Thus, because it is undisputed that humans are members of the kingdom Animalia, it was error for the district court to limit the claim term

“animal” to exclude humans. *Martek Biosciences Corp. v. Nutrinova*, 570 F.3d 1363, 1380 (Fed. Cir. 2009)(emphasis added).

The ‘158 Patent expressly defines “integration time” as follows:

... The amount of integrated photo-charge is directly related to the time the image sensor collects and integrates signal from the scene. **This is known as integration time.** EX1001, 4:3-7 (emphasis added).

Given this express definition, the term “integration time” as used in claims 1, 9 and 15 of the ‘158 Patent means “the time interval during which the image sensor collects and integrates signal from the scene.”

B. “a processing component configured to control an integration time of each sensor” (claim 1), “the processing component is configured to determine an integration time of each channel” (claim 9), and “identifying an integration time for each of a plurality of channels” (claim 15)

The specification expressly teaches that “[t]he processor ... provides integration time control for each of the camera channels.” EX1001, 8:33-37. The ‘158 Patent explains that by providing the integration times to each camera channel, the processor is able to “separately and simultaneously control an integration time of each channel ... so that an image formed by combining data of a frame received simultaneously from the channels has a relatively large dynamic range.” EX1001, 5:5-11; *see also* 5:15-18 (“[e]ach sensor camera channel has its own optics, photo-detection and readout mechanism that includes a plurality of picture elements (pixels) with independent signal integration time control”).

In IPR2022-00710 (the Toyota IPR), the Board interpreted the “processing component” of Claim 1 as follows:

... Consistent with this interpretation, claim 1 also recites “a processing component configured to control an integration time of *each* sensor,” which similarly distinguishes the processing component’s configuration as being able to control the integration time of an individual sensor distinct from the other sensor(s) in the group.

The specification is in accord with this interpretation. For example, the specification states,

The digital cameras described herein overcome this dynamic range limitation through the use of multiple camera channels, including multiple optics and image sensors on a single integrated circuit (IC) or semiconductor Substrate. The multiple camera channels are configured to image the same field of view simultaneously, and each operates independently under a different integration time.

And the specification states,

Each channel includes an optics component and an image sensor having an active area including multiple picture elements (pixels). Each sensor is controlled under or with an independent signal integration time . . .

Toyota Motor Corp. v. Intellectual Ventures II LLC, IPR2022-00710, Paper 13, at 12-13 (October 26, 2022) (emphasis added; citations omitted).

Thus, as the Board found in the Toyota IPR, the recitation in claim 1 that a processing component is configured to “control an integration time of *each* sensor,” requires that the processing component’s configuration function to “control the

integration time of an individual sensor distinct from the other sensor(s) in the group.” Thus, claim 1, as well as claims 9 and 15 (which include substantially similar limitations), require *independent control of the integration time* of *each* sensor.

C. “a processing component configured to control an integration time of each sensor” (claim 1)

Having expressly defined “integration time,” the ‘158 Patent expressly defines “integration time control.” From the ‘158 Patent:

In contrast to exposure control, which is used by conventional digital cameras to manage dynamic range, the digital camera systems of an embodiment use *integration time control* to control *the time the electrical signal is integrated on a charge storage device (capacitance) within a sensor (pixel)*, as described herein. *Integration time control, also referred to as “focal plane shutter” control, controls the time the electrical signal is integrated or accumulated by controlling a switch (e.g., charge integration switch) coupled or connected to the sensor or a photo-detection mechanism of a sensor.* For example, the charge integration switch is placed in a state to allow charge to accumulate within the sensor for a period of time approximately equal to the integration time corresponding to that sensor; *upon completion of the integration period, the switch is placed in a state to transfer the accumulated charge* as a photo-signal to a processing component. *Id.*, 4:41-63 (emphasis added).

In defining “integration time control,” the ‘158 Patent specifies two requirements.

First, the ‘158 Patent specifies that “integration time control” is “*focal plane* shutter control.” This means that “integration time control” is applied *at* the focal plane of the image. In the context of the claims of the ‘158 Patent, the “focal plane”

corresponds to the plane at which light passing through the optics components contacts an image sensor. By way of example, a mechanical shutter at the entrance of a camera that is spaced apart from the image sensor does not apply focal plane shutter control, because the mechanical shutter is not at the focal plane.

Second, the ‘158 Patent specifies that “integration time control” is performed “by controlling a switch (e.g., charge integration switch) coupled or connected to the sensor or a photo-detection mechanism of a sensor” which regulates the time the image sensor collects and integrates light. As Dr. Saber explains:

... integration time control” as used in the ‘158 Patent is in contrast to off-sensor timing signals (e.g. frame, line, transfer, correlated-double-sampling, or A/D clocks) as those signals can coordinate operation or retrieval, but they do not define when the pixel is integrating photocharge and they do not open or close the charge-integration path at the sensor. Instead, “integration time control” in the ‘158 Patent begins when an integration switch permits charge to accumulate and ends when that switch closes. That is why the specification ties “integration time control” to focal-plane shutter control at the pixel and treats it as distinct from upstream exposure heuristics or downstream readout sequencing.

EX2017, ¶96

IV. MATERIALS RELIED ON IN THE PETITION

A. Matsushima (EX1007)

Matsushima discloses a dual-path digital camera that acquires a wide-angle image and a telephoto image using two optical/sensor chains—lenses/apertures 17A/17B with CCD sensors 18A/18B—under the control of CPU 30 and a timing generator (TG) 28. In the exposure (AE) routine, integration circuits 60A/60B

determine “the subject luminance (imaging EV value)” and CPU 30 then determines “the aperture value and [the] shutter speed”; the system controls “the CCD 18A and CCD 18B charge accumulation time ... to reach the determined shutter speed.” (EX1007, ¶¶0034–0035). Matsushima states that each CCD “has a so-called electronic shutter function,” and that TG 28 “provides appropriate timing signals” to both CCD drive circuits, the CDS circuits, and the A/D converters; “each circuit is driven synchronously by timing signals applied from the [TG] 28.” (EX1007, ¶¶0024, 0027). Figure 1 depicts the block architecture (CPU 30, TG 28, drive circuits 20A/20B, CDS 22A/22B, A/D 24A/24B), and Matsushima’s AE description cites the integration of R, G, and B signals in a single frame to compute the imaging EV used to set the single shutter value. (EX1007, ¶¶0021–0029, 0034).

For image synthesis, the telephoto image 62B is scaled to produce image 66, which is then inserted into the center of the wide-angle image 62A; to avoid a visible seam, “correction data is generated” from peripheral regions and used to smooth the boundary. (EX1007, ¶¶0049–0051, 0057; Figs. 4A, 4B, 5). In the Petition’s mapping, these disclosures are relied upon to meet: (i) the multi-sensor optics/device limitations; (ii) “configured to control an integration time of each sensor”; and (iii) the “combine”/synthesis concepts. Patent Owner’s merits responses appear in Section V.

B. Yu (EX1005)

Yu describes a multi-sensor, multi-lens imaging system in which a digital image-processing block generates per-sensor “exposure time” control signals and coordinates acquisition, storage, and later registration/combination of individual sensor outputs. Yu’s digital image-processing circuitry generates four independent feedback signals (332), each derived from the corresponding histogram and used respectively to control a corresponding image sensor, including shortening that sensor’s exposure time where indicated. (EX1005, 6:59–65; 11:39–42; 12:10–19; 12:16–19; 13:23–37), The Petition cites these passages and Yu’s depiction of per-sensor image streams (e.g., Fig. 5) to address multi-sensor capture and “combining.” (EX1005, 7:50–53; 13:21–31). In Ground 2, Petitioner pairs Yu’s platform with separate references to supply “on-sensor” details

C. Miyazaki (EX1006)

Miyazaki describes a single-sensor digital still camera in which “shutter speed” is governed by coordinating a mechanical shutter with an electronic shutter available with the CCD image sensor, and later shows generation of an electronic-shutter control signal for that one CCD. The Petition relies on these disclosures for the proposition that “exposure time” can be realized as sensor-side (focal-plane) charge-integration control and to bridge Yu’s high-level exposure-time

outputs to on-sensor “integration time” control. Patent Owner’s responses appear in Section VI.

V. GROUND 1 FAILS BECAUSE MATSUSHIMA DOES NOT DISCLOSE INDEPENDENT INTEGRATION TIME CONTROL AND THE PETITION’S INTERPRETATION MISCHARACTERIZES THE REFERENCE

A. The claim language and intrinsic record require independent per-sensor control—more than “one value applied to both.”

The claims speak in the singular for each sensor and require per-sensor timing, not a group setting. The patent’s specification confirms that “integration time” is the sensor-level charge-accumulation interval controlled at the focal plane, not generic “exposure.” The ‘158 patent defines integration time as “the time the image sensor collects and integrates signal from the scene” and explains that integration time control “controls the time the electrical signal is integrated or accumulated by controlling a switch (e.g., charge integration switch) coupled or connected to the sensor,” expressly labeling this “focal plane shutter control.” (EX1001, 3:65–4:6; 4:46–56).

Read in context, “configured to control an integration time of each sensor” requires independent per-sensor (per-channel) focal-plane timing. The specification states that multiple channels “are configured to image the same field of view simultaneously, and each operates independently under a different integration time,” and later summarizes that the processing component “is configured to separately and

simultaneously control an integration time of each channel,” so that a single-frame composite has a relatively large dynamic range. (EX1001, 4:38–45; 5:3–18).

The specification operationalizes that independence. The processor “provides integration time control for each of the camera channels” and adjusts each channel’s integration time in real time (or near-real-time) based on the image analyzed “on a frame by frame basis,” before combining the channels to produce a composite single frame with a continuous monotonic response (see Fig. 7 reproduced below). (EX1001, 8:32–38; 7:36–39; see also 4:21–35 (single-frame fusion)).

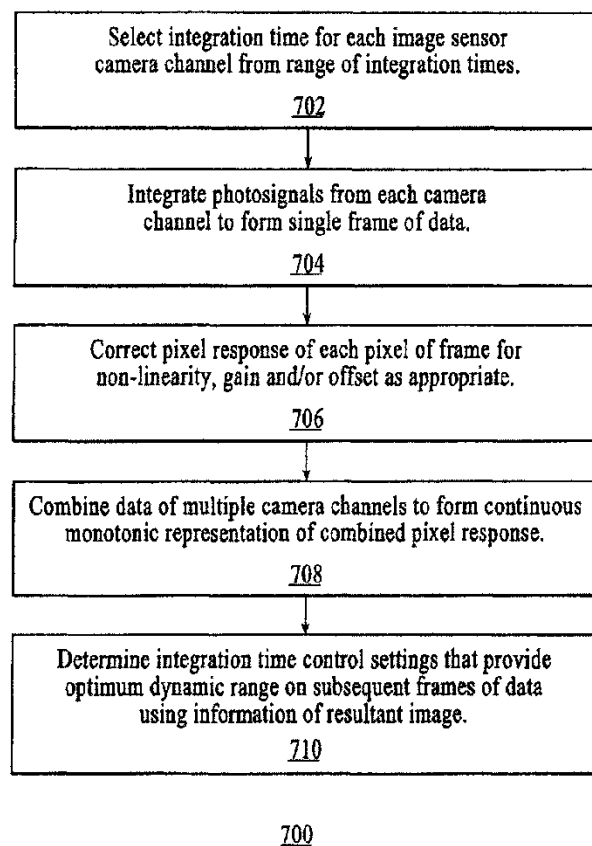


FIG.7

This intrinsic record stands in sharp contrast to Petitioner’s Ground 1 mapping, which treats Matsushima’s single AE solution (one imaging EV → the aperture value and the shutter speed) as if it were independent, per-sensor timing. Matsushima describes AE as metering “the imaging EV” (singular), then setting “the aperture value and shutter speed” (singular), and controlling “the CCD 18A and CCD 18B charge accumulation time ... to reach the determined shutter speed.” Nothing in Matsushima states that the two CCDs are given independent integration-time values, nor does it identify any in-frame divergence between CCD 18A and 18B. (EX1007, ¶¶[0034]–[0035]).

B. Matsushima’s AE loop derives a single EV, aperture, and shutter speed and applies that common shutter speed to both CCDs

Petitioner’s mapping treats Matsushima as if it disclosed independent per-sensor integration-time control. (see Petition, 20-21). The text says otherwise. Matsushima’s CPU 30 performs auto-exposure (AE) by (i) metering to determine “the subject luminance (imaging EV value)” (singular), (ii) determining “the aperture value and shutter speed” (singular), and then (iii) controlling “the CCD 18A and CCD 18B charge accumulation time ... to reach the determined shutter speed” (again singular). Matsushima further explains that the metering/AE may be repeated “several times to obtain the exact imaging EV,” after which the system sets “the final aperture value and shutter speed” and controls “the charge accumulation time” at

“the determined shutter speed.” Nothing in these passages ever identifies different integration-time values for CCD 18A versus CCD 18B; to the contrary, the consistent use of the singular for the metered value, aperture, and shutter speed—paired with the conjunctive reference to both CCDs—confirms a common shutter value applied synchronously to both sensors. (EX1007, ¶¶0034–0035).

Petitioner’s attempt to convert Matsushima’s common AE/shutter operation into per-sensor control by paraphrasing ¶0034 with the word “respectively” inserted is improper. The term does not appear in Matsushima; inserting it changes the reference’s meaning from “one AE value → one shutter speed applied to both CCDs” to “two AE values → two different shutter speeds.” Under 37 C.F.R. § 42.65(a), such unsupported expert gloss and mischaracterization is entitled to little or no weight.

Instead, as Dr. Saber explains:

From an imaging-systems standpoint, Matsushima’s block diagram shows a single control domain for both channels. The CPU 30 issues high-level exposure decisions and then drives a single timing signal generating circuit (TG) 28, which in turn feeds timing to both CCD drive circuits 20A and 20B, as well as the common front-end blocks (CDS and A/D). Matsushima is explicit: the TG “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 [TG] 28.” (EX1007, ¶0027.) EX2017, ¶108

Dr. Saber further details that:

At the sensor level, Matsushima explains that each CCD includes an electronic shutter (shutter gates and drains), and that the accumulation time (shutter speed) is controlled via shutter gate pulses. (EX1007, ¶¶0024.) In an architecture where one TG sources timing and both CCD drivers are clocked synchronously, the same shutter-gate pulse train (period/duty) is applied to both sensors, yielding the same integration window on both channels—precisely what you would expect for a common AE solution. (EX1007, ¶¶0027; EX1007, ¶¶0024.)

Conversely, to realize independent per-sensor integration-time control (what Petitioner reads in), the system would need per-channel timing with different shutter-pulse periods/duties (or distinct timing generators or de-synchronized clock domains) so that CCD 18A and CCD 18B integrate for different intervals within the same frame window. Matsushima does not disclose that. It discloses the opposite: one CPU, one TG, and synchronous drive of both CCD paths. (EX1007, ¶¶0027.) EX2017, ¶¶110-111

As a result, Ground 1 fails to show that Matsushima teaches the claim requirement that the processing component is “configured to control an integration time of each sensor.” A system that meters one EV, selects one shutter speed, and drives the charge-accumulation time of both CCDs to that determined shutter speed is common control—not the independent per-sensor focal-plane timing the claims and specification require. (EX1007, ¶¶0034–0035).

C. Petitioner’s “electronic shutter per sensor” citations do not show independent per-sensor control or in-frame control

Petitioner cites Matsushima’s remark that each CCD “has a so-called electronic shutter function” and that the timing generator (“TG 28”) “provides appropriate timing signals” to CCD drivers—then leaps to the conclusion that the CPU independently controls each sensor’s integration time during the frame. Matsushima does not say that. In the very passage Petitioner invokes, TG 28 is described as furnishing drive/readout timing for the CCD drive circuits—i.e., frame/line/transfer clocks that coordinate operation of the two image paths—not distinct per-sensor shutter-gate windows within the same frame. (EX1007, ¶¶0023–0024.) Nothing there identifies separate, per-sensor integration-time values or any in-frame actuation that sets different charge-accumulation intervals for CCD 18A versus CCD 18B.

That coordinated, synchronous role is entirely consistent with Matsushima’s auto-exposure loop, which meters one imaging EV, sets the aperture and the shutter speed (singular), and then controls “the CCD 18A and CCD 18B charge accumulation time ... to reach the determined shutter speed.” (EX1007, ¶¶0034–0035.) The repeated singulars— “the determined shutter speed,” “the charge accumulation time,” “the final aperture value and shutter speed”—are incompatible

with Petitioner's theory that the CPU sets different in-frame integration times on a per-sensor basis.

Technically, showing independent per-sensor integration-time control in a multi-sensor system requires disclosure of independent per-sensor shutter-gate generation (e.g., distinct gate/clear signals or gated sub-clocks to each individual sensor CCD array) that define non-identical charge-integration windows within the same frame period. It also requires the overall synchronization of the start of capture of one sensor with respect to the other (i.e. start capturing with sensor 1 and a few milliseconds later start the capturing with sensor 2, end the capturing of one sensor prior or posterior to the other sensor) given that they both would need to properly operate within an overall frame period. In addition, it also requires synchronizing the processing of the output of each individual sensor in order for the captured data to be processed and properly integrated into a single image within the timing period of a single frame. Matsushima discloses no such details.

As Dr. Saber explains:

... if Matsushima actually implemented different in-frame exposure windows per CCD, one would expect to see at least one of the following disclosed: (a) per-sensor shutter pins or explicitly separate shutter timing channels; (b) per-channel timing registers or parameters (e.g., separate exposure counts/widths) programmed by the CPU; (c) de-synchronized or multi-phase TG outputs with described phase/width differences per channel; (d) readout/processing coordination that names the in-frame offsets and explains how the ISP fuses

the two exposures inside the frame budget. Matsushima provides none of those specifics. It provides the opposite: a single TG supplying timing to both CCD drive circuits and a single AE solution whose one shutter value is applied to control both CCDs' accumulation time. (EX1007, ¶¶0023–0024; 0034–0035.) EX2017, ¶120

Accordingly, citing the existence of an “electronic shutter function” on a CCD does not establish how (or even that) the system actually drives different in-frame integration windows for the two sensors; it merely confirms that the device is capable of electronic shuttering in general. (EX1007, ¶¶0023–0024). Under 37 C.F.R. § 42.65(a), Petitioner's ipse dixit that TG 28's “timing signals” amount to independent in-frame shutter control for each sensor is entitled to little weight absent a pinpoint citation from the reference. There is no such citation here.

Therefore, Petitioner's TG-28/electronic-shutter citations show, at most, that Matsushima synchronizes drive and readout of two CCDs that are exposed at the same shutter value chosen by the AE loop—not that the CPU independently controls each sensor's integration time during the frame. On this record, Ground 1 fails to meet “configured to control an integration time of each sensor” and claim-2's “during a frame.” (EX1007, ¶¶0023–0024; 0034–0035).

D. There is no disclosure of independent per-sensor control; Matsushima’s AE sets and applies a single common value

Matsushima describes a pre-capture AE loop in which the camera meters to determine “the subject luminance (imaging EV value),” then determines “the aperture value and shutter speed,” and then exposes by controlling “the CCD 18A and CCD 18B charge accumulation time ... to reach the determined shutter speed.” (EX1007, ¶¶0034–0035.) Nothing in that sequence discloses that one CCD is assigned a different integration-time value than the other, or that the controller sets per-sensor timing independently. The consistent use of singular terms— “the imaging EV,” “the aperture value and [the] shutter speed,” “the determined shutter speed,” and “the charge accumulation time”—paired with the conjunctive reference to both CCDs, conveys a single AE result applied in common to CCD 18A and CCD 18B. (EX1007, ¶¶0034–0035).

Petitioner’s quotation of ¶0034 as if the integration circuits “determine the subject luminance ... for sensors 18A and 18B respectively” is not supported by the text; the word “respectively” does not appear in ¶0034. (EX1007, ¶0034.) As shown below, inserting “respectively” alters the reference from a common-value AE regime to a per-sensor regime the document does not describe.

<u>Petition, at 20</u>	<u>Actual Text Of [0034] Matsushima</u>
Ex.1007, [0034] (for automatic exposure (AE) adjustment, the integration circuits 60A and 60B determine the subject luminance (imaging EV value) for sensors (CCD) 18A and 18B <u>respectively</u> , and CPU 30 determines “aperture value and shutter speed...based on this imaging EV value.”) (emphasis added)	For AE control, <u>the</u> 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 <u>the</u> CCD 18A and CCD 18B <u>charge accumulation time</u> is controlled using an electronic shutter to reach the determined shutter speed.

Where the reference is silent, that gap cannot be filled by expert ipse dixit or word insertions; inherency requires that the limitation be necessarily present, not possibly present. See 37 C.F.R. § 42.65(a). Given Matsushima’s repeated singular phrasing applied to both CCDs, there is no necessary disclosure of different per-sensor integration-time values.

Accordingly, Matsushima teaches only a system that meters one EV, selects one shutter speed, and drives the charge-accumulation time of both CCDs to that determined shutter speed. That is common control, not the independent per-sensor integration-time control the claims and specification require. (EX1007, ¶¶0034–0035.)

E. Limitation 1.3 Requires Per-Sensor Focal-Plane Control, Not a Single Common Shutter Value

The Board asked why limitation 1.3 does not read on a system that “individually control[s] the integration time of CCDs sensor 18A and 18B to operate synchronously with a single, common shutter speed value.” Institution Decision, , at 22 (emphasis added). The Board answered this very question in the Toyota IPR, where the Board found as follows:

... In the context of the disputed phrase “wherein each optics component of the plurality of optics components is configured to pass light to a sensor of the plurality of sensors,” the article “a” before “sensor” is used to distinguish the configuration of “*each* optics component” as being able “to pass light to” to an individual sensor distinct from the other sensor(s) in the group. Ex. 1001, 25:34–36. Consistent with this interpretation, claim 1 also recites “a processing component configured to control an integration time of *each* sensor,” which similarly distinguishes the processing component’s configuration as being able to control the integration time of an individual sensor distinct from the other sensor(s) in the group. *Id.* at 25:38–39 (emphasis added).

The Specification is in accord with this interpretation. For example, the Specification states,

The digital cameras described herein overcome this dynamic range limitation through the use of multiple camera channels, including multiple optics and image sensors on a single integrated circuit (IC) or semiconductor substrate. The multiple camera channels are configured to image the same field of view simultaneously, and *each operates independently* under a different integration time.

Ex. 1001, 4:18–24 (emphasis added). And the Specification states,

Each channel includes an optics component and an image sensor having an active area including multiple picture elements (pixels). Each sensor is controlled under or with an independent signal integration time . . . [and] [t]he images obtained in each channel under the different integration times are obtained simultaneously or nearly simultaneously, so undesirable temporal aliasing from moving scenes or camera motion is minimized.

Id. at 3:43–57 (emphasis added).

EX1002, 12-13 (emphasis added). Thus, as the Board has already found, sensors controlled with “a single, common shutter speed value” are outside the scope of the Challenged Claims which must be “able to control the integration time of an individual sensor *distinct from the other sensor(s)* in the group” (emphasis added).

Read in view of the ‘158 Patent’s express definition of integration time as focal-plane control of a charge-integration time and the repeated teaching that the processor “separately and simultaneously control[s] an integration time of each channel,” the claim language requires per-sensor focal-plane control capable of being set differently. A design that always distributes the same shutter pulses to both sensors is not “configured to control [integration time] of each sensor” as claimed; it has only a single, common-mode control variable and thus lacks the per-sensor independence the intrinsic record demands. (EX1001, 3:65–4:6; 4:38–45; 4:46–56; 5:3–18; 7:36–39). Because the intrinsic record defines integration time as focal-plane (sensor-side) charge-integration control and teaches separate and

simultaneous control ‘of each channel,’ a design that can only ever apply one common shutter value to both sensors lacks the second, per-sensor degree of freedom that the claims require.” (EX1001, 3:65–4:6; 4:38–45; 4:46–56; 5:3–18; 7:36–39).

First, the ‘158 Patent defines integration time control as focal-plane (on-sensor) control of the charge-integration switch— “the time the image sensor collects and integrates signal from the scene,” implemented by “controlling a switch (e.g., charge integration switch) coupled or connected to the sensor,” expressly labeled “focal plane shutter control.” (EX1001, 3:65–4:6; 4:46–56). The specification then teaches that the multi-channel system images the same field of view simultaneously, where each channel operates independently under a different integration time, and the processor is “configured to separately and simultaneously control an integration time of each channel,” so the simultaneously captured channel data can be combined into a composite single frame with enlarged dynamic range. (EX1001, 4:38–45; 5:3–18; 7:36–39). In other words, “of each sensor” in context denotes per-sensor focal-plane timing that can be set differently within the same frame window to create the multi-exposure content that the patent then fuses in a single frame. A scheme that always drives the same shutter value to both sensors, even if the controller can address them “individually,” collapses those two degrees of freedom into one common-mode setting and does not provide the independent

per-sensor control the patent claims and teaches. (EX1001, 4:38–45; 5:3–18; 7:36–39; 8:32–38).

Second, a POSITA in 2004–2005 would understand that independent per-sensor integration-time control requires per-sensor control so one CCD’s charge-accumulation window can be varied without varying the other in the same frame period. A design that merely distributes the same shutter pulses to both sensors is not “configured to control [integration time] of each sensor” in the sense the patent uses that phrase; it has only a single controllable variable shared across sensors, not independent control over each. As Dr. Saber explains:

...that is exactly what Matsushima discloses: TG 28 “provides appropriate timing signals” and the drive circuits are operated synchronously, while the AE loop meters one imaging EV, sets the aperture and the shutter speed (singular), and then controls “the CCD 18A and CCD 18B charge accumulation time ... to reach the determined shutter speed.” Nothing there identifies distinct, in-frame shutter-gate windows per sensor. EX2017, ¶145.

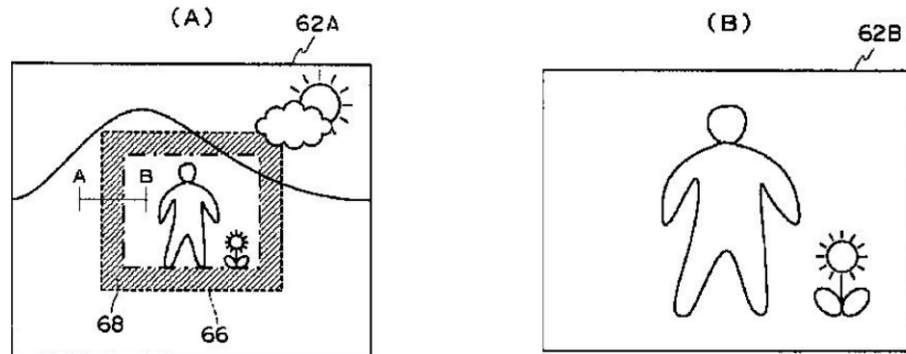
Applied here, limitation 1.3, read under *Phillips* and in light of the specification’s express teachings, requires a processing component configured to furnish independent focal-plane integration-time control for each sensor—i.e., the ability to set different in-frame integration windows that are then combined into a single-frame image. Operating the two CCDs synchronously at a single, common shutter value—as in Matsushima—does not satisfy that requirement.

F. 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. Matsushima explicitly describes a synthesis process aimed at achieving a natural boundary between combined images, a goal that the prior art recognized as particularly challenging when merging images with different exposures. EX2017, ¶132. More specifically, prior research, including studies on image mosaics, highlighted the difficulty of blending images with differing exposures without producing unnatural seams. *Id.* Thus, Petitioner's argument that images 62A and 62B in Matsushima have different exposure times (which the Petition equates with different integration times) is inconsistent with the teachings of the prior art as a whole, which recognized the challenge of achieving a natural boundary (as called for Matsushima) when synthesizing images with different exposures. *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.” EX1007, [0049]; EX2017, ¶133.

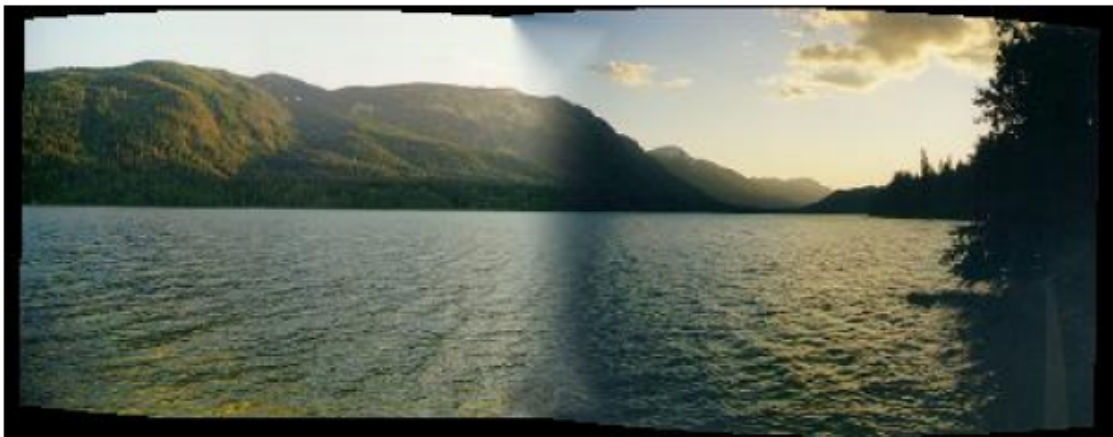


Matsushima recognized that “simply replacing the image in the center of the captured image 62A with the scaled down image 66 may result in an unnatural boundary between the two images,” and stated that “correction data is generated to correct the image in the peripheral regions 68 based on the image 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.” EX1007, [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]; EX2017, ¶134. 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. EX2017, ¶134.

Matsushima nowhere states or implies that its techniques were useful for synthesizing images with different exposures. EX2017, ¶135. This is not surprising, because synthesizing images with different exposures in a manner that resulted in a natural boundary was a known problem. *Id.* As explained in one paper from the time (authored by researchers at Harvard and Microsoft):

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 Szeliski. “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. EX2016, 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 a highly noticeable and far from a “natural” boundary between images 62A and 66 called for in Matsushima. *Id.*, 6 (referring to “the sharp transition between images in the center of the mosaic”). EX2017, ¶135.

The paper discussed two methods for potentially ameliorating the unnatural boundary shown in Figure 7(A), neither of which resulted in a natural boundary. EX2017, ¶136. 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 the “natural” boundary between images 62A and 66 called for in Matsushima. EX2017, ¶136.

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. EX2017, ¶137.

Thus, inserting an image (e.g., Matsushima’s high resolution image) captured with one illumination into another image (e.g., Matsushima’s low resolution image) captured with a different illumination would result in a mosaic with an unnatural boundary that could not have been corrected with boundary style algorithms. EX2017, ¶138. When viewed in light of the prior art as a whole -- which recognized the challenge of synthesizing images with different exposures in a manner that

resulted in the natural boundary called for by Matsushima -- the actual wording of Matsushima makes sense. More specifically, Matsushima's description of a single, common charge accumulation for both CCD 18A and CCD 18B would have resulted in images having the same exposure. *Id.* While Matsushima's blending of images with the same exposure may indeed have resulted in the natural boundary called for by the reference, there is no description in Matsushima or in the Petition itself of any techniques at the time that could have synthesized images with different exposures in a way that would have resulted in the natural boundary called for by Matsushima. *Id.* 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 boundary between images with different exposures was problematic. *Id.*

This state of the art renders Petitioner's reading of Matsushima implausible: had Matsushima intended different exposures for images 62A and 62B, it would have confronted—and addressed—the well-known problem of seam artifacts that arise when blending images of different exposures; instead, Matsushima's avoided this issue by using a single AE solution and peripheral blending, consistent with same-exposure inputs. (EX1007, ¶¶0034–0035; EX2016 at 4–6).

G. Matsushima’s wide/tele compositor is not the same-scene, single-frame fusion that the ‘158 Patent claims and teaches

The ‘158 Patent defines “integration time” with reference to the scene— “the time the image sensor collects and integrates signal from the scene”—and explains that integration-time control is exercised at the focal plane. (EX1001, 3:65–4:6; 4:46–56). Read in context, that definition is implemented in a multi-channel system imaging simultaneously, where each channel operates independently under a different integration time, and a processing component “separately and simultaneously control[s] an integration time of each channel,” after which the simultaneously captured channel data are combined into a composite single frame with a continuous monotonic response. (EX1001, 4:38–45; 5:3–18; 7:36–39). The intrinsic record thus ties “integration time ... from the scene” to co-registered, same-scene capture across channels within the same frame window, precisely to avoid temporal aliasing and to enable single-frame fusion.

Matsushima is a different paradigm. It is a wide/tele dual-path camera that meters once, sets a single shutter speed, and then spatially composites a telephoto inset into a wide-angle base image, applying peripheral-zone correction to smooth the seam. (EX1007, ¶¶0034–0035; ¶0027). The two paths do not view the same field of view; the tele path is a cropped, different-FOV view that is scaled and pasted into the wide image. Id. Nothing in Matsushima describes combining co-registered,

simultaneous channel data from the same scene to create a single-frame image with a continuous monotonic response as the ‘158 Patent requires. (EX1001, 4:38–45; 5:3–18; 7:36–39). On a proper “scene”-anchored reading of the “integration time” and “combine ... to provide an image” elements, Ground 1 fails for lack of same-scene multi-channel fusion.

Patent Owner respectfully maintains that “integration time” (as used in the claims) should be applied consistent with the specification’s same-scene architecture: multiple channels simultaneously imaging under different per-channel integration times whose outputs are then combined into one frame. (EX1001, 4:38–45; 5:3–18; 7:36–39). Matsushima’s tele-inset compositor—a different-FOV mosaic that requires boundary correction (EX1007, ¶0027)—does not meet that teaching. And while the Institution Decision deferred a final view on whether “scene” excludes still photographs, it did not endorse Petitioner’s mechanics or extend “scene” to embrace different-FOV spatial pasting. The Board’s interim posture, therefore, does not cure Ground 1’s substantive gap: Matsushima neither teaches same-scene multi-channel integration-time control nor the single-frame fusion that the ‘158 Patent claims and discloses.

H. Dependent claim 2 (“during a frame”): Ground 1 fails to identify any in-frame, per-sensor control event in Matsushima

Claim 2 further requires that “the processing component is further configured to control the integration time of each sensor during a frame.” Read in light of the specification, “during a frame” means control within the frame-capture window—i.e., actuating the focal-plane (charge-integration) switch that opens/closes the integration window for each sensor while that frame’s data are being collected, not merely choosing a value beforehand. The ‘158 Patent ties “integration time” to focal plane shutter control of a charge-integration switch (EX1001, 3:65–4:6; 4:46–56) and describes channels as, “each operat[ing] independently under a different integration time,” with the processor “separately and simultaneously control[ing] an integration time of each channel,” and then combining the single-frame data (EX1001, 4:38–45; 5:3–18; 7:36–39).

Under Ground 1, Petitioner relies on Matsushima’s auto-exposure sequence: meter → determine the imaging EV (singular) → compute the aperture and the shutter speed (singular) → expose by controlling “the CCD 18A and CCD 18B charge accumulation time ... to reach the determined shutter speed.” (EX1007, ¶¶0034–0035). Those passages describe pre-exposure selection of a single shutter value and a subsequent exposure at that value. They do not disclose (or inherently require) any in-frame control event in which the controller actuates different charge-

integration windows for 18A vs. 18B while the frame is being captured. *Id.* Accordingly, Matsushima’s AE is a pre-capture loop and no in-frame actuation is identified.

As Dr. Saber explains:

Petitioner’s fallback to the timing generator (TG-28) misreads the reference. Matsushima states that TG-28 “provides appropriate timing signals” to the CCD drive circuits and describes the two image paths as being driven synchronously—i.e., frame/line/transfer clocks used to coordinate operation and readout—not distinct per-sensor shutter-gate waveforms that define different integration windows within the same frame. (EX1007, ¶¶0023–0024.) Nothing in ¶¶0023–0024 or ¶¶0034–0035 identifies any actuation “during a frame” that sets per-sensor integration time, much less sets different in-frame windows across the two CCDs. A POSITA would understand that TG-28’s “timing signals” coordinate drive/readout, not per-sensor, in-frame shutter gating. EX2017, ¶149.

Accordingly, as Dr. Saber explains, a “POSITA would distinguish (i) timing used to sequence exposure/readout (line clocks, transfer pulses, synchronous drive) from (ii) timing that defines the charge-integration interval (the focal-plane shutter gate). The former is consistent with Matsushima’s TG-28 description (EX1007, ¶¶0023–0024); the latter is what claim 2 requires during the frame as to each sensor (EX1001, 3:65–4:6; 4:46–56).” EX2017, ¶150. Here, Petitioner points only to the former.

In fact, Matsushima repeatedly uses singular forms— “the imaging EV,” “the aperture value and the shutter speed,” “the determined shutter speed,” “the charge

accumulation time”—and applies them to both CCDs (EX1007, ¶¶0034–0035). That language is incompatible with the notion that, during the capture of a frame, one CCD is gated differently from the other by an independent controller action. Therefore, the singular AE terms underscore the absence of in-frame per-sensor control.

As a result, Claim 2 demands in-frame focal-plane control of the integration time of each sensor. Matsushima’s cited passages show only pre-capture AE selection of a single shutter value and synchronous drive/readout—not any in-frame, per-sensor actuation that sets (or varies) integration windows for 18A and 18B during the frame. On this record, Petitioner has not pinpointed an in-frame control event satisfying claim 2.

**I. Dependent claims 11 and 16 (relative, in-frame differences):
Petitioner fails to show that one channel/sensor operates under a
shorter integration time than another within the same frame**

Claims 11 and 16 add a concrete relative limitation— “the integration time of at least one channel is relatively shorter than ... at least one other channel” (claim 11) and “a first integration time ... is less than a second integration time” (claim 16). Read with the intrinsic record, these claims require independent, per-sensor focal-plane control that sets different integration-time windows across sensors within the frame to produce the multi-exposure content that is then combined into a single frame. See ‘158 Patent (EX1001, 4:38–45; 5:3–18; 7:36–39; 8:32–38) (channels

acquire images simultaneously, each operates independently under a different integration time, the processor “separately and simultaneously control[s] an integration time of each channel,” and combines the single-frame data).

Petitioner identifies no disclosure that one CCD in Matsushima runs shorter (or longer) than the other within a frame. To the contrary, Matsushima meters “the subject luminance (imaging EV value)” (singular), determines “the aperture value and shutter speed” (singular), and then controls “the CCD 18A and CCD 18B charge accumulation time ... to reach the determined shutter speed”—again singular. (EX1007, ¶¶0034–0035). That is a common-value regime, not the relative regime claims 11/16 require. Petitioner’s fallback to TG-28 “timing signals” does not help; Matsushima describes TG-28 as providing drive/readout timing and synchronous operation of the CCD drive circuits, not distinct, per-sensor shutter-gate windows within the same frame. (EX1007, ¶¶0023–0024). And Petitioner’s attempted insertion in ¶0034 of determining luminance “respectively” for 18A/18B is a textual error—the word does not appear in Matsushima—and Petitioner’s improper insertion cannot supply the missing difference between per-sensor integration times. (EX1007, ¶0034; 37 C.F.R. § 42.65(a)). Simply put, a single-value regime cannot satisfy a limitation that requires one channel’s integration time to be shorter than another’s. Accordingly, Ground 1 fails to meet the “relatively shorter” limitations of claims 11 and 16.

VI. GROUND 2: NEITHER YU NOR MIYAZAKI DISCLOSES INDEPENDENT CONTROL OF INTEGRATION TIME THAT IS APPLIED AT THE FOCAL-PLANE AND PERFORMED BY CONTROLLING A SWITCH COUPLED TO THE SENSOR THAT REGULATES THE TIME THAT THE IMAGE SENSOR COLLECTS AND INTEGRATES LIGHT

A. Yu Fails To Expressly Or Inherently Disclose Independent Control Of Integration Time Applied At The Focal Plane By Controlling A Switch That Regulates The Time That The Image Sensor Collects And Integrates Light

As explained in Section IV(C), the ‘158 Patent specifies that “integration time control” is “*focal plane* shutter control,” meaning that “integration time control” is applied at the focal plane of the image. In addition, the ‘158 Patent defines “integration time control” as being performed “*by controlling a switch* (e.g., charge integration switch) *coupled or connected to the sensor or a photo-detection mechanism of a sensor*” which regulates the time the image sensor collects and integrates light. In other words, “integration time control” in the ‘158 Patent begins when an integration switch permits charge to accumulate and ends when that switch closes or the charge is cleared.

Yu’s digital image-processing circuitry generates four independent feedback signals (332), each derived from the corresponding histogram and used respectively to control a corresponding image sensor, including shortening that sensor’s exposure time where indicated. (EX1005, 6:59–65; 11:39–42; 12:10–14; 12:16–19). Those passages do not expressly or inherently disclose “integration time control” applied

at “*focal plane* shutter control “by controlling a switch (e.g., charge integration switch) coupled or connected to the sensor or a photo-detection mechanism of a sensor, which regulates the time the image sensor collects and integrates light. In fact, the Petition concedes “Yu does not describe the implementation details.” Petition, 59-60.

From this sparse disclosure, Petitioner concludes that “controlling exposure time” inherently means “*controlling an integration time*” as described and claimed in the ‘158 Patent. However, as the Federal Circuit explains, the use of inherency, “a doctrine originally rooted in anticipation, must be carefully circumscribed in the context of obviousness” and “[t]he 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) (internal markings and citations omitted). The Court has “emphasized that the limitation at issue necessarily must be present in order to be inherently disclosed by the reference.” *Southwire Co. v. Cerro Wire LLC*, 870 F.3d 1306, 1310-11 (Fed. Cir. 2017) (internal citation omitted). Accordingly,”[a] party must...meet a high standard in order to rely on inherency to establish the existence of a claim limitation in the prior art in an obviousness analysis.” *Millennium Pharms., Inc. v. Sandoz, Inc.*, 862 F.3d 1356, 1367 (Fed. Cir. 2017). Therefore, obviousness cannot be established by the mere

fact that something may happen. Instead, to teach the high standard of inherency, the alleged feature must necessarily be present in the cited reference.

In the present case, the Petitioner has not met this high burden. As Dr. Saber explains:

In CCD/CMOS imagers there are two distinct layers of timing: (i) pixel-domain/focal-plane timing that opens and closes the charge-collection path (the “integration gate”), and (ii) driver timing—frame, line, and transfer clocks—that sequence when rows/columns are reset, transferred, sampled, and read out. Adjusting only the latter (frame/line/transfer clocks) can change when the charge is moved, but fails to control a pixel’s charge-integration switch.

For example, in an interline CCD, photocharge is accumulated under a photodiode and later moved through a transfer gate into a vertical shift register, then clocked out by horizontal clocks. If a controller simply shortens the frame transfer period or initiates vertical transfer earlier, the system can limit how long charge accumulates before transfer. But unless the controller actively gates the integration switch as a shutter, the pixel’s charge node was never opened/closed by a focal-plane shutter command.

EX2017, ¶¶90-91.

Accordingly, Yu’s generic disclosure of image processing circuitry that produces control signals, each controlling the exposure time of one of said four image sensors fails to expressly or inherently disclose how Yu’s exposure time is controlled.

B. Miyazaki's exposure is a mechanical plus electronic scheme. Importing it into Yu would bring both, and would therefore not be feasible.

Miyazaki sets “shutter speed ... by controlling the mechanical shutter and an electronic shutter available with the CCD image sensor.” It then details an electronic-shutter control signal for a single CCD. EX1006, 4:16–19 (“In the illustrated embodiment, the camera 10 controls a shutter speed, i.e., an exposure time at the time of the shot by controlling the mechanical shutter and an electronic shutter available for the CCD image sensor 14); 9:8-14 (“Specifically, the controller 38 delivers to the optics driver 34 a control signal for controlling the focal position of the lens and a control signal for controlling the duration of opening of the mechanical shutter. Also, the controller 38 feeds an electronic shutter control signal to the CCD driver 36 for controlling the duration of charge storage in the CCD image sensor 14). Miyazaki nowhere suggests dispensing with the mechanical shutter or running electronic-only. Instead, as Dr. Saber explains, “in Miyazaki the mechanical shutter defines a coarse/open interval, while the electronic shutter (on-sensor charge gating) can shorten or fine-tune.” EX2017, ¶176. Accordingly, Miyazaki presents the combination as the way the camera realizes the effective exposure duration for that one sensor.

Implementing Miyazaki's combined mechanical shutter and electronic shutter to achieve independent “integration time control” for each of Yu's “channels” would

not have been feasible or desirable. As a practical matter, it would not have been feasible or desirable to have four separate and distinct mechanical shutters, each of which required independent control, within an integrated system. Given the number of required moving parts and the timing requirements for actuating those moving parts, there is no evidence that such a design could have been implemented, even if a POSITA would have wanted to do so (to be clear, they would not.) Equipping Yu with multiple mechanical shutters would be a significant redesign. As Dr. Saber explains:

It would require added moving assemblies at each lens path, more size and power, vibration, shutter lag, wear, and tight synchronization across shutters. Neither Yu nor Miyazaki teaches those details. The Petition offers no timing budgets or control scheme and treats the change as routine, which it is not.
EX2017, ¶193

Yu does not disclose or need a mechanical shutter, and there is no evidence that importing four separate and distinct mechanical shutters into Yu would have improved the performance of Yu in any respect.

Petitioner then tries the opposite move. It keeps only Miyazaki's electronic portion and discards the mechanical half. That carve-out is explained only by impermissible hindsight. Miyazaki does not teach an electronic-only exposure system. Its point is coordinated mechanical and electronic shuttering for one CCD. EX1006, 4:16–19; 9:8–14. *KSR* requires a reason with rational underpinnings to

modify the prior art. The Petition offers a label rather than a reason. Even if one sets aside the mechanical shutter, the combination still lacks the multi-sensor mechanics that the claims require. Yu does not identify on-sensor electronic shutters. It does not disclose a charge-integration switch. It does not show gate or clear waveforms at the sensors. It does not show per-sensor shutter-gate generation or wiring that closes Yu's exposure loop onto each sensor's focal-plane switch. EX1005, 6:59–65; 12:16–19; 13:23–37. The annotated figures in the Petition merely label lines as electronic shutter control. That is a conclusion and not a disclosure. It is not accompanied by enablement-like detail on implementation, coordination, or tolerances across multiple sensors. 37 C.F.R. § 42.65(a).

As a result, Miyazaki teaches a two-part mechanical and electronic shutter stack for a single sensor. A person of ordinary skill, if they were even to combine these references, would import both into Yu. That would inject camera-level mechanics that Yu neither discloses nor needs and would defeat per-sensor independence. If Petitioner discards the mechanical part to avoid those consequences, the combination still fails. Yu lacks the on-sensor focal-plane control that the '158 Patent requires. Miyazaki does not scale that control to multiple sensors. Either path leaves Ground 2 without the claimed per-sensor integration-time control in a multi-sensor architecture.

The Petition also claims that the combination would “eliminate any mechanical shutter” from Yu. But Yu does not disclose a mechanical shutter in the first place; the mechanical-plus-electronic shutter regime is Miyazaki’s single-sensor design. (EX1005, 6:59–65; 12:16–19; 13:23–37; EX1006, 4:16–19; 9:8–14). Petitioner never explains why a POSITA would import Miyazaki’s single-sensor shutter scheme into Yu’s multi-sensor architecture merely to “eliminate” hardware not present in Yu, nor how that importation yields the per-sensor, in-frame focal-plane timing the claims require. Therefore, Petitioner’s motivation is internally inconsistent.

Finally, even if it were permissible to cherry-pick only the electronic portion of Miyazaki’s exposure system and put it into Yu (to be clear, it is not), Miyazaki’s generic disclosures relating to electronic exposure control still fail to meet the claim language. The ‘158 Patent specifies that “integration time control” requires “*focal plane shutter control*” performed “*by controlling a switch* (e.g., charge integration switch) *coupled or connected to the sensor or a photo-detection mechanism of a sensor*” which regulates the time the image sensor collects and integrates light. As explained above, there would have been multiple ways of accomplishing “exposure control” in Miyazaki including, e.g., (i) pixel-domain/focal-plane timing that opens and closes the charge-collection path (the “integration gate”), and (ii) driver timing—frame, line, and transfer clocks—that sequence when rows/columns are

reset, transferred, sampled, and read out. Miyazaki’s generic disclosure fails to expressly or inherently disclose the former, as required by claim 1 of the ‘158 Patent.

C. Missing enablement-like specifics for a multi-sensor, on-sensor-shutter system (Ground 2 fails on mechanics, not labels)

To meet the claims as Petitioner reads them—multiple sensors, each with an on-sensor electronic shutter governed by “integration time”—a POSITA would expect concrete, signal-level design features that neither Yu nor Miyazaki discloses. At a minimum, there must be per-sensor shutter-gate generation so that each imager receives its own focal-plane gating (distinct gate/clear waveforms or gated sub-clocks) rather than a single exposure-time number broadcast to all sensors. Yu never identifies such focal-plane gate paths; it says only that “Four independent feedback signals 332 are generated in [the] circuitry 330 and ... are used respectively to control each of image sensors 302–30,” and that it “generates all necessary controls signals” for per-sensor control circuits, without describing an electronic shutter, a charge-integration switch, or gate/clear timing at the sensors. (EX1005, 6:59–65; 11:39–42; 12:10–19; 12:16–19; 13:23–37). Miyazaki also fails to disclose per-sensor focal plane shutter control performed by gating a control switch.

As Dr. Saber explains:

... a workable multi-sensor architecture would also specify how cross-sensor timing is aligned and toleranced—e.g., jitter/skew budgets, gating waveforms, and sequencing—so that differently timed

integration windows can be coordinated across sensors without introducing artifacts or readout conflicts.
EX2017, ¶204

Neither Yu nor Miyazaki provides these timing specifications, and the Petition cites none. Yu's Figure 5 simply depicts per-sensor image streams in memory; it is not a disclosure of focal-plane shutter gating for the imagers. (EX1005, 7:50–53).

Equally absent is any closure of Yu's histogram-based exposure-time feedback loop onto a focal-plane switch at each sensor. To convert Yu's "exposure time" signals (332 to control circuits 342/344/346/348) into integration time as defined in the '158 Patent, Petitioner needed a disclosure that those control circuits actually drive an electronic shutter/charge-integration switch at the sensor. Yu never supplies that linkage; it does not mention electronic shutters, charge-integration switches, or reset/clear gating. (EX1005, 6:59–65; 12:16–19; 13:23–37). Miyazaki links an electronic-shutter control signal to a single CCD array only and does not provide any details of synchronization, independent data processing, and proper data integration into a single frame period (EX1006, 9:8–14). The Petition's annotated figures simply label lines as "controlling an electronic shutter on each sensor," which is an attorney/expert conclusion rather than a prior-art disclosure and should be discounted under 37 C.F.R. § 42.65(a).

These are not mere formalities; they are the mechanics that distinguish an exposure-time number from sensor-level charge-integration control. The '158 Patent

defines “integration time” as “the time the image sensor collects and integrates signal from the scene,” implemented by “controlling a switch (e.g., charge integration switch) ... focal plane shutter control.” (EX1001, 3:65–4:6; 4:46–56). Ground 2 never identifies, in Yu or in Miyazaki, the multi-sensor focal-plane architecture that would satisfy that definition for each sensor. Yu provides per-sensor exposure-time signals with no focal-plane gate implementation; Miyazaki provides an electronic shutter for one sensor only. (EX1005, 6:59–65; 12:16–19; 13:23–37; EX1006, 4:16–19; 9:8–14). On this record, the combination fails for lack of any disclosed—or even plausibly enabled—multi-sensor on-sensor-shutter design.

D. Even under the Board’s interim “scene” view, Ground 2 still fails

The Institution Decision expressly deferred Patent Owner’s “scene” narrowing, stating that “absent a more fully developed record, we do not agree that the term ‘scene,’ which is used to construe the claim term ‘integration time,’ excludes the time the image sensor collects and integrates signals for a photograph or still image.” (Institution Decision, 23). Even taking that interim view as a given, the Petition must still prove the mechanics the claims require: independent, per-sensor control of integration time at the sensor—i.e., focal-plane control of a charge-integration switch for each sensor. The ‘158 Patent defines “integration time” as “the time the image sensor collects and integrates signal from the scene” and explains that integration-time control “controls the time the electrical signal is integrated or

accumulated by controlling a switch (e.g., charge integration switch) ... also referred to as ‘focal plane shutter control.’” (EX1001, 3:65–4:6; 4:46–56).

On that record, Yu discloses only that the digital image processing circuitry produces “four control signals, each controlling the exposure time of one of said four image sensors,” and that the circuitry “generates all necessary controls signals,” but it never identifies an electronic shutter, a charge-integration switch, or gate/clear timing at the sensor. (EX1005, 6:59–65; 11:39–42; 12:10–19; 12:16–19; 13:23–37). By contrast, Miyazaki teaches controlling “shutter speed ... by controlling the mechanical shutter and an electronic shutter available with the CCD image sensor,” and later describes an electronic-shutter control signal—but all in a single-sensor still camera, not a multi-sensor system. (EX1006, 4:16–19; 9:8–14). Thus, even if “scene” encompasses still photography, the combination still lacks any disclosure that each of Yu’s sensors is controlled at the sensor by focal-plane shutter gating as the ‘158 Patent defines.

The Petition tries to bridge this gap with conclusory statements that “controlling exposure time” in Yu means “controlling an integration time” and with annotated figures that label lines as on-sensor shutter control. But Yu’s text remains agnostic about how exposure time is implemented (optically, mechanically, or electrically), and the cited passages do not identify focal-plane gate/clear signals at the sensors. (EX1005, 6:59–65; 12:16–19; 13:23–37). Under 37 C.F.R. § 42.65(a),

such ipse dixit should carry little weight, particularly when the claims—read with the specification—require on-sensor control via a charge-integration switch. (EX1001, 4:46–56).

As a result, the Board’s interim view of “scene” does not resolve the dispositive mechanical deficiency in Ground 2. Even accepting that “scene” includes still images, Petitioner still must show a prior-art disclosure (or enabled modification) in which each of Yu’s sensors is controlled at the focal plane with independent integration-time control consistent with the ‘158 Patent’s definition. Yu does not disclose on-sensor shutter gating; Miyazaki discloses it only for a single sensor. The combination therefore fails on the merits regardless of the “scene” construction.

E. Dependent claim 2 (“during a frame”)—Ground 2 fails because Yu does not disclose per-sensor, on-sensor control during the frame and Miyazaki is single-sensor

Claim 2 requires that “the processing component is further configured to control the integration time of each sensor during a frame.” Read with the specification, “integration time” is not a high-level exposure label; it is sensor-level, focal-plane control of a charge-integration switch— “the time the image sensor collects and integrates signal from the scene,” implemented by “controlling a switch (e.g., charge integration switch) ... also referred to as ‘focal plane shutter control.’” (EX1001, 3:65–4:6; 4:46–56.) The patent further teaches channels imaging the same

field of view simultaneously, each operating independently under a different integration time, with the processor separately and simultaneously controlling the integration time of each channel and combining the resulting single-frame data. (EX1001, 4:38–45; 5:3–18; 7:36–39). Against that intrinsic backdrop, Yu never identifies per-sensor, on-sensor actuation during the frame. Yu states only that the “Four independent feedback signals 332 are generated in [the] circuitry 330 and ... are used respectively to control each of image sensors 302–308” and that it “generates all necessary controls signals” delivered to per-sensor control circuits. (EX1005, 6:59–65; 11:39–42; 12:10–19; 12:16–19; 13:23–37). Those passages are agnostic to how “exposure time” is realized and do not disclose an electronic shutter, a charge-integration switch, or gate/clear timing at the sensor. Petitioner’s mapping of “during a frame” points to Yu’s per-sensor image streams (Fig. 5) rather than to a disclosure of focal-plane gating at each sensor while the frame is being captured. (EX1005, 7:50–53).

Miyazaki does not cure that omission. As Dr. Saber explains, it teaches a single-sensor digital still camera that controls shutter speed by controlling a mechanical shutter together with an electronic shutter available with the CCD image sensor and later describes an electronic-shutter control signal for that one CCD. (EX2017, ¶203). Nothing in Miyazaki coordinates electronic-shutter actuation across multiple sensors or connects Yu’s exposure-time feedback to per-sensor

focal-plane gates for more than one imager. Petitioner’s annotated figures and conclusory statements that Yu’s exposure-time control “is” integration-time control merely relabel the missing mechanics and should be given little weight under 37 C.F.R. § 42.65(a). On this record, Ground 2 identifies no disclosure—either in Yu alone or in Yu as modified by Miyazaki—of a processing component that controls the integration time of each sensor during a frame as the claims, and the ‘158 Patent’s focal-plane definition, require.

F. Dependent claims 11 and 16 (“relatively shorter”): Ground 2 does not show different integration times across channels

Claims 11 and 16 explicitly require an actual relative difference— “the integration time of at least one channel is relatively shorter than the integration time of at least one other channel.” Read with the intrinsic record, “integration time” is sensor-level, focal-plane charge-accumulation time, not a high-level exposure label. The specification teaches channels imaging the same field of view simultaneously, “each operates independently under a different integration time,” and a processor “separately and simultaneously” controlling the integration time of each channel to enable single-frame fusion. (EX1001, 4:38–45; 5:3–18; 7:36–39). Against that backdrop, Yu never discloses that one sensor’s integration time is set shorter than another’s. Yu states only that “Four independent feedback signals 332 are generated in [the] circuitry 330 and ... are used respectively to control each of image sensors

302–308” and that it “generates all necessary controls signals” to per-sensor control circuits. (EX1005, 6:59–65; 11:39–42; 12:10–19; 12:16–19; 13:23–37). Those passages are agnostic as to whether the commanded “exposure time” values are equal or different, and they do not identify focal-plane control of a charge-integration switch as the ‘158 Patent requires.

Miyazaki does not cure the deficiency because it is a single-sensor still-camera reference that controls “shutter speed ... by controlling the mechanical shutter and an electronic shutter available with the CCD image sensor,” and later describes an electronic-shutter control signal for that one CCD. (EX1006, 4:16–19; 9:8–14). A single-sensor teaching cannot establish a relative relationship between two channels’ integration times in a multi-sensor system. The combination therefore lacks any cited disclosure that, in Yu’s multi-sensor camera, at least one channel operates under a shorter integration time than another channel as claims 11 and 16 requires. Petitioner’s annotated figures that label lines as “electronic shutter” for each sensor are attorney conclusions, not prior-art disclosures showing different per-sensor integration-time values, and should be discounted under § 42.65(a). On this record, Ground 2 fails to meet the “relatively shorter” limitation of claims 11 and 16.

VII. CONCLUSION

Petitioner has not met its burden to prove any challenged claim unpatentable. Matsushima does not disclose independent per-sensor integration-time control (or the claim-2 “during a frame” requirement), and Petitioner’s Yu and Miyazaki combination supplies the missing multi-sensor, on-sensor mechanics by attorney assertion rather than prior-art disclosure. For these reasons, the Board should enter a Final Written Decision confirming the patentability of the Challenged Claims.

Respectfully submitted,

Dated: October 7, 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 12,856 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,

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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 7, 2025 to lead and backup counsel of record for Petitioner as follows:

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