

HAYNES BOONE

*TESLA, INC. V. INTELLECTUAL
VENTURES II LLC*

IPR2025-00222 (9,232,158)

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DEMONSTRATIVE EXHIBIT – NOT EVIDENCE

Claims 1 and 2, '158 Patent

1. An image capture device comprising:
a plurality of sensors;
a plurality of optics components, wherein each optics component of the plurality of optics components is configured to pass light to a sensor of the plurality of sensors;
and
a processing component configured to control an integration time of each sensor.
2. The device of claim 1, wherein the processing component is further configured to control the integration time of each sensor during a frame.

Ex. 1001, 25:32-42.

Claims 9 and 11, '158 Patent

9. A system comprising:

a plurality of channels, wherein each channel of the plurality of channels includes a sensor; and

a processing component coupled to the plurality of channels, wherein the processing component is configured to determine an integration time of each channel of the plurality of channels, wherein the processing component is configured to combine data from the plurality of channels received to provide an image.

11. The system of claim 9, wherein the integration time of at least one channel is relatively shorter than the integration time of at least one other channel.

Ex. 1001, 26:5-14, 18-20.

Claims 15 and 16, '158 Patent

15. A method comprising:

identifying an integration time for each of a plurality of channels of an image capture device, wherein the plurality of channels includes a plurality of sensors; capturing data with each of the plurality of sensors, wherein the data captured by each sensor is based at least in part on the integration time of the sensor; and generating an image by combining the data captured by each of the plurality of sensors.

16. The method of claim 15, wherein a first integration time of a first sensor is less than a second integration time of a second sensor.

Ex. 1001, 26:30-42.

Claims Challenged, Grounds Instituted

Claim(s) Challenged	35 U.S.C. § ¹	Reference(s)
1, 2, 5, 8, 9, 11, 13–16, 19	103(a)	Matsushima ²
1, 2, 4, 5, 8–11, 13, 14	103(a)	Yu ³ , Miyazaki ⁴

Inst. Dec. (Paper 10), 6, 24.

Issues:

- **Ground 1:** limitations [1.3], [9.2.2], [15.1]; claims 2, 11, and 16.
- **Ground 2:** motivation to combine, limitation [1.3], claims 2, 11.

Undisputed:

- **Ground 1:** limitations [1.0]-[1.2], [9.0]-[9.1], [9.2.1], [9.2.3], [15.0], [15.2]-[15.3], claims 5, 8, 9, 13, 14, 19.
- **Ground 2:** limitations [1.0]-[1.2], [9.0]-[9.1], [9.2.1], [9.2.3], claims 4, 5, 8-10, 13, 14.

Petition, 10-78; POR 18-58;
Reply 12-30; Sur-Reply, 11-25.

Discussion Roadmap

- Claim Construction:
 - “*integration time*” (claims 1, 2, 8-9, 11, 13-16) Slides 7-9
 - “*during a frame*” (claim 2) Slides 10-14
 - IV’s other extraneous requirements Slide 15
- Ground 1: Matsushima renders obvious claims 1-2, 5, 8-9, 11, 13-16 and 19. Slides 17-32
- Ground 2: Yu and Miyazaki render obvious claims 1-2, 4-5, 8-11, 13 and 14. Slides 34-49

Claim Construction - “*integration time*” (claims 1, 2, 8-9, 11, 13-16)

1. An image capture device comprising:
a plurality of sensors;
a plurality of optics components, wherein each optics component of the plurality of optics components is configured to pass light to a sensor of the plurality of sensors;
and
a processing component configured to control an integration time of each sensor.

Ex. 1001, 25:32-39.

Claim Construction - “*integration time*” (claims 1, 2, 8-9, 11, 13-16)

Petitioner’s Construction and Court’s Construction in GM Litigation	IV’s Proposed Construction
<i>“the time the image sensor collects and integrates signal from the scene ”</i>	<i>“the time <u>interval during which</u> the image sensor collects and integrates signal from the scene ”</i>

Petition, 8; (IV v. GM - WDTX) Ex. 1015, 49; Reply, 1-2.

POR, 12.

The District Court in the GM litigation construed “*integration time*” according to the ’158 patent’s express definition.

(IV v. GM - WDTX) Ex. 1015, 49; Petition, 8; Reply, 1-2.

The '158 patent expressly defines “integration time.”

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. A long integration

Ex. 1001, 4:3-7; Petition, 8; Reply, 1-2; (*IV v. GM* - WDTX) Ex. 1015, 48 (relying on explicit definition); POR, 12 (acknowledging explicit definition).

Claim Construction - “*during a frame*” (claim 2)

2. The device of claim 1, wherein the processing component is further configured to control the integration time of each sensor during a frame.

Ex. 1001, 25:40-42.

Claim Construction - “during a frame” (claim 2)

Petitioner's Construction	IV's Implicit Construction from POR	IV's Further Implicit Requirements from Sur-Reply
“during a period of time in which data for a single frame of an image is captured”	None in Claim Construction, Section III of POR, but IV implicitly construes as: “ within the frame-capture window itself—i.e., actuating the focal-plane (charge-integration) switch that opens/closes each sensor's integration window while that frame's data are being collected, <i>not merely choosing a value beforehand.</i> ”	Per IV's Sur-Reply, the phrase “during a frame” imposes: “a temporal constraint requiring control of the integration time for each [sic] during the frame-capture window (i.e., between the start and end of the window), rather than, e.g., simply defining the start and end of that window.” and requires: “in-frame actuation of the focal-plane (charge integration) gate that opens and closes each sensor's integration window <u>while that frame's data are being collected.</u> ”

Petition, 9-10; Reply, 11-12.

POR, 40.

Sur-Reply, 10-11.

IV's assertions of implicit requirements are not supported by the specification and should be rejected.

Reply, 11-12, 23; (Guidash Supp.) Ex. 1044, ¶¶27-28.



Petitioner's construction as *a period of time* is supported by the specification.

active area including multiple picture elements (pixels). Each sensor is controlled under or with an independent signal integration time as described in detail below. 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

Ex. 1001, 3:47-50;
Petition, 9-10.

times. The photo-signal from each camera channel is integrated **704** within a single frame of data, and the resultant photo-charge for each pixel is stored within that pixel. The

Ex. 1001, 11:28-29;
Petition, 9-10.

IV **did not offer a competing express construction** of “*during a frame*,” and its expert **confirmed in deposition** that no terms other than those listed in Section VII of his declaration were construed.

Reply, 11-12; POR, Section III (Claim Construction), 9-15; (Saber) Ex. 2017, Section VII (Claim Construction), ¶¶66-96; (Saber Depo) Ex. 1048, 25:4-7.

IV's strawmen are not relevant to Petitioner's construction

Instead, Petitioner's construction is consistent with the distinctions asserted by IV:

Petitioner's construction:
"during a period of time in which data for a single frame of an image is captured"

- **is not** merely choosing a value beforehand
- **is not** simply defining the start and end of that window

POR, 40.

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

Sur-Reply, 10-11.

The Reply treats claim 2 as a nullity by arguing that "during a frame" "defines a period of time" and "does not define specific technical implementations," and then insisting that Matsushima's shutter-gate "on/off" signal meets the claim language. Reply, 11–12; Reply, 24–25. However, in claim 2, the phrase "during a frame" imposes a temporal constraint requiring control of the integration time for each during the frame-capture window (i.e., between the start and end of the window), rather than, e.g., simply defining the start and end of that window.

IV's extraneous requirements

Claims	IV's Purported Requirement	Petitioner's Response
1, 9, 15	<i>independent</i> control of integration time of each sensor	Slides 21-23, 54-61
1, 9, 15	<i>different</i> integration time values	Slides 25-29, 49, 70
1, 2, 9, 15	actuation mechanics, switch/gate control of charge accumulation , focal plane control events or waveforms	Slides 31-32, 63-69

Claim Construction Summary

Claim Term	Correct Construction
<i>“integration time”</i> (claims 1, 2, 8-9, 11, 13-16)	“the time the image sensor collects and integrates signal from the scene”
<i>“during a frame”</i> (claim 2)	“during a period of time in which data for a single frame of an image is captured”
<i>“control an integration time of each sensor”</i> (claim 1)	ordinary meaning
<i>“determine an integration time of each channel”</i> (claim 9)	ordinary meaning
<i>“identifying an integration time for each of a plurality of channels”</i> (claim 15)	ordinary meaning

Petition, 8; (*IV v. GM* - WDTX) Ex. 1015, 49 (“integration time”); Reply, 1-2;
Petition, 9-10; Reply, 11-12;
(*IV v. GM* - WDTX) Ex. 1015, 108-109 (“processor component configured to control an integration time...”).

Discussion Roadmap

- Claim Construction Slides 7-15
- Ground 1: Matsushima renders obvious claims 1-2, 5, 8-9, 11, 13-16 and 19.
 - Matsushima renders obvious the “*integration time*” limitations [1.3], [9.2.2] and [15.1]. Slides 17-20
 - Matsushima renders those limitations obvious even with IV’s extraneous requirements Slides 21-27
 - Matsushima renders obvious “during a frame” (claim 2). Slides 29-32
- Ground 2: Yu and Miyazaki render obvious claims 1-2, 4-5, 8-11, 13 and 14. Slides 34-49

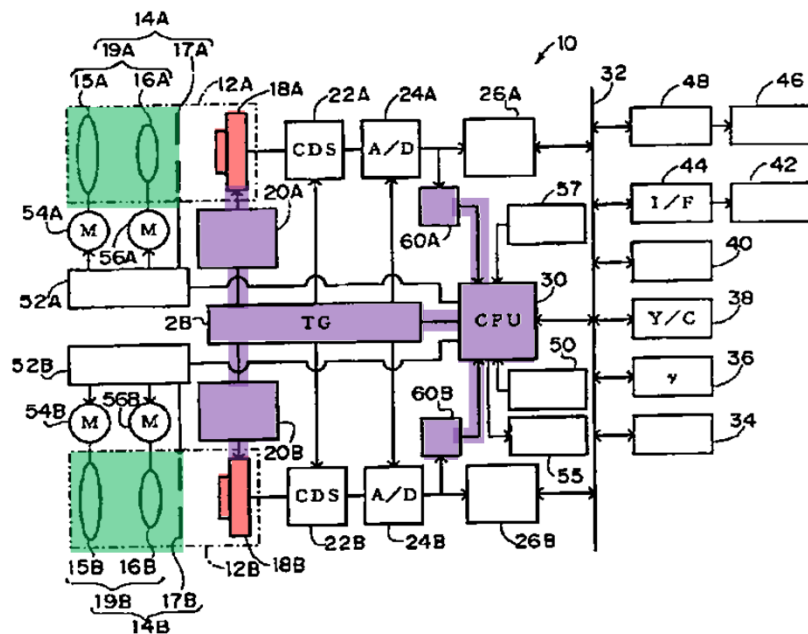
Matsushima

Digital camera includes two independent imaging systems:

- **optics components: imaging optics 14A and 4B**
- **sensors: CCD 18A and 18B**
- **processing component (including CPU 30)**

Petition, 14-21;
Reply, 12-23.

[FIG. 1]



[0017] FIG. 1 is a block diagram showing the configuration of a digital camera. This digital camera 10 has **two independent imaging systems** (a first imaging system 12A and a second imaging system 12B), and subject images are formed on the light-receiving surfaces of **CCD 18A and 18B** via **imaging optics 14A and 14B**, respectively.

(Matsushima) Ex. 1007, [0017];
Petition, 11-12, 14-15.

[0028] The **CPU 30** is the control unit that performs overall control of each circuit in the digital camera 10.

(Matsushima) Ex. 1007, [0028];
Petition, 20.

(Matsushima) Ex. 1007, FIG. 1, annotated; Petition, 16-19;
(Guidash) Ex. 1003, ¶¶ 86, 94.

Limitation [1.3]

1. An image capture device comprising:
a plurality of sensors;
a plurality of optics components, wherein each optics component of the plurality of optics components is configured to pass light to a sensor of the plurality of sensors;
and
a processing component configured to control an integration time of each sensor.

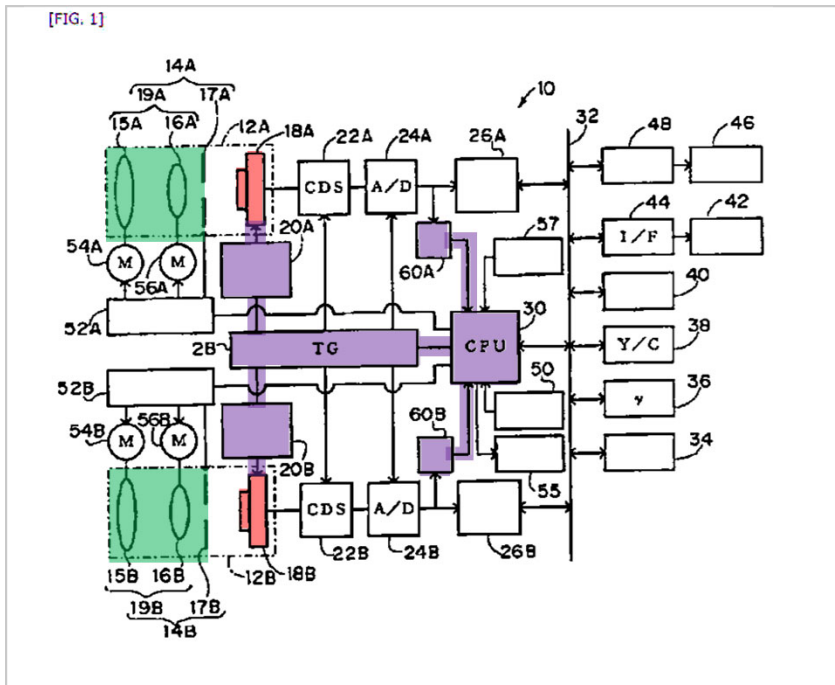
Ex. 1001, 25:32-39.

Petitioner and GM court's construction for "*integration time*":
"the time the image sensor collects and integrates signal from the scene"

Petition, 8; Reply, 1-2; *see also* Slides 8-9.

Matsushima discloses “control an integration time of each sensor”

- It is **undisputed** that Matsushima describes a processing component (including CPU 30) configured to control integration times of sensors, using an electronic shutter per sensor.
Reply, 15-16.



Ex. 1007, FIG. 1, annotated, [0028]; Petition, 16-19;
Ex. 1003, ¶¶ 86, 94; Reply, 15-16.

[0024] CCD 18A and CCD 18B each have a shutter drain via a shutter gate, and the accumulated signal charges can be swept to the shutter drain by driving the shutter gates with shutter gate pulses. In other words, the CCDs 18 have a so-called electronic shutter function that controls the accumulation time (shutter speed) of the charge accumulated by each sensor via shutter gate pulses.

Ex. 1007, [0024]; see also Petition, 17-21 (citing [0024] and explaining that charge accumulation time is integration time).

“Patent Owner **does not** dispute that Matsushima describes electronic shutter hardware elements at each CCD.”

Sur-Reply, 15.

Matsushima's disclosure tracks limitation [1.3].

limitation [1.3]	Matsushima, Ex.1007, [0024]
“a processing component configured to control an integration time of each sensor. ”	“the CCDs 18 have a so-called electronic shutter function that controls the accumulation time (shutter speed) of the charge accumulated by each sensor via shutter gate pulses.”

Reply, 20-21; Petition, 19-21 (demonstrating correspondence of disclosure and claim language).

IV seeks to import an unsupported requirement of “independent control”

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.



POR, 14.

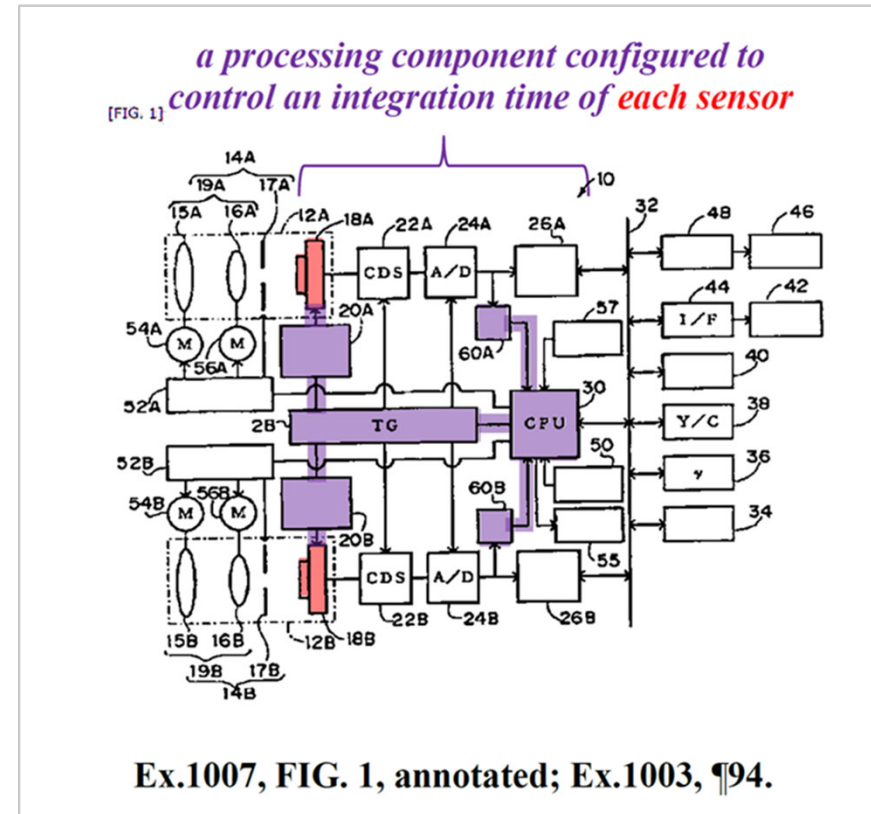
- IV’s “independent control” requirement contradicts the specification and file history.
Reply, 2-5; slides 54-56; Ex. 1001, Abstract, 3:50-52, 4:42-45, 4:56-59, 5:4-6; claim 13 (“automatically control”); claim 19 (“separately controlling”); (Application 11/788,122, parent of the ’158 patent) Ex. 1031, 66, annotated; (180 Patent) Ex. 1046, claim 1.
- IV’s reliance on the Board’s prior institution decision is misplaced.
Reply, 5-6; slide 57; (DI for IPR2020-00710 [Toyota IPR] in 158 FH) Ex. 1002, 16-17.
- IV improperly imports the same requirement into three distinct claim terms, rewriting claims that nowhere recite control.
Reply, 6-7, 9; slides 59-60; (*IV v. GM - WDTX*) Ex. 1015, 108-109 (plain and ordinary meaning).

The Petition explains that Matsushima teaches independent control of integration time of each sensor.

Matsushima describes independent control of integration time of each sensor.

Petition, 18-20 (*citing* Ex. 1007, FIG. 1, [0024], [0027], [0034]-[0035]); Ex. 1003, ¶¶90-100; *see also* Petitioner Opposition (Paper 8), 33-34; Ex. 1044, ¶¶47-48; Reply, 15-16.

- No dispute that Matsushima describes **independent** imaging systems 12A and 12B.
- No dispute that Matsushima describes **distinct** paths for controlling the integration time of an individual sensor distinct from other sensors.
- No dispute that Matsushima teaches an **electronic shutter on each sensor**, for controlling the integration time of an individual sensor distinct from the other sensor.



Ex. 1007, FIG. 1, annotated; Ex. 1003, ¶94;
Petition, 19; Reply, 15-16; Ex. 1044, ¶48.

Reply, 15-16.

Matsushima discloses independent control under “ordinary engineering usage” standard opined by IV’s own expert

IV’s expert opined that the language “*control an integration time of each sensor*” means “per-sensor control authority” in “ordinary engineering usage.”

(Saber) Ex. 2017, ¶70; *see also* Reply, 20-21 (noting standard opined by IV’s expert).

Matsushima uses nearly identical language “controls the accumulation time...by each sensor.”

Ex. 1007, [0024]; Petition, 18-21 (*citing* Ex. 1007, [0024]); *see* Reply 20-21 (nearly identical phrasings—acts, objects, numerosity); (Guidash) Ex. 1044, ¶62 (two phrases to have the same meaning to a POSITA).

70. In my opinion, a POSITA reading the claims under *Phillips* would give “of each sensor” operative effect consistent with the specification’s architecture. In ordinary engineering usage, “control an integration time of each sensor” denotes per-sensor control authority over the sensor-local charge-integration interval, not a global exposure value broadcast identically to all channels. That understanding aligns with the patent’s express definition of “integration time” as the interval the sensor itself collects charge and with the mechanism of control—focal-plane switching at the sensor—set out in the specification. (EX1001, 3:65–4:6; 4:46–56.)

(Saber) Ex. 2017, ¶70.

[0024] CCD 18A and CCD 18B each have a shutter drain via a shutter gate, and the accumulated signal charges can be swept to the shutter drain by driving the shutter gates with shutter gate pulses. In other words, the CCDs 18 have a so-called electronic shutter function that controls the accumulation time (shutter speed) of the charge accumulated by each sensor via shutter gate pulses.

IV seeks to import an unsupported requirement of different integration times.

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



POR, 28.

Independent claims are not limited to different integration times, which are the limitations of dependent claims 11 and 16. (Reply, 13)

11. The system of claim 9, wherein the integration time of at least one channel is relatively shorter than the integration time of at least one other channel.

Ex. 1001, 26:18-20.

16. The method of claim 15, wherein a first integration time of a first sensor is less than a second integration time of a second sensor.

Ex. 1001, 26:39-41.

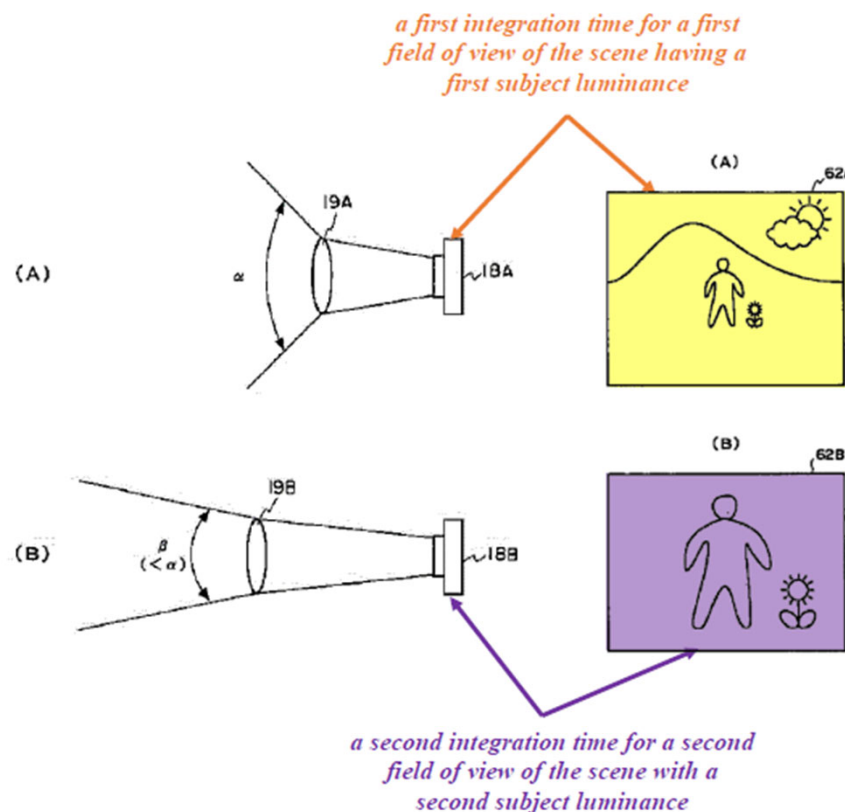
Matsushima teaches different integration times.

As explained by Mr. Guidash and below at [5.0] and [11.0], Matsushima provides improved image quality with a broad dynamic range, by combining images 62A and 62B having different integration times for different regions in a scene. Ex.1003, ¶¶98, 106-112, 132-135; Ex.1007, [0048]-[0049], [0034].

Petition, 21.

Matsushima describes capturing images with different field of views (different shooting angles α and β) using two channels (independent imaging systems 12A and 12B), respectively. Ex.1007, [0017]. A POSITA would have understood that in Matsushima, the integration times of the image sensors would have different values for different subject luminance of different FOVs. Ex.1003, ¶134.

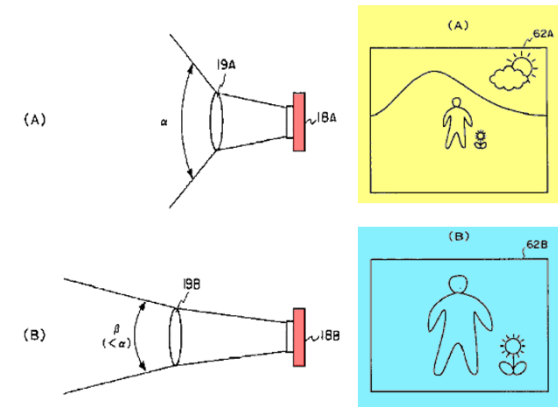
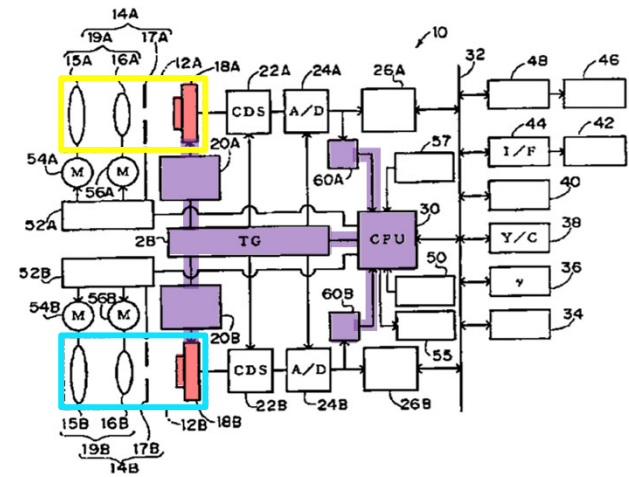
Petition, 34-35 (claim 11); Ex. 1007, FIGs. 2-3, annotated;
Ex. 1003, ¶134; see also Reply 16-17; Ex. 1044, ¶¶49-51.



Petitioner's expert explains how Matsushima teaches different integration times.

134. Specifically, Matsushima describes capturing images with different field of views (different shooting angles α and β) using two channels (independent imaging systems 12A and 12B) respectively. Ex.1007, [0017]. A POSITA would have understood that in Matsushima, the integration times of the image sensors would have different values for different subject luminance of different FOVs. This is because the first subject luminance of the shooting angle α and the second subject luminance of the shooting angle β are determined independently (by integration circuits 60A and 60B). 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 sensor. A broad dynamic range is achieved by combining images 62A and 62B having different integration times for different regions in a scene. As I discussed at V.B.2, expanding intra-scene dynamic range using images with different integration times were well-known. Ex.1009, 9; Ex.1024, 3; Ex.1025, 7, FIG. 8; Ex.1026, 1; *see also* Ex.1001, 1:57-58.

[FIG. 1]



Ex. 1003, ¶¶132-135, 94; Ex. 1007, FIGs. 1, 2, 3, annotated; Petition, 33-35; *see also* Reply, 16-17; Ex. 1044, ¶¶49-57.

Expanding intra-scene dynamic range using multiple integration times was well-known.

Intra-scene dynamic range (IDR) refers to the range of illumination levels within a single scene that imager sensor can provide details about. This is a measure of the sensor's maximum calculable or extrapolated signal level, compared to its total dark temporal RMS noise level. A good way to illustrate this is to consider a sensor that takes two pictures of the same scene. The first picture features a long integration time while the second uses a short integration time.

The picture with the long integration time will provide good details in the dark regions of the scene but the bright regions may not show good details since too many electrons may have overpowered, or saturated the pixel. Alternatively, the picture with the short integration time will provide good details in the bright areas (because the pixels did not saturate), but now, there are not enough photons captured to provide good details in the darker regions of the scene.

(Kodak White Paper) Ex. 1009, 9; Ex. 1003, 38-40; Petition, 1-3, 35; Reply, 16-17.

The good news is that signal processing electronics can be used to blend these two images to provide an image that offers good details in both the dark and bright regions of the scene. This is the intra-scene dynamic range. A sensor can have high IDR without having low noise or high DR.

(Kodak White Paper) Ex. 1009, 9; Ex. 1003, 38-40; Petition, 1-3, 35; Reply, 16-17.

Discussion Roadmap

- Claim Construction Slides 7-15
- Ground 1: Matsushima renders obvious claims 1-2, 5, 8-9, 11, 13-16 and 19.
 - Matsushima renders obvious the “integration time” limitations [1.3], [9.2.2] and [15.1]. Slides 17-20
 - Matsushima renders those limitations obvious even with IV’s extraneous requirements Slides 21-27
 - Matsushima renders obvious “during a frame” (claim 2). Slides 29-32
- Ground 2: Yu and Miyazaki render obvious claims 1-2, 4-5, 8-11, 13 and 14. Slides 34-49

Claim 2, “during a frame”

2. The device of claim 1, wherein the processing component is further configured to control the integration time of each sensor during a frame.

Ex. 1001, 25:40-42.

Petitioner’s construction for “*during a frame*”:

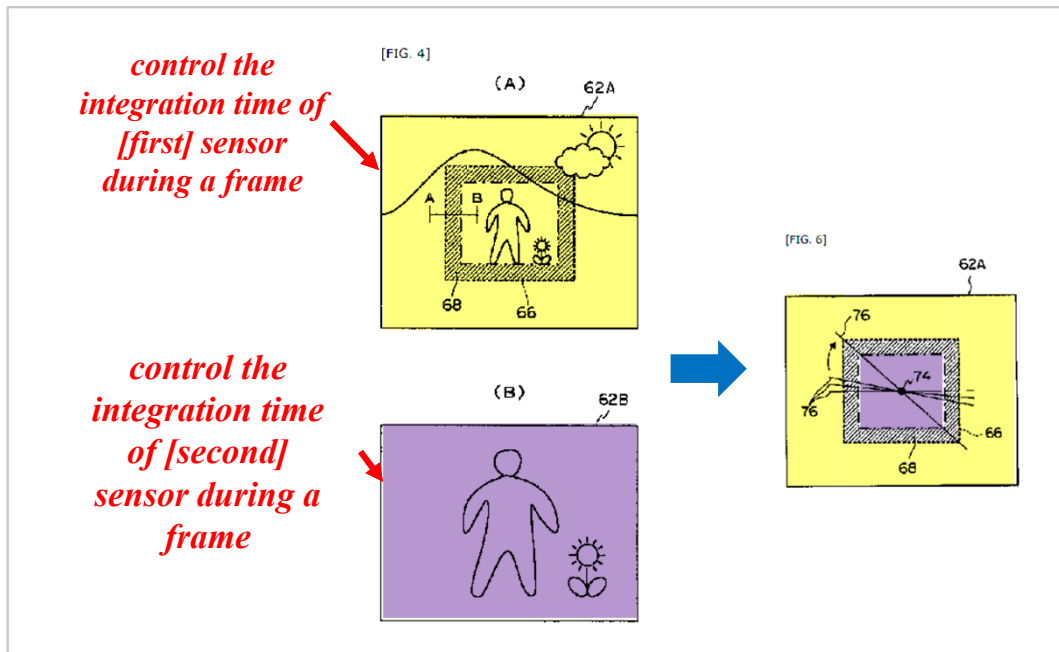
“during a period of time in which data for a single frame of an image is captured”

Petition, 9-10; Reply, 11-12; *see also* Slides 11-13.

Matsushima discloses “during a frame” (claim 2)

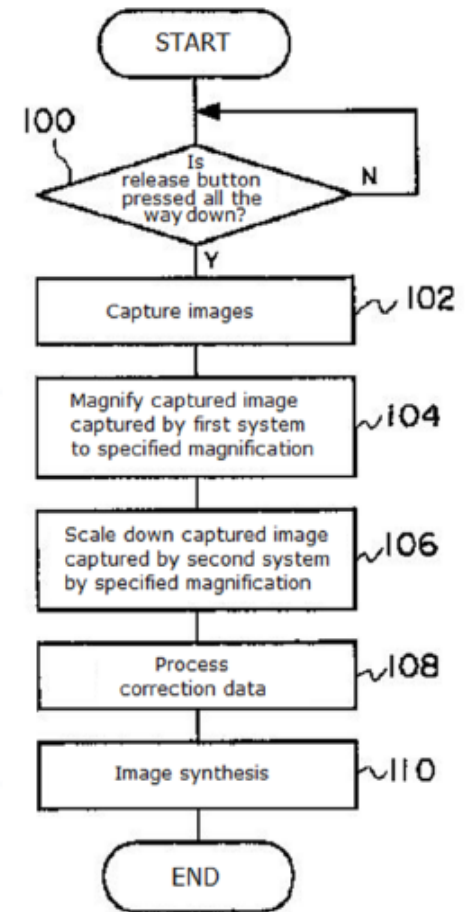
time in which data for a single frame of an image is captured” by a sensor. As shown in FIGS. 4 and 6 below, Matsushima discloses or at least renders obvious that control of each sensor as claimed in [1.3] is performed during a period of time in which data for a single frame of an image is captured by that sensor (a single frame of image 62A captured by sensor 18A, and a single frame of image 62B captured by sensor 18B). Ex.1003, ¶103.

Petition, 22-24; Ex. 1003, ¶¶103-104.



Petition, 23-24; Ex. 1003, ¶103.

[FIG. 7]



Ex. 1007, FIG. 7, annotated; Petition, 27 (step 102: “data ... received during a frame”); Ex. 1003, ¶111.

Matsushima discloses “*during a frame*” even under IV’s flawed construction

'158 patent	Matsushima
“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.”	“CCD 18A and CCD 18B each have a shutter drain via a shutter gate, and the accumulated signal charges can be swept to the shutter drain by driving the shutter gates with shutter gate pulses. In other words, the CCDs 18 have a so-called electronic shutter function that controls the accumulation time (shutter speed) of the charge accumulated by each sensor via shutter gate pulses.”

Reply, 24-25; Ex. 1007, [0024] Ex. 1001, 4:46-56.

- Matsushima’s shutter gate control, like the integration time control of the ’158 patent, happens during the frame for completing the integration period.
 - Matsushima’s “driving the shutter gates” **is the same** “integration time control” described in the ’158 patent.
 - **Both** Matsushima and the ’158 patent **describe** controlling a switch to govern per-sensor charge accumulation time during the capture of a single frame.

Ex. 1044, ¶174; Ex. 1003, ¶103; POR, 40; Reply, 24-25.

Matsushima discloses “*during a frame*” even under IV’s requirement

IV’s requirement:
“during the frame-
capture window
(i.e., between the
start and end of the
window)”

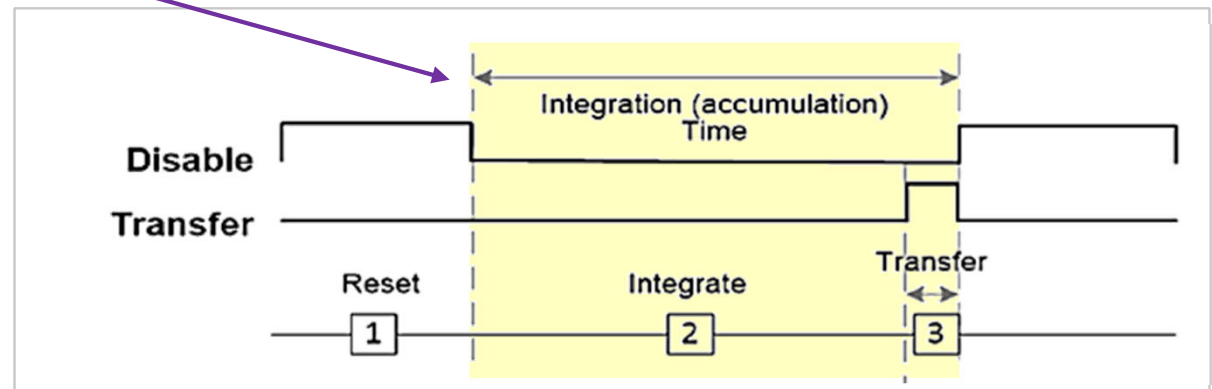
Sur-Reply, 10-11.

73. As explained in my previous declaration, Matsushima discloses controlling an electronic shutter of each sensor for capturing the corresponding single frame of an image. Ex.1003, ¶¶103-104 (citing Ex.1007, [0034]).

Matsushima’s shutter-gate control teaches controlling a charge-integration switch during a frame, because the controlling of the on/off state of the shutter gate spans the entire integration period: switching/keeping the shutter gate off to allow the charges to accumulate and be transferred from the collection region for readout, and switching/keeping the shutter gate on to end the charge accumulation by sweeping charges to the shutter drain. This was well known to a POSITA. Ex.1003, ¶¶25-34, 48-50 (citing Ex.1023, 6, FIGS 7-8; EX 1021, FIG. 17).

Ex. 1044, ¶73; Reply, 24.

Ex. 1003, ¶150; Petition, 2.



Discussion Roadmap

- Claim Construction Slides 7-15
- Ground 1: Matsushima renders obvious claims 1-2, 5, 8-9, 11, 13-16 and 19. Slides 17-32
- Ground 2: Yu and Miyazaki render obvious claims 1-2, 4-5, 8-11, 13 and 14.
 - Yu alone or in combination with Miyazaki renders obvious [1.3]. Slides 34-41
 - A POSITA would have combined Yu with Miyazaki. Slides 43-45
 - Yu-Miyazaki renders obvious “during a frame” (claim 2). Slide 47
 - Yu-Miyazaki renders obvious different integration times. Slide 49

Ground 2: Yu alone or in combination with Miyazaki renders obvious limitation [1.3].

- Prior art teachings are **uncontested** for:
 - independent claim 9 and its dependent claims 10, 13-14;
 - limitations [1.0]-[1.2] of independent claim 1 and all limitations of its dependent claims 4, 5, 8; and
 - IV only contests reasons to combine Yu and Miyazaki.

POR 44-58; Sur-Reply 18-25.

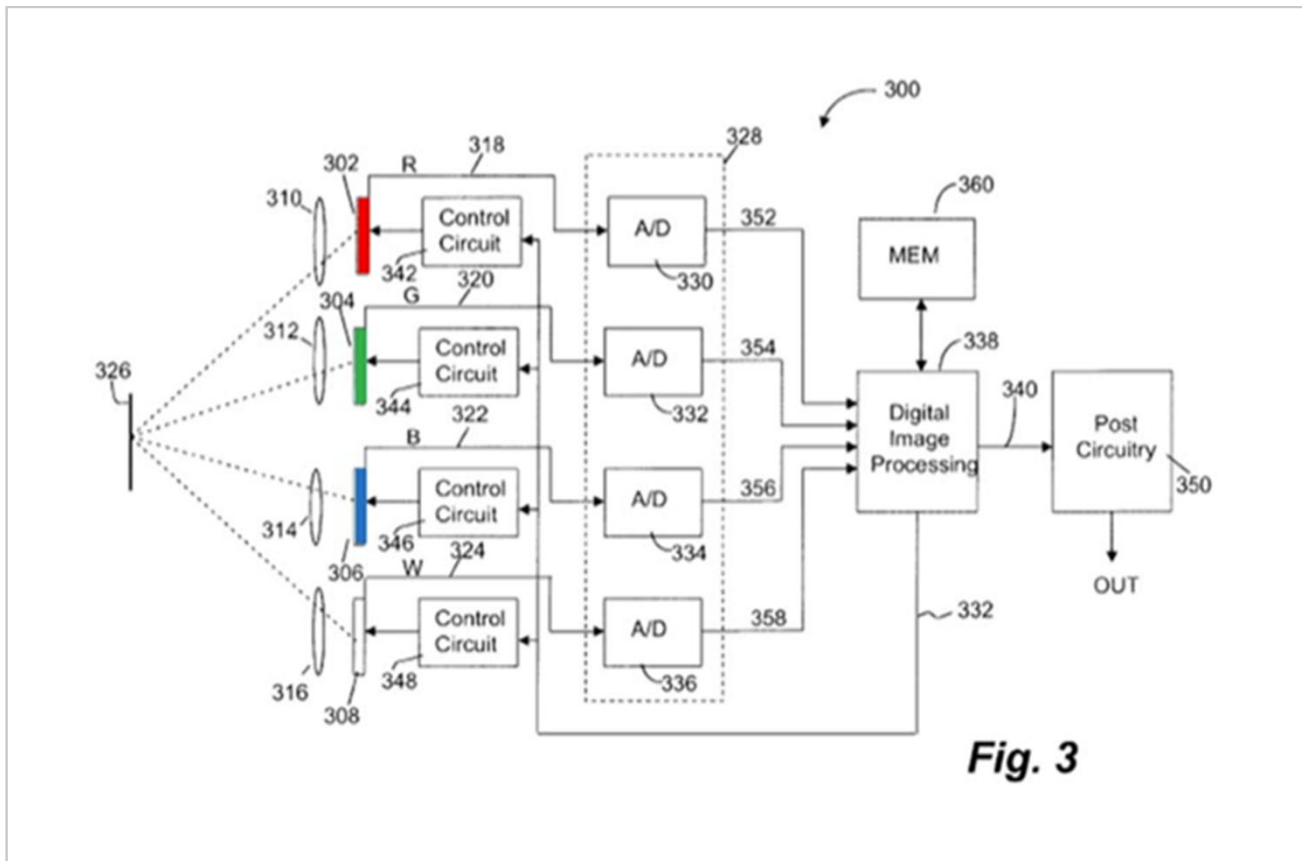
1. An image capture device comprising:
a plurality of sensors;
a plurality of optics components, wherein each optics component of the plurality of optics components is configured to pass light to a sensor of the plurality of sensors;
and
a processing component configured to control an integration time of each sensor.

Ex. 1001, 25:32-39.

Petitioner and GM court's construction for "*integration time*":
"the time the image sensor collects and integrates signal from the scene"

Petition, 8; Reply, 1-2; see also Slides 8-9.

Yu describes a digital camera that uses multiple independent image sensors, each having its own lens.



(Yu) Ex. 1005, FIG. 3; Petition, 43; (Guidash) Ex. 1003, ¶¶158, 164-174.

Undisputed that Yu describes:

- “**independent** sensors”
- “each...is respectively and **independently** controlled to expose the same imaging target”
- “each being separately controlled with **different** exposure time”

POR, 44-46; Sur-Reply, 18-22.

According to another embodiment in which the W sensor is not used, three images from three color sensors can compliment each other in the same way as described. This can be done as a result of three images from three **independent sensors**, each being **separately controlled with different exposure time** and other system parameters. Those skilled in the art can appreciate that images from a single image sensor with a single lens can be hardly enhanced for a larger dynamic range without sacrificing one end or the other of the dynamic range. With images independently from multiple sensors with multiple lenses, the complementary expansions of the respective dynamic ranges become possible.

Ex. 1005, 9:40-46; Petition, 73-75; Reply, 29.

FIG. 8 shows a process flow diagram of present invention according to one embodiment and shall be understood in conjunction with FIG. 3. Different from existing digital cameras, the disclosed improved digital camera uses multiple sensors with multiple lenses at 802. In particular, one embodiment uses four identical image sensors, full resolutions of the images are fully used. At 804, each of the image sensors is made to be responsive to a certain color region of the visible color spectrum. Examples include the use of color filters coated upon the image sensors and colored lenses. What should be noted is that one of the image sensors can be made to be responsive to a full range of the visible color spectrum, which may include the use of a full transparent filter. With the configuration, each of the image sensors is **respectively and independently controlled** to expose to the same imaging target. It can be appreciated by those skilled in the art that the existing digital cameras using one image sensor would not be able to selectively control the operations of image pixel while each of the image sensors in the present invention can be **controlled independently**.

Ex. 1005, FIG. 9:66-10:1; Petition, 43.

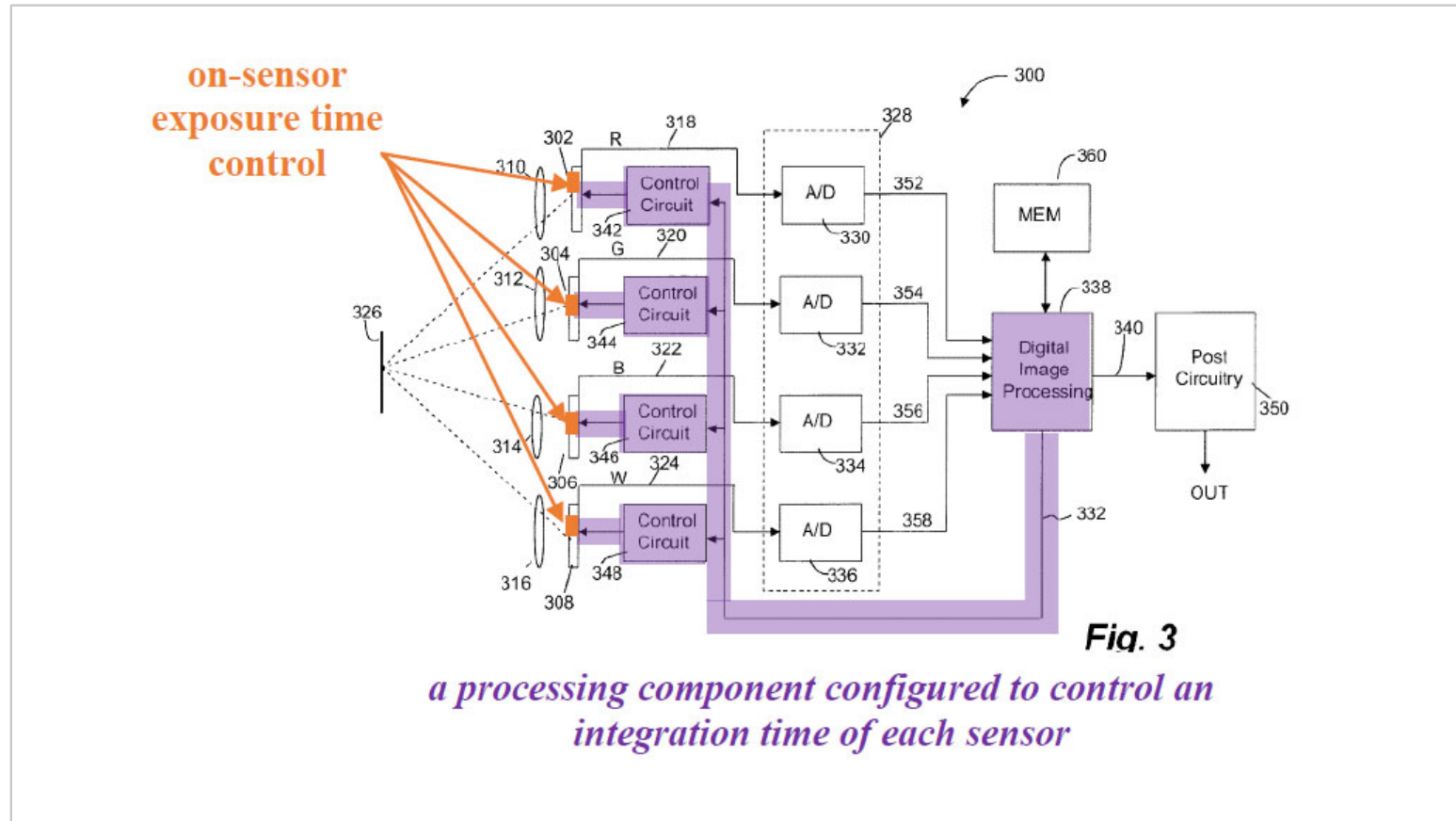
Undisputed that Yu discloses that “*the integration time is controlled based on incident light level*” (claim 8)

Given an intensity image, there are many ways to determine if the given image is saturated due to an overexposure. One of the available ways is to determine from a histogram of the given image, which is explained in great detail in “Digital Image Processing” by Rafael C. Gonzalez from Addison-Wesley Publisher. Large population concentrated on the high end of the histogram is an indication of saturation. Thus a control signal to reduce a predefined exposure time can be generated. Upon receiving the control signal, the control circuit acts accordingly. To be more specific, control circuits 342, 344, 346 and 348 receive respectively the control signals 332, each generated with respect to a corresponding histogram in digital image processing circuitry 338 and independently and respectively control image sensors 302, 304, 306 and 308. It is understood to those skilled in the art that there are many other causes that may need to control image sensors 302, 304, 306 and 308 independently, such as gain and offset controls. All necessary controls signals may

Ex. 1005, 6:44-58; Petition, 68.

Yu alone discloses “control an integration time of each sensor.”

Yu describes controlling an integration time (exposure time) of each sensor with its respective on-sensor exposure control. Petition, 52.



Ex. 1005, FIG. 3, annotated; Ex. 1003, ¶178; Petition, 52.

Yu alone discloses “*control an integration time of each sensor.*”

Yu describes on-sensor exposure time control.

Petitioner’s expert explains that on-sensor control of exposure time control is control of integration time.

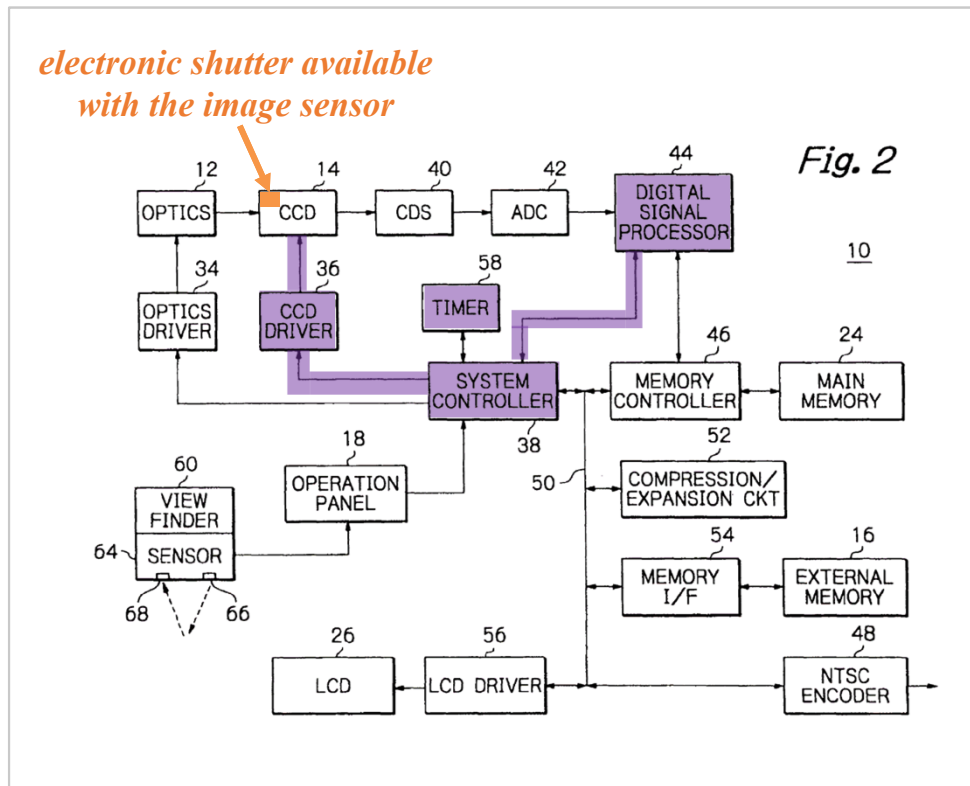
181. Yu’s “controlling exposure time” of each sensor means “*controlling an integration time*” based on how it describes its control system. Specifically, Yu describes controlling exposure time by sending signals **to the sensors themselves**, rather than controlling a mechanical shutter separate from the sensors.

Ex.1005,12:15-19 (“digital image processing circuitry produces four control signals, each controlling the exposure time of one of said four image sensors”); FIG. 3 (each control circuit 342, 344, 346, and 348 providing an exposure time control signal to sensors 302, 304, 306, and 308 respectively). In other words, Yu does not control exposure by controlling the amount of time light is allowed to fall upon the sensors using mechanical shutters external to the sensors, but rather controls exposure time by controlling the duration a sensor collects and integrates the electronic signal from the scene, which is also referred to as integration time or charge accumulation period. Ex.1039, 3 (defining “integration time” as “The time or proportion of the operating cycle of the CCD in which charge is accumulated”); Ex.1008, 2 (describing that in CCD image sensors providing an electronic shutter, “[t]he **exposure time** is the time between the reset of the imager and the transfer of charge from the photodiodes to the vertical CCDs,” which is the charge integration time.).

(Guidash) Ex. 1003, ¶181; Petition, 53-54; (Kodak App Note) Ex. 1008, 2.

Ground 2: Yu-Miyazaki also renders the claims obvious.

Miyazaki describes controlling an integration time using an on-sensor electronic shutter. Petition, 45.

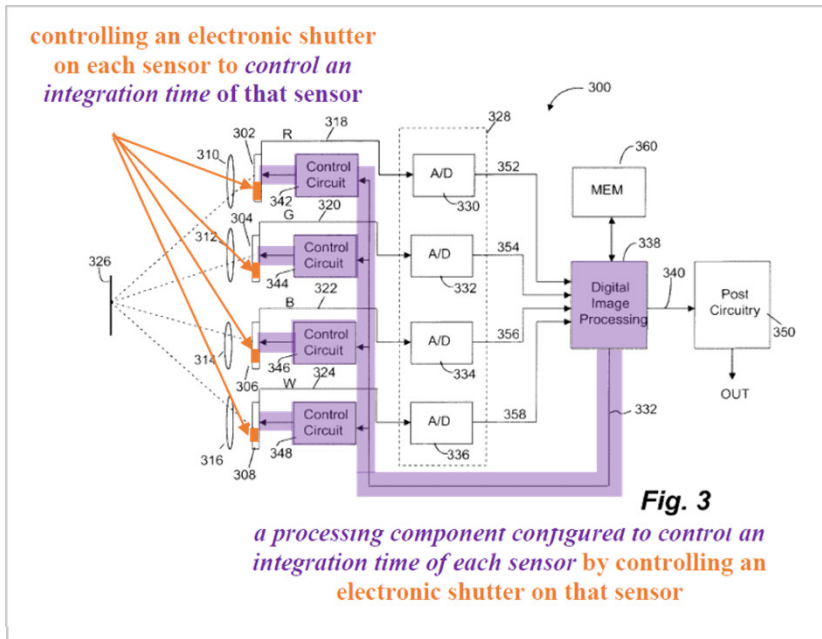


Further, the system controller 38 executes various adjustments for a shot, e.g., adjusts the focus and determines a lens opening and a shutter speed. The digital signal processor 44 calculates various estimated values for shot adjustment by using the image data output from the ADC 42, as stated earlier. The system controller 38 controls the various sections of the camera 10 on the basis of the estimated values. 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. In addition, the controller 38 delivers a control

(Miyazaki) Ex. 1006, 11-14; Ex. 1003, ¶162; Petition, 45.

(Miyazaki) Ex. 1006, FIG. 2, annotated;
Ex. 1003, ¶161; Petition, 45.

Yu-Miyazaki renders obvious “control an integration time of each sensor.”



Example Combination of Yu-Miyazaki (Ex. 1005, FIG. 3, annotated); Ex. 1003, ¶188; Petition, 57.

200. Therefore, Yu-Miyazaki renders obvious a processing component (Yu's digital image processor 338, together with Yu's control circuits 342, 344, 346, 348) configured to control (using four independent feedback signals 332 and respective control circuits 342, 344, 346, 348, as taught by Yu) an integration time (integration time by controlling an electronic shutter of a sensor as taught by Miyazaki and applied in Yu) of each sensor (Yu's image sensors 302, 304, 306, 308).

Ex. 1003, ¶200; Petition, 62-64.

Discussion Roadmap

- Claim Construction Slides 7-15
- Ground 1: Matsushima renders obvious claims 1-2, 5, 8-9, 11, 13-16 and 19. Slides 17-32
- Ground 2: Yu and Miyazaki render obvious claims 1-2, 4-5, 8-11, 13 and 14.
 - Yu alone or in combination with Miyazaki renders obvious [1.3]. Slides 34-41
 - A POSITA would have combined Yu with Miyazaki. Slides 43-45
 - Yu-Miyazaki renders obvious “during a frame” (claim 2). Slide 47
 - Yu-Miyazaki renders obvious different integration times. Slide 49

Petitioner Has Established a Motivation to Combine Yu and Miyazaki under *KSR*

✓	“need or problem known in the field” <i>KSR</i>, 127 S.Ct. at 1742	Petition, 59 (“Yu describes a need to use an on-sensor exposure control to control an exposure time of each of its plurality of sensors[, describing that] digital image processing circuitry produces four control signals, each controlling the exposure time of one of said four image sensors”); (Guidash) Ex. 1003, ¶192; (Yu) Ex. 1005, FIG. 3, 12:16-19.
✓	“obvious benefit” and “predictable results” <i>Id.</i> at 1731, 1739, 1740, 1744	Petition, 58-59 (“the benefit of a fast, reliable, and small digital camera....allows a fast shutter speed [to] capture fast-moving subjects with reduced blur....allows for the elimination of any mechanical shutter...allow for a more compact and lightweight camera”); Ex. 1003, ¶191; (Kodak App Note) Ex. 1008, 2; (CCD Primer) Ex. 1023, 11 . Petition, 60 (“yield the predictable result of varying sensor integration time for exposure control”), 61-62 (“a reasonable expectation of success [because] it would have been within the ordinary skill of a POSITA to implement each of Yu’s image sensors with an on-sensor electronic shutter for integration time control, as taught by Miyazaki”)
✓	“a combination of familiar elements according to known methods” <i>Id.</i> at 1739	Petition, 60 (“a combination of prior art elements (Yu’s digital camera with independent control of the exposure time of each of the multiple image sensors with an electronic shutter of an image sensor configured to control the integration time, as taught by Miyazaki) according to known methods (controlling each electronic shutter of each image sensor to control the integration time of the sensor.”).

Applying Miyazaki in Yu is using a known technique to improve similar devices in the same way.

“There is a motivation to combine when a known technique ‘has been used to improve one device, and a person of ordinary skill in the art would recognize that it would improve similar devices in the same way,’ using the ‘prior art elements according to their established functions.’”
Intel Corp. v. PACT XPP Schweiz AG, 61 F.4th 1373, 1380–81 (Fed. Cir. 2023).

Petition, 60-61.

195. In addition, modifying Yu’s multi-sensor multi-lens digital camera to implement, for each of the multiple sensors, controlling an on-sensor electronic shutter to control the integration time of that sensor as taught by Miyazaki would be improving a similar device (Yu’s multi-sensor multi-lens digital camera) in the same way. I understand there is a motivation to combine when a known technique has been used to improve one device, and a person of ordinary skill in the art would recognize that it would improve similar devices in the same way, using the prior art elements according to their established functions.

Petitioner’s expert explains that for each Yu sensor, Miyazaki’s teaching of on-sensor electronic shutter to control integration time would improve Yu’s multi-lens digital camera in a similar manner.

Ex. 1003, ¶195; Petition, 60-61.

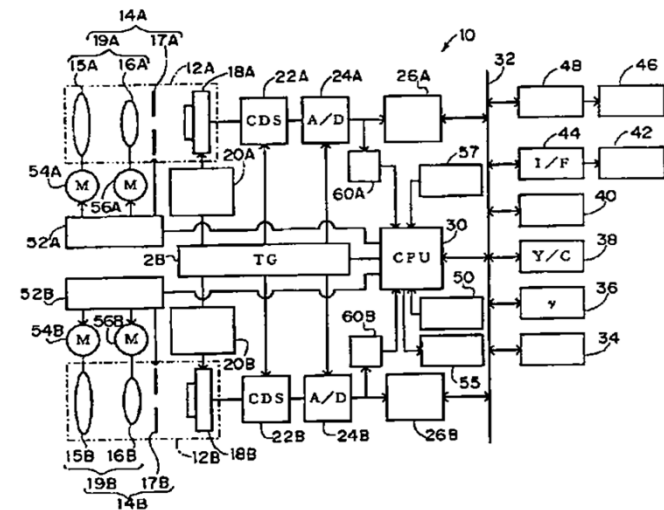
IV's contention for “enablement like specifics” is misplaced.

We have explained that there is **no** absolute requirement for a relied-upon reference to be self-enabling in the § 103 context, so long as the **overall evidence** of what was known at the time of invention establishes that a skilled artisan could have made and used the claimed invention. *Raytheon Techs. v. Gen. Elec. Co.*, 993 F. 3d 1374, 1376-77 (Fed. Cir. 2021).

**Multi-sensor, on-sensor
shutter systems were
well established at the time.**

Reply, 28-29; Ex. 1044, ¶91;
(Matsushima) Ex. 1007, FIG. 1.

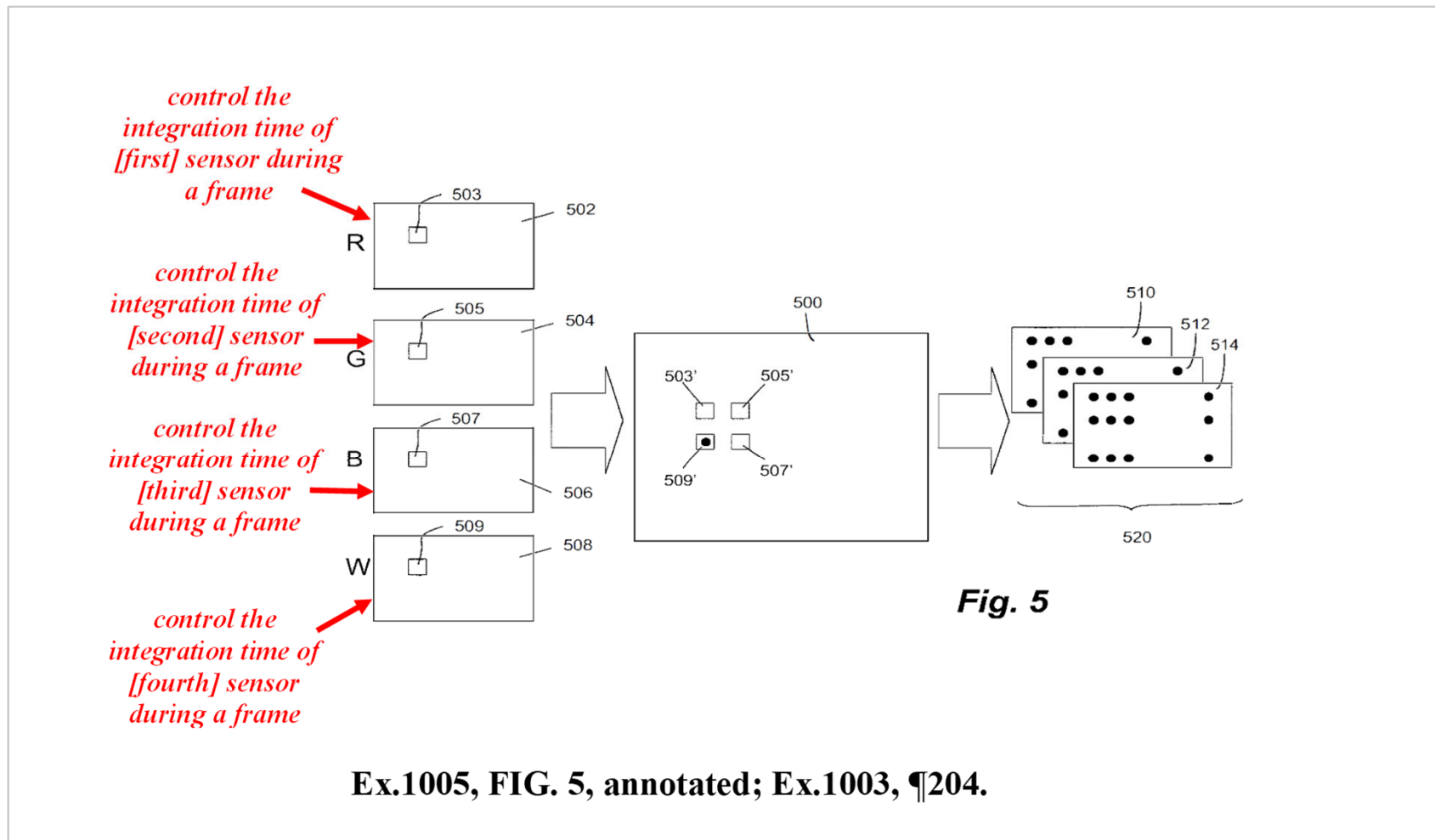
[FIG. 1]



Discussion Roadmap

- Claim Construction Slides 7-15
- Ground 1: Matsushima renders obvious claims 1-2, 5, 8-9, 11, 13-16 and 19. Slides 17-32
- Ground 2: Yu and Miyazaki render obvious claims 1-2, 4-5, 8-11, 13 and 14.
 - Yu alone or in combination with Miyazaki renders obvious [1.3]. Slides 34-41
 - A POSITA would have combined Yu with Miyazaki. Slides 43-45
 - Yu-Miyazaki renders obvious “during a frame” (claim 2). Slide 47
 - Yu-Miyazaki renders obvious different integration times. Slide 49

Yu-Miyazaki renders obvious “*during a frame.*”



(Yu) Ex. 1005, FIG. 5, annotated; Petition, 64; Ex. 1003, ¶204.

Discussion Roadmap

- Claim Construction Slides 7-15
- Ground 1: Matsushima renders obvious claims 1-2, 5, 8-9, 11, 13-16 and 19. Slides 17-32
- Ground 2: Yu and Miyazaki render obvious claims 1-2, 4-5, 8-11, 13 and 14.
 - Yu alone or in combination with Miyazaki renders obvious [1.3]. Slides 34-41
 - A POSITA would have combined Yu with Miyazaki. Slides 43-45
 - Yu-Miyazaki renders obvious “during a frame” (claim 2). Slide 47
 - Yu-Miyazaki renders obvious different integration times. Slides 49

Yu-Miyazaki renders obvious different integration times.

According to another embodiment in which the W sensor is not used, three images from three color sensors can compliment each other in the same way as described. This can be done as a result of three images from three independent sensors, each being separately controlled with different exposure time and other system parameters. Those skilled in the art can appreciate that images from a single image sensor with a single lens can be hardly enhanced for a larger dynamic range without sacrificing one end or the other of the dynamic range. With images independently from multiple sensors with multiple lenses, the complementary expansions of the respective dynamic ranges become possible.

(Yu) Ex. 1005, 9:40-46; Petition, 73-75; Reply, 29.

Thank You



HAYNES BOONE

*TESLA, INC. V. INTELLECTUAL
VENTURES II LLC*

IPR2025-00222 (9,232,158)

Backup Slides



Claim Construction – extraneous requirement of “independent control”

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

For all three distinct terms, IV imports an unsupported requirement of “independent control”

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.



POR, 14.

- IV’s “independent control” requirement contradicts the specification and file history. (Reply, 2-5)
- IV’s reliance on the Board’s prior institution decision is misplaced. (Reply, 5-6)
- IV improperly imports the same requirement into three distinct claim terms, rewriting claims that nowhere recite control. (Reply, 6-7).

IV's “independent control” requirement contradicts the specification.

The specification uses varied expressions to denote variations on “*control*,” including embodiments other than “independent control.”

“The processing component is configured to **separately control** an integration time of each channel”

“The integration time for each channel can be **automatically controlled and/or controlled** in response to a user input.”

“use integration time control to **control** the time the electrical signal is integrated on a charge storage device (capacitance)”

“Digital camera components or circuitry are configured to allow **independent control** of the charge integration”

“The processing component is configured to **separately and simultaneously control** an integration time of each channel”

Ex. 1001, Abstract, 3:50-52; 4:42-45; 4:56-59; 5:4-6;
see also claim 13 (“automatically control”); claim 19 (“separately controlling”); Reply, 3.

IV's "independent control" requirement contradicts the file history.

The amendments make clear that the Applicant differentiated between the narrower, more specific control formulations and simple "*control*." Reply, 4.

1. (Currently amended) A digital camera comprising:

a plurality of sensors integrated in a semiconductor substrate, each sensor comprising an array of photo-detectors, wherein each sensor is configured to image the same field of view;

a plurality of optics component, each optics component configured to pass light to a sensor of the plurality of sensors, wherein each optics component and an associated sensor form one of a plurality of channels; and

a processing component coupled to the plurality of channels and configured to ~~separately and simultaneously~~ control an integration time of each sensor during a frame, wherein the integration time of at least one sensor is relatively shorter than the integration time of at least one other sensor, the processing component configured to combine data from the plurality of sensors received ~~simultaneously~~ during the frame to provide an image ~~having a large dynamic range.~~

(Application 11/788,122, parent of the '158 patent) Ex. 1031, 66, annotated; Reply, 4.

IV's “independent control” requirement contradicts the file history.

Claims in US 7,916,180 in the family recite narrower variations of “*control*.”

Reply, 4.

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.

Ex. 1046, claim 1; Reply, 4.

IV's reliance on the Board's prior institution decision in the Toyota IPR is misplaced

- The Board did not rewrite the term “*control*” to mean “independent control.”
- It concerned a one-to-one configuration related to “an individual sensor distinct from the other sensor(s).”

(DI for IPR2020-00710 [Toyota IPR] in 158 FH) Ex. 1002, 16-17;
Reply, 5-6.

is limited to a singular one of the “plurality of sensors.” 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).

Ex. 1002, 16-17;
Reply, 5-6.

Claim Construction - extraneous requirement of “independent control”

(claims 1, 9, 15)

IV improperly imports the same “independent control” requirement into three distinct claim terms

- “control an integration time of each sensor” (claim 1)
- “determine an integration time of each channel” (claim 9)
- “identifying an integration time for each of a plurality of channels” (claim 15)

IV’s constructions should be rejected.

- Claims 9 and 15 do not even recite “*control*.” IV attempts to insert a requirement based on a term (“*control*”) entirely absent from the claim language.
- IV ignores the differences among the terms “*control*,” “*determine*,” and “*identifying*” in claims 1, 9, and 15.

Reply, 7.

The district court previously construed the term to have “plain and ordinary meaning.”

2. Court’s Construction

For the reasons set forth above, the phrase “a processing component configured to control an integration time of each sensor;” the phrase “a processing component ... configured to combine data from the plurality of sensors received to provide an image;” and the phrase “the processing component is configured to determine an integration time of each channel of the plurality of channels” is not subject to § 112(f), and will be given their plain and ordinary meaning.

(IV v. GM - WDTX) Ex. 1015, 108-109; Reply, 9.

Petitioner's alternative constructions should be adopted if construction is required

Term	Petitioner's Alternative Construction
<i>"control an integration time of each sensor"</i> (claim 1)	"control an integration time of each <u>distinct</u> sensor"
<i>"determine an integration time of each channel"</i> (claim 9)	"determine an integration time of each <u>independent</u> channel"
<i>"identifying an integration time for each of a plurality of channels"</i> (claim 15)	"identifying an integration time for each of a plurality of <u>independent</u> channels"

Reply, 7.

is limited to a singular one of the "plurality of sensors." 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).

Petitioner's alternative constructions are consistent with the Board's constructions from the Toyota IPR.

Ex. 1002, 16-17;
Reply, 8.

Claim Construction – extraneous requirement for focal plane switch

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

“a processing component configured to control an integration time of each sensor”

Construction in GM Litigation (Petitioner’s Proposed Construction)	IV’s Implicit Construction
plain and ordinary meaning. Ex.1015, 108-109.	No explicit construction in Section III.C of POR, but IV implicitly, requires both: (i) “applied at the focal plane of the image” and (ii) “performed by controlling a switch (e.g., charge integration switch)....” POR, 14-15, 44-45, 50-55.

Reply, 9.

“a processing component configured to control an integration time of each sensor”

Term	Claim Term?	Meaning
<i>“control an integration time”</i>	Yes	control an “ <i>integration time</i> ,” where “ <i>integration time</i> ” is expressly defined by the specification and construed by the district court in GM litigation. Reply, 10-11.
“integration time control”	No	“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)....” (Ex.1001, 4:46-50) is merely a description of a feature of an embodiment, <u>not</u> a definition of a claim term. Reply, 10-11.

“To act as its own lexicographer, a patentee must clearly set forth a definition of **the disputed claim term** other than its plain and ordinary meaning and must clearly express an intent to redefine **the term**.”

Kyocera Senco Indus. Tools Inc. v. Int’l Trade Comm’n, 22 F.4th 1369, 1378 (Fed. Cir. 2022); Reply, 10.

Claim Construction

“during a frame”

IV truncates Petitioner's proposed construction

The Reply treats claim 2 as a nullity by arguing that “during a frame” “defines a period of time” and “does not define specific technical implementations,” and then insisting that Matsushima’s shutter-gate “on/off” signal meets the claim language. Reply, 11–12; Reply, 24–25. However, in claim 2, the phrase “during a frame” imposes a temporal constraint requiring control of the integration time for each during the frame-capture window (i.e., between the start and end of the window), rather than, e.g., simply defining the start and end of that window.

IV omits the critical language “in which data for a single frame of an image is captured” from Petitioner’s construction.

Sur-Reply, 10.

Petitioner's proposed construction is supported by statements of IV's own expert.

181. (ii) In-frame cross-sensor synchronization. With multiple sensors, different integration windows must be phase-aligned to the same frame budget (e.g., start A at t_0 , start B at $t_0 + \Delta$; end A before readout begins; end B at a different Δ'), and readout/CDS/A-D must be sequenced so both sensors' data are available for the same output frame. Miyazaki discusses timing only for one CCD; it does not describe

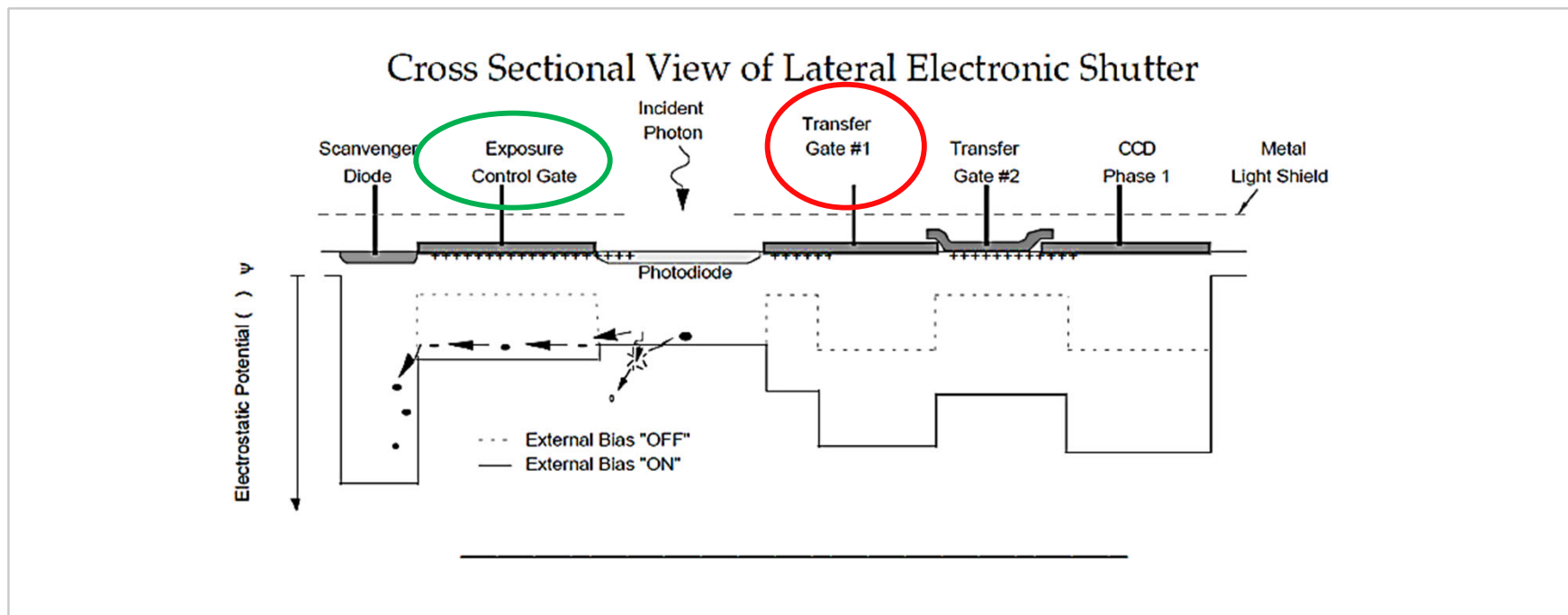
Ex. 2017, ¶¶69-71.

Matsushima describes controlling an electronic shutter on each sensor to achieve optimal exposure adjustment

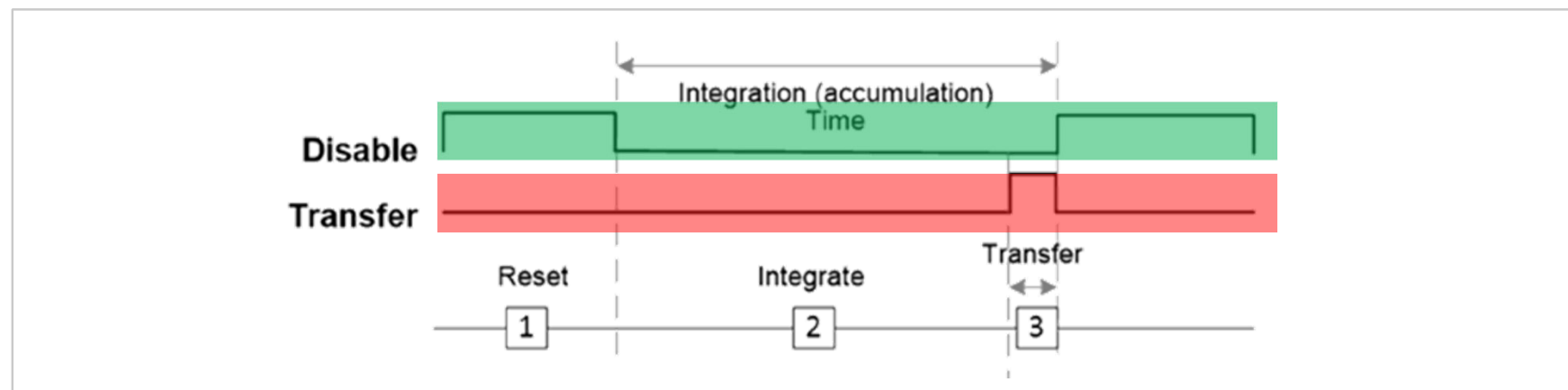
[0034] For AE control, the subject luminance (imaging EV value) is determined based on integration of the R, G, and B signals in a single frame by the integration circuits 60A and 60B, and the aperture value and shutter speed are determined based on this imaging EV value. The apertures 17A and 17B are 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. As a result, optimal exposure adjustment and focusing are performed simply by pointing the imaging lenses 15A and 15B of the digital camera 10 at the subject.

Ex. 1001, [0034].

Electronic shutters and their control of integration times were well-known.



Ex. 1021, 17; Ex. 1003, ¶152; Petition, 2.



Ex. 1003, ¶152; Petition, 2.

Different integration times: IV took the opposite position in the GM Litigation.

claimed. GM argues that the term “image capture” is used only once to refer to a digital camera, which GM argues should mean that a POSITA would understand that the ’158 Patent intends that multiple sensors with “different” integration times and that this construction is “critical.” CC Br. at 22. This is incorrect. The ’158 Patent specification does not limit the term image capture device to one using “different” integration times. The specification instead clearly states that the ’158 Patent can be controlled automatically or in response to user input. Ex. 18, ’158 Patent at 3:50-52; Hernandez at ¶¶ 148-153. In other cases integration time for channels can be set to “low incident light levels.” *Id.* at 11:7-10. There is simply nothing in the specification that would limit integration time to a “different time.”

(IV CC Brief) Ex. 1050, 21-22; Reply, 13-14.

Matsushima discloses “*during a frame*” (claim 2)

104. Specifically, Matsushima teaches using sensors 18A and 18B to capture images 62A and 62B of the same scene. Ex.1007, [0048] (“a captured image 62A taken with the first imaging system 12A [using sensor 18A]” and “a captured image 62B taken with the second imaging system 12B [using sensor 18B]”). As discussed at Ground 1:[1.3], an integration time of each sensor is controlled to capture data for its corresponding single frame of an image. Ex.1007, [0034] (describing controlling an electronic shutter of each sensor for capturing the corresponding single frame of an image). Accordingly, Matsushima discloses that controlling an integration time of sensor 18A during a period of time in which data for a single frame of image 62A is captured by that sensor 18A, and controlling an integration time of sensor 18B during a period of time in which data for a single frame of image 62B is captured by that sensor 18B.

Ex. 1003, ¶104.

END

