UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

SAMSUNG ELECTRONICS CO., LTD. AND SAMSUNG ELECTRONICS AMERICA, INC.,
Petitioner,

v.

OPTIMUM IMAGING TECHNOLOGIES LLC,
Patent Owner.

Case IPR2025-00628

Patent No. 8,451,339

PETITION FOR *INTER PARTES* REVIEW OF CLAIMS 6, 7, AND 10 OF U.S. PATENT NO. 8,451,339

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TABLE OF EXHIBITS

Exhibit	Description
Ex-1001	U.S. Pat. No. 8,451,339 ("'339 Patent")
Ex-1002	Prosecution History of the '339 Patent Sans NPL
Ex-1003	Declaration of Wayne Prentice
Ex-1004	Curriculum Vitae of Expert Witness Wayne Prentice
Ex-1005	U.S. Pat. App. Pub. No. 2002/0135688 ("Niikawa")
Ex-1006	[RESERVED]
Ex-1007	[RESERVED]
Ex-1008	[RESERVED]
Ex-1009	[RESERVED]
Ex-1010	[RESERVED]
Ex-1011	[RESERVED]
Ex-1012	[RESERVED]
Ex-1013	[RESERVED]
Ex-1014	U.S. Patent No. 9,063,982 ("Bestgen")
Ex-1015	U.S. Patent No. 6,920,443 ("Cesare")
Ex-1016	U.S. Pat. No. 7,612,805 ("'805 Patent")
Ex-1017	[RESERVED]
Ex-1018	[RESERVED]
Ex-1019	[RESERVED]
Ex-1020	[RESERVED]

Exhibit	Description
Ex-1021	Certified Translation of Japanese Pat. App. Pub. No. H11205652 ("Ichiyama")
Ex-1022	Japanese Pat. App. Pub. No. H11-205652 ("Ichiyama-JP")
Ex-1023	[RESERVED]
Ex-1024	[RESERVED]
Ex-1025	Certified Translation of Ricoh Technical Report No. 31, RICOH (Apr. 20, 2006), https://web.archive.org/web/20060420051054/http:/www.ricoh.co.jp/about/business_overview/report/31/ ("Ricoh")
Ex-1026	Ricoh Technical Report No. 31, RICOH (Apr. 20, 2006), https://web.archive.org/web/20060420051054/http:/www.ricoh.co.jp/about/business_overview/report/31/ ("Ricoh-JP")
Ex-1027	U.S. Patent No. 10,873,685 ("'685 Patent")
Ex-1028	U.S. Pat. App. Pub. No. 2005/0041121 ("Steinberg")
Ex-1029	Certified Translation of Japanese Patent App. Pub. No. 2003158672 ("Endo")
Ex-1030	Japanese Patent App. Pub. No. 2003-158672 ("Endo-JP")
Ex-1031	[RESERVED]
Ex-1032	Greg Linden & Deepak Somaya, *System-on-a-chip integration in the semiconductor industry: industry structure and firm strategies*, Industrial and Corporate Change, pp.545-576.
Ex-1033	U.S. Patent No. 7,352,394 to DeLuca et al.
Ex-1034	Gordon E. Moore, *Cramming More Components onto Integrated Circuits*, Proc. Of IEEE, Vol. 86, No. 1 (Jan. 1998) (reprinted from Gordon E. Moore, *Cramming More Components onto Integrated Circuits*, *Electronics*, pp.114-117 (Apr. 19, 1965)).

Exhibit	Description
Ex-1035	Patent Owner's Infringement Contentions Cover Pleading
Ex-1036	U.S. Patent Application Publication No. 2004/0252217 A1 to Battles et al.
Ex-1037	U.S. Patent Application Publication No. 2008/0192129 A1 to Walker et al.
Ex-1038	M.B. Sandler, et al., *A Comparative Evaluation of DSPs, Microprocessors, and the Transputer for Image Processing*, Int'l Conf. on Acoustics, Speech, and Signal Processing, pp.1532-1539 (IEEE, May 23, 1989).
Ex-1039	U.S. Patent No. 6,407,777 to DeLuca et al.
Ex-1040	Xiao-Ping Maio, et al., Automatic Red-eye Detection and Removal, IEEE Int'l Conference on Multimedia and Expo (ICME) (IEEE Cat No. 04TH8763), pp.1195-1198 (Jun. 27, 2004)
Ex-1041	Lei Zhang, et al., Automated Red-Eye Detection and Correction in Digital Photographs, 2004 Int'l Conference on Image Processing, ICIP'04, Vol. 4, pp.2363-2366 (Oct. 24, 2004)
Ex-1042	U.S. Patent No. 6,016,354 to Lin et al
Ex-1043	U.S. Patent No. 7,042,505 to DeLuca
Ex-1044	U.S. Pat. App. Pub. No. 2006/0274185 to Safai
Ex-1045	U.S. Patent No. 7,107,516 to Anderson, et al.
Ex-1046	U.S. Pat. App. Pub. No. 2003/0151679 to Amerson et al.
Ex-1047	U.S. Pat. App. Pub. No. 2005/0286097 to Hung et al.
Ex-1048	U.S. Pat. App. Pub. No. 2008/0192129 to Walker et al.
Ex-1049	U.S. Pat. App. Pub. No. 2002/0186412 to Murashita

Exhibit	Description
Ex-1050	TMS320DSC21 – A High Performance, Programmable, Single Chip Digital Signal Processing Solution to Digital Still Cameras, DSC Business Unit, Texas Instruments (2005)
Ex-1051	TI and Kodak – Working Together to Bring Superior Digital Camera Products to Market
Ex-1052	Email from counsel for OIT to counsel for Samsung (January 21, 2025)
Ex-1053	Excerpted Claim Chart from Patent Owner's Infringement Contentions
Ex-1054	The American Heritage Guide to Contemporary Usage and Style (2005)

LIST OF CHALLENGED CLAIMS

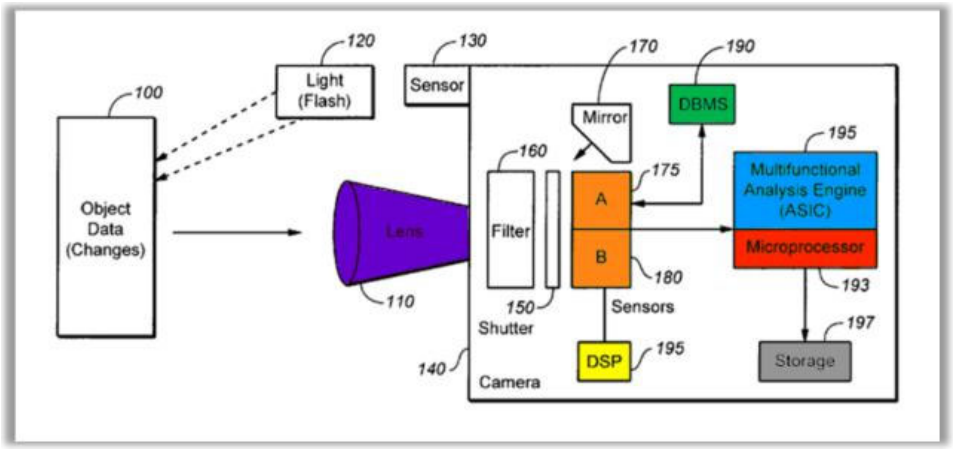
Identifier	Claim Language
[6pre]	A digital imaging system for correcting image aberrations comprising:
[6A-1]	a digital camera mechanism,
[6A-2]	an optical lens mechanism,
[6A-3]	a digital sensor,
[6A-4]	an integrated circuit,
[6A-5]	a digital signal processor,
[6A-6]	system software,
[6A-7]	a database management system and
[6A-8]	a memory storage sub-system;
[6B]	wherein the optical lens mechanism is a zoom lens or a fixed focal length lens;
[6C]	wherein the image data file is forwarded from the digital sensor to storage in memory;
[6D]	wherein at least one optical and/or digital aberration in the image file are identified by comparing image files in the database management system by using the system software and the integrated circuit;
[6E]	wherein the at least one filtration algorithms required to correct the at least one optical and/or digital aberration are sent from the integrated circuit to the digital signal processor;
[6F]	wherein the at least one optical and/or digital aberration from the optical lens mechanism are corrected by using the digital signal processor to apply digital filtration algorithm; and

Identifier	Claim Language
[6G]	wherein the modified digital file consisting of the digital data optimized from the at least one aberration that are corrected from the original optical image is stored in memory.
[7]	The system of claim 6: wherein the optical aberrations include spherical, comatic, lens distortion, astigmatism, chromatic aberrations, curvature of field, pin cushion, barrel distortion, scattered light, red eye, dust and/or flare types of optical aberrations.
[10]	The system of claim 6: wherein the digital signal processor applies color filtration to the image file.

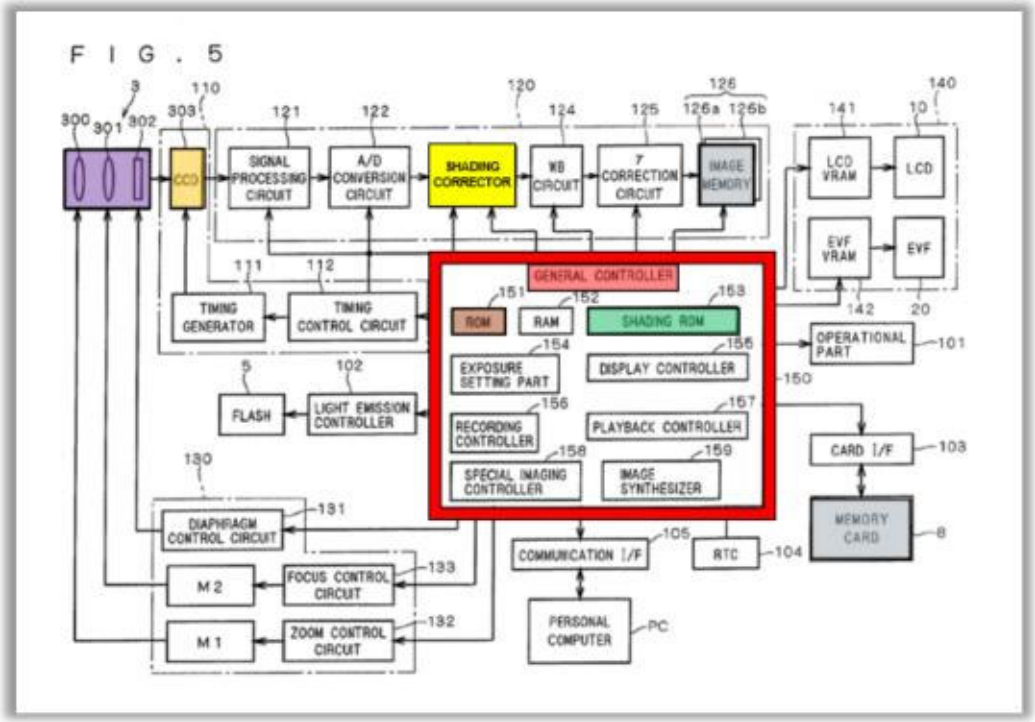
I. Introduction

Digital cameras capture images by an image sensor receiving light that passes through a lens, processing the data from the image sensor, and storing the image in memory. The image quality of the stored image may be adversely affected by distortions and artifacts caused by lenses. These adverse effects are known as "aberrations." Such aberrations include "vignetting," where less light is received at the edge of the image, causing the edges to be shaded.

Techniques for correcting aberrations were well known. Acknowledging that correcting aberrations post-production (*e.g.*, using Photoshop on a computer) was well known (Ex-1001, 6:31-36), the '339 Patent describes and claims using well-known aberration correcting techniques in the camera itself utilizing the components of a camera, including (i) a lens (purple), (ii) a digital sensor (orange), (iii) a digital signal processor (yellow), (iv) an application specific integrated circuit (blue), (v) software, (vi) a database management system (green), and (vii) a memory (grey).



But correcting aberrations in-camera had been known for years. For example, Niikawa discloses a digital camera that corrects vignetting using the components of the camera. Like the '339 Patent, Niikawa discloses correcting aberrations in a camera using a (i) lens (purple), (ii) CCD image sensor (orange), (iii) shading corrector processor (yellow), (iv) general controller (red), (v) programs stored in the general controller's memory (brown), (vi) correction tables stored in the general controller's shading ROM (green), and (vii) memory (grey).



As detailed herein, correcting aberrations in camera was not novel as taught by Niikawa and many other references. And implementing well-known aberration techniques in camera was certainly obvious. Thus, trial should be instituted and claims 6, 7, and 10 ("Challenged Claims") should be cancelled.

II. Requirements for IPR

A. Standing

Petitioner certifies that the '339 Patent is available for IPR, and that Petitioner is not barred or estopped from requesting this review.

B. Challenge and Relief Requested

Petitioner relies on the following references that qualify as prior art under 35 U.S.C. §102(b):

- Niikawa (Ex-1005), published on September 26, 2002.
- Steinberg (Ex-1028), published on February 24, 2005.

Petitioner requests that the Challenged Claims be determined unpatentable and cancelled on the following grounds:

Ground 1: Claims 6, 7, and 10 are obvious over Niikawa in view of Steinberg.

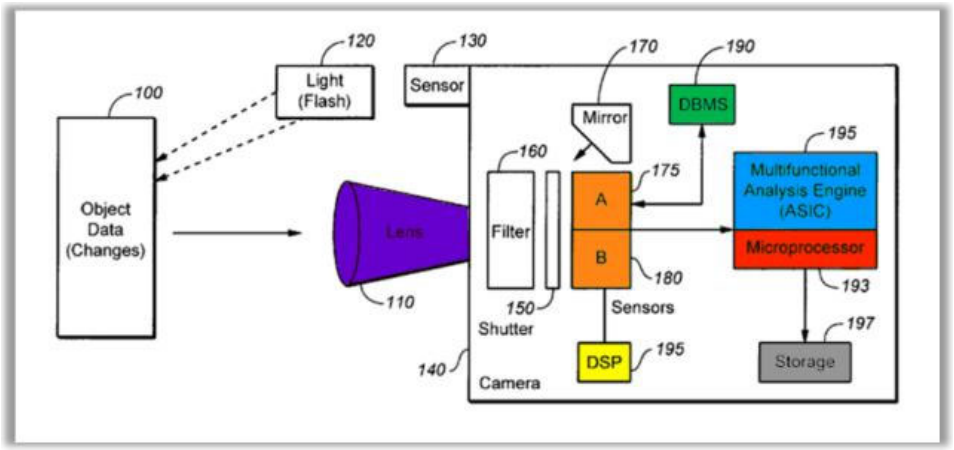
This Petition is supported by the Declaration of Wayne Prentice (Ex-1003).

III. Overview of the '339 Patent

A. Summary

The '339 Patent discloses in-camera digital corrections to aberrations. Ex-1001, 8:3-4. The '339 Patent admits that existing optical technologies reliably corrected for imaging aberrations, asserting that those technologies lacked "in-camera modification capabilit[ies] for each specific image problem." *Id.*, 6:54-58; *see also* 1:37-45, 2:38-56, 3:25-26, 3:40-53, 4:25-38, 5:6-35, 6:18-30.

The patent describes a digital camera capable of identifying and correcting for optical image aberrations. *Id.*, claim 6. The camera includes (i) an optical lens mechanism (*e.g.*, lens 110, purple), (ii) a digital sensor (*e.g.*, digital sensor 175 or 180, orange), (iii) a digital signal processor (*e.g.*, DSP 195, yellow), (iv) an application specific integrated circuit (*e.g.*, ASIC 195, blue), (v) a microprocessor (*e.g.*, microprocessor 193, red), (vi) a database management system (*e.g.*, DBMS 190, green), and (vii) a memory storage sub-system (*e.g.*, storage 197, grey). *See id.*, claim 6; Ex-1003, ¶¶54-59.



Ex-1001, Fig. 1 (annotation added).

B. Relevant Prosecution History

During prosecution, the Examiner took official notice that many claimed elements were "old and well known in the art," including: "a system wherein the digital signal processor applies at least one FFT algorithm to correct the at least one optical aberration," "the digital signal processor applies color filtration to the image file," "the optical lens mechanism is a zoom lens," "the zoom lens changes focal

length positions on a continuous scale," and "each focal length of a zoom lens is analyzed for a different set of optical aberrations." Ex-1002, 136-139, 143.

In response, the applicant acknowledged that a "microprocessor is a CPU that controls the computing functions [in a digital] camera," that "[t]he CPU may use memory circuits (DRAM, EPROM, EEPROM, Flash memory) in order to store and access data to perform a set of control functions," that "a digital signal processor (DSP) ... is used to process a digital image file," and that "[a] DSP may be used to process these digital filter components in order to eliminate digital or color artifacts related to specific image sensor pixels." *Id*., 120-121. The applicant also acknowledged that "the applicant does not claim to invent" "the FFT algorithm," and in reference to the FFT algorithm, that "[t]here is no reason not to include a powerful class of algorithm to the toolbox in order to solve the aberrations." *Id*., 123.

A notice of allowance issued after the applicant's response. *Id*., 82. The '339 Patent issued on May 28, 2013.

Neither Niikawa nor Steinberg were cited during prosecution of the '339 Patent.

C. Priority Date

For purposes of this proceeding only, Petitioner assumes that the provisional application's filing date, July 11, 2006, is the effective filing date ("Priority Date"). This is before March 16, 2013, so the pre-AIA statute applies.

D. Level of Ordinary Skill in the Art

A person having ordinary skill in the art ("POSA") would have had a bachelor's degree in electrical engineering, physics, or a related field, with at least two years of industry experience and/or research, both concerning digital camera system design and image processing. Ex-1003, ¶¶62-63.

E. Claim Construction

Without agreeing to the correctness of—or taking ownership of—the following constructions, Petitioner bases its challenges on an implicit claim construction advanced by Patent Owner in co-pending district court litigation as reflected in Patent Owner's infringement contentions. *See W. Digital Corp. v. SPEX Techs., Inc*., IPR2018-00084, Paper No. 14, p.11 (PTAB Apr. 25, 2018) ("37 C.F.R. § 42.104(b)(3) does not require Petitioner to express its subjective agreement regarding correctness of its proffered claim constructions or take ownership of those constructions.").

1. Claim 6: "sent from the integrated circuit to the digital signal processor"

Under Patent Owner's implicit claim construction set forth in its contentions, the integrated circuit can include the digital signal processor. Ex-1001, 38:30-32. Patent Owner's infringement contentions equate the "integrated circuit" with a "microprocessor." Ex-1053, p.14 ("The Samsung Accused Devices contain . . . a microprocessor, a digital signal processor . . ." (repeated twice)), p.15 ("[T]he

Samsung Accused Devices . . . contain . . . microprocessors, DSPs," etc.). In identifying the "[m]icroprocessor" allegedly found in the Samsung Accused Devices, Patent Owner identifies certain Samsung Exynos systems on a chip ("SoCs"). *Id.*, p.23. In identifying the alleged "digital signal processor" Patent Owner states "Digital Signal Processor with integrated application specific circuit," again identifies the Samsung Exynos SoCs. *Id.*, pp.24-28. Therefore, Patent Owner contends that Samsung Exynos processors include an integrated circuit, which itself includes a DSP, which includes an "application specific circuit." *Id.*

Therefore, Patent Owner's interpretation of the phrase "from the integrated circuit to the digital signal processor" allows for sending the claimed at least one filtration algorithm from one part of the integrated circuit (in Patent Owner's contentions, an Exynos SoC, Ex-1053, pp.14-15) to another part of an integrated circuit that is a digital signal processor (in Patent Owner's contentions, a DSP "built into" an Exynos processor, *id.*, p.50). Petitioner applies this construction for the purposes of this Petition without affirmatively endorsing it.

Further construction is unnecessary to resolve the questions presented in this Petition and thus the remainder of the words and phrases in the claim should be accorded their plain and ordinary meaning that a POSA would attributed to them in light of the specification of the '339 Patent.

2. Claim 7: "wherein the optical aberrations include spherical, comatic, lens distortion, astigmatism, chromatic aberrations, curvature of field, pin cushion, barrel distortion, scattered light, red eye, dust and/or flare types of optical aberrations."

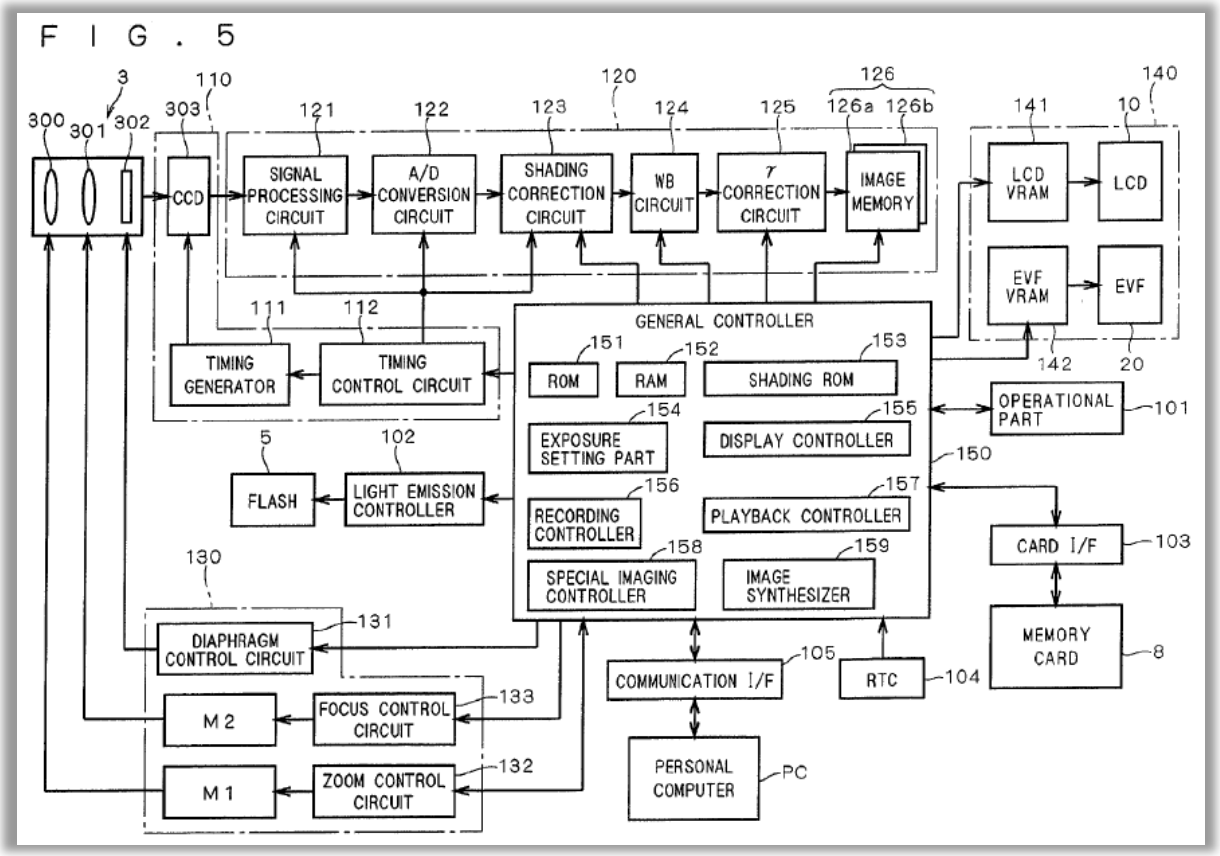
For the purposes of this Petition, Petitioner interprets this phrase as requiring any one or more of the listed "optical aberrations." *See* AM. COLLEGE HERITAGE GUIDE TO CONTEMPORARY USAGE AND STYLE (2005) (Ex-1054) ("and/or" is "use[d] in general writing to mean 'one or the other or both'").

IV. The Challenged Claims Are Unpatentable

A. Ground 1

1. Overview of the references, the combination, and motivation to combine.

Niikawa discloses an image processing apparatus, *e.g.*, a digital camera, having a lens 3 and CCD sensor 303, that performs shading correction on images. *E.g.*, Ex-1005, Abstract, [0067]. An example of hardware used in Niikawa's digital camera is shown in Figure 5:



Ex-1005, Fig. 5

Images are captured by CCD 303, are digitized, and then undergo processing in signal processor 120. Ex-1005, [0077]-[0079]. The images are stored in image memory 126 after they are processed by signal processor 120. *Id.*, [0087]. Niikawa's camera includes a "general controller 150" that includes, among other things, a ROM 151 that "stores processing programs for executing a variety of concrete processings in the exposure function and playback function and control programs for controlling drivings of the above-mentioned members of the digital camera." Ex-1005, [0096]. The general controller also includes an "image synthesizer" that reads the images

from memory 126 and positions them so that the patterns in the images can be synthesized accurately to obtain a higher quality image. Ex-1005, [0003], [0111], [0139]. The general controller 150 includes programs for controlling camera functions and the components of the digital camera 1. Ex-1005, [0096]. Based on the optical conditions of the lens, such as focal length and f-number, the general controller 150 selects a "correction table" with inverse correction coefficients from shading ROM 153 to send to the shading corrector. *Id.*, [0082], [0084], [0108]; Ex-1003, ¶¶69-77.

Niikawa is analogous art at least because it is in the same field of endeavor as the '339 Patent, *i.e.*, digital signal processing techniques, such as aberration correction, for imaging systems like digital and video cameras. *Compare* Ex-1001, 1:16-33 *with* Ex-1005, Abstract, [0003], [0065]. Niikawa also is reasonably pertinent to the problem to be solved: correcting image aberrations in-camera. *Id.* Niikawa and the '339 Patent both list the H04N subclass under the International Classification. Ex-1005, Ex-1001.

Steinberg discloses a digital camera with a red-eye filter for "detecting a region within a captured image indicative of a red-eye phenomenon . . . based upon a comparison of the captured image and a reference image." Ex-1028, Abstract; *see also id*., [0012] ("In the embodiment the filter detects said region indicative of a red-eye phenomenon by identifying a region in the captured image at least having a color

indicative of a red-eye phenomenon and comparing said identified region with the corresponding region in the reference image"). To perform this comparison of a captured image with one or more reference images, Steinberg uses software executed by a digital signal processor (DSP) to (1) compare images—at least one taken without a flash and one taken with a flash, (2) identify suspected red eye in the image, and (3) correct the red eye by modifying pixel values. Ex-1028, [0030], [0032], [0054], [0065]; Ex-1003, ¶¶83-86.

Steinberg is analogous art at least because it is in the same field of endeavor as the '339 Patent, *i.e.*, digital signal processing techniques, such as red-eye correction, for imaging systems like digital cameras. *Compare* Ex-1001, 38:59 ("red eye") *with* Ex-1028, [0002]. Steinberg also is reasonably pertinent to the problem to be solved: correcting image artifacts in-camera. Ex-1001, 2:52-54, Ex-1028, [0002]. Steinberg and the '339 Patent both list the H04N subclass under the International Classification. Ex-1001, Ex-1028.

As described by Steinberg, a POSA knew that red eye was an "unnatural glowing red of an eye"—an "objectionable phenomenon"—and was desirable to eliminate from digital photographs. Ex-1028, [0003], [0006]; Ex-1003, ¶¶51-53. Red eye is caused by light from the camera's flash reflecting from vascular tissue in the eye causing a red dot where the subject's pupil is in an image. Ex-1028, [0003].

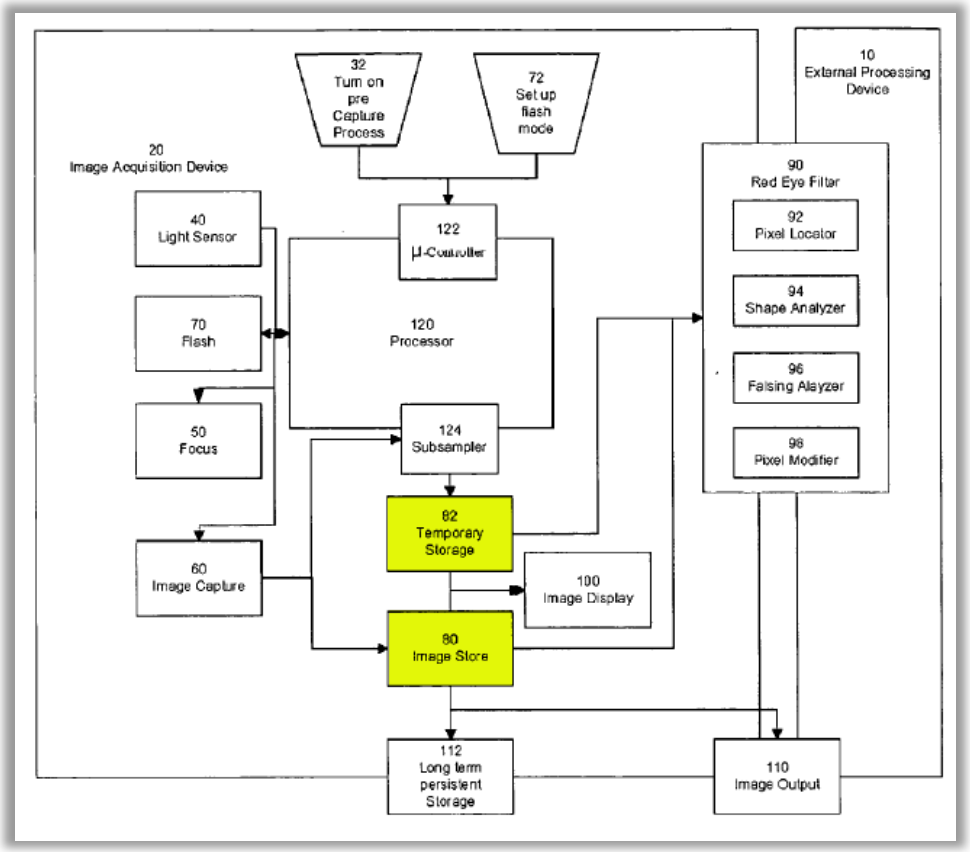
A POSA reading Niikawa would have seen that Niikawa's camera includes a flash. Ex-1005, [0068], [0088]. And while a POSA would have known that this flash would cause objectionable red eye, Niikawa does not describe any techniques for removing red eye from captured images. Ex-1003, ¶90.

A POSA would thus have sought out a solution to this problem. *Id.* In doing so, a POSA would have looked to Steinberg as providing an effective way to remove red eye without the need for a pre-flash, which itself was an objectionable solution. Ex-1003, ¶¶51-53, 90-91; Ex-1028, [0004]-[0005]. As explained above, Steinberg describes a procedure for identifying red eye in an image by comparing one or more reference or "preview images" with a captured image to determine whether the acquired image exhibits red eye. Ex-1028, Abstract (detecting red eye "based upon a comparison of the captured image and a reference image of nominally the same scene taken without flash"). Exercising only routine, ordinary skill, a POSA would have understood that several modifications to Niikawa were needed to incorporate Steinberg's red eye removal techniques into Niikawa's digital camera. Ex-1003, ¶¶95-115.

First, a POSA would have appreciated that Niikawa's system software would need to be updated to include Steinberg's red eye filtration algorithms. Ex-1003, ¶¶95, 106-108. A POSA would have understood that Niikawa's ROM 151 stored software to control various camera functions and this would have been the natural

place to install Steinberg's red eye filtration algorithms. Ex-1003, ¶107; Ex-1005, [0096]; Ex-1028, [0032]. A POSA would have been motivated to incorporate Steinberg's red eye filtration algorithms into Niikawa's ROM 151 to enable Niikawa's camera to remove undesirable red eye from images, thus providing better quality images. Ex-1003, ¶¶107-108. And, a POSA would have found it obvious to store the red eye filter algorithm alongside Niikawa's other programs and algorithms in ROM 151 because it would have merely used Niikawa's ROM 151 for its ordinary use: storing programs for use by the camera hardware. Ex-1003, ¶108; Ex-1005, [0096].

Second, a POSA would have appreciated that Niikawa's general controller 150 would need to have storage for the captured image and reference image(s) so that they may be accessed and compared to detect red eye. Ex-1003, ¶¶96-100. For instance, Steinberg discloses two memory storage locations for storing reference (or "preview") images and captured images for comparison as shown below in yellow:



Ex-1028, Fig. 1 (annotation added),

Here, temporary storage 82 "is used to store one or plurality of the preview images" and "image store" 80 can "comprise computer memory such as a dynamic random access memory or a non-volatile memory" and can be used to store the captured image. Ex-1028, [0029]-[0030]. These storage locations can be combined or separate. *Id.*, [0029]. The stored preview or reference images and the captured image are both received by the filter 90 to allow for application of the red eye filtration algorithm. *Id.*, [0030].

Based on these teachings, a POSA would thus have appreciated from Steinberg that one or more storage locations was needed in Niikawa's camera to store reference and captured images for processing by the Steinberg red eye filtration algorithms. Ex-1003, ¶¶96-99. This storage location must be after the images (both reference and captured images) are captured. Ex-1003, ¶¶97-98. Because Niikawa's general controller 150 performs "centralized control" of exposure and playback, as well as various image processing functions (*e.g.*, image synthesis and storage), a POSA would have been motivated to store the reference and captured images in storage within general controller because captured images are operated on by the general controller before they are stored in memory card 8. Ex-1005, [0096]-[0097], [0111], [0118], [0121]; Ex-1003, ¶¶100-102. Moreover, because Niikawa and Steinberg are silent as to the data structure(s) that the preview images would have been stored in, a POSA would have needed to select among a finite number of known storage techniques for storing images. Ex-1003, ¶103. One such choice available to a POSA was to store images in a database within the general controller. *See* Ex-1037, [0110], [0112], [0164], [0182]; Ex-1003, ¶¶42, 103-104. By storing the images in a database, a POSA would have merely been combining known techniques for image storage and retrieval (using an image database) according to known methods (using a database management system to store and retrieve images from the image database so that they can be input into Steinberg's red eye filter) to yield

predictable results (a convenient way to store and retrieve reference and captured images for use in red eye filtration). Ex-1003, ¶¶42, 104-105.

Third, a POSA would have recognized that once Steinberg's software was stored in Niikawa's ROM 151 it needed to be loaded and executed by some form of processor. Ex-1003, ¶95, 109. Steinberg explains that "many of the processes implemented in the digital camera may be implemented in or controlled by software operating in a . . . digital signal processor (DSP)," which is generically referred to as a "processor" in Figure 1. Ex-1028, [0029]. A POSA knew that DSPs were more efficient than general purpose processors for use in embedded systems when it came to performing specific arithmetic operations on images. *See* Ex-1003, ¶¶110-111, 163 (discussing Ex-1038, p.1535, which explains that "DSP devices definitely exhibit a clear advantage on a performance per processor basis, and in the embedded real time systems, they will prove the more cost effective"). Therefore, a POSA would have been motivated to include a DSP in Niikawa's general controller 150 to implement and execute the functionality of Steinberg's red eye filter 90 including pixel locator, shape analyzer, falsing analyzer, and pixel modifier. Ex-1003, ¶¶111-112; Ex-1028, [0030].

In the described combination of Niikawa and Steinberg (referred to below as the "Niikawa-Steinberg system") a POSA would have recognized that the resulting system would have identified red eye in the image file by comparing image files in

a database management system using system software and an integrated circuit ("IC"), conveyed filtration algorithms from the IC (specifically, ROM 151 of the IC) to the Steinberg digital signal processor ("DSP") within the Niikawa general controller (IC), and correcting for that red eye by using the DSP to apply the Steinberg digital filtration algorithms as recited in limitations [6D], [6E], and [6F]. Ex-1003, ¶¶113-115. Further details of how the aforementioned Niikawa-Steinberg system renders claims 6, 7, and 10 obvious are discussed below.

A POSA would have reasonably expected to succeed in combining Niikawa and Steinberg in the manner discussed above and in further detail below. Ex-1003, ¶¶113-115. Niikawa and Steinberg use digital camera hardware that had become ubiquitous by the 2006 earliest effective filing date of the '339 Patent. This hardware included lenses, CCDs, A/D converters, integrated circuits, DSPs, and various image correction algorithms as discussed throughout this Petition. Ex-1003, ¶¶69-82, 113-115. And, the various algorithms applied by Niikawa and Steinberg were known such that their implementation would have provided expected and published results. Therefore, the combination of Niikawa and Steinberg would have been something a POSA would have been motivated to do to allow Niikawa to correct for red eye and would have been something a POSA would have believed they would have successfully accomplished. *Id.*

2. Independent Claim 6

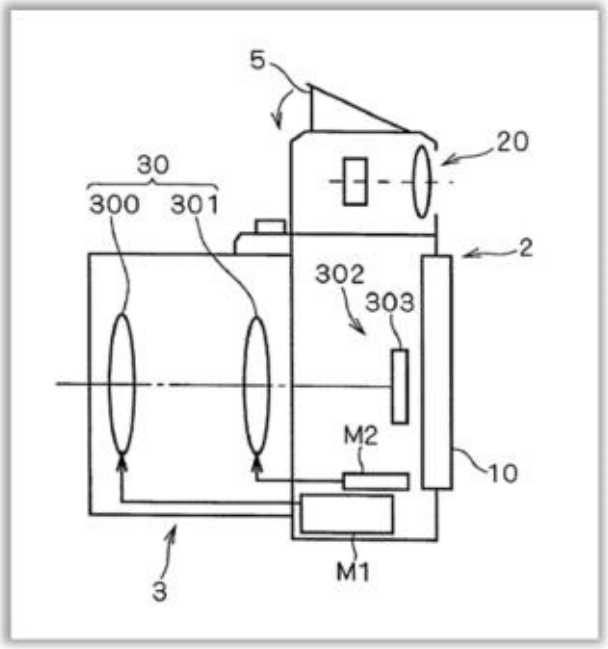
[6pre] A digital imaging system for correcting optical image aberrations comprising:

Even if the preamble was a limitation, Niikawa discloses a digital imaging system, *e.g.*, an image processing apparatus or camera, that performs shading correction on images, which is a form of optical image aberration correction. Ex-1005, Abstract, [0012], [0056], [0065], [0082], Fig. 5; Ex-1003, ¶¶69-72, 116.

Niikawa discloses a digital imaging system (digital camera 1) for correcting optical image aberrations (shading aberrations). Ex-1003, ¶116.

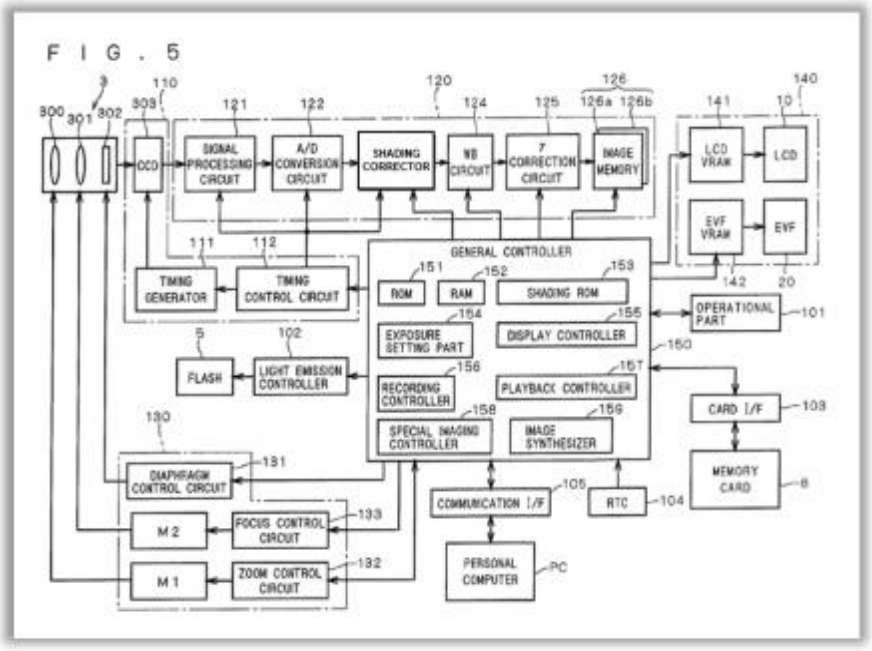
[6A-1] a digital camera mechanism,

Niikawa discloses digital camera 1. Ex-1005, Abstract, [0065], [0075], Figs. 2-5. Figure 3 depicts a cross-section view of digital camera 1 with imaging lens 3, including zoom lens 300 and focus lens 301, and camera main body 2. *Id.*, [0027], [0065], [0067], [0069], [0088]; Ex-1003, ¶¶69-72, 117-119.



Ex-1005, Fig. 3.

Figure 5 depicts the internal configuration of digital camera 1. Ex-1005, [0029], [0075], Fig. 5; Ex-1003, ¶¶118-119.

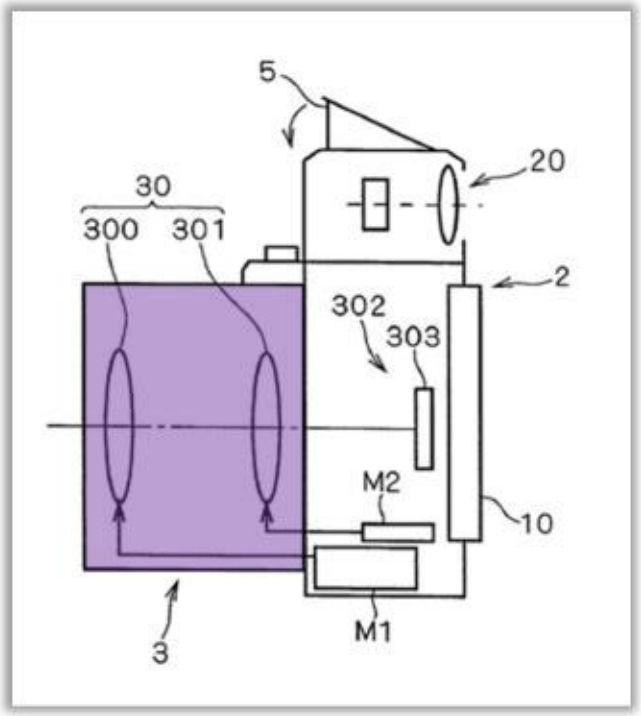


Ex-1005, Fig. 5.

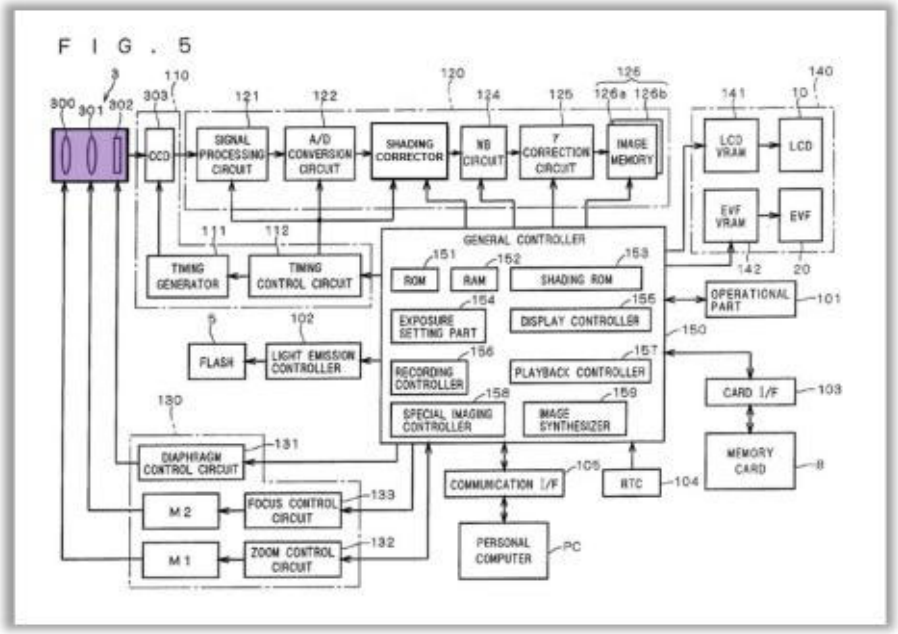
Niikawa thus discloses a digital camera mechanism (digital camera 1). Ex-1003, ¶¶118-119.

[6A-2] an optical lens mechanism,

Niikawa discloses that digital camera 1 has an imaging lens 3 (purple), including zoom lens 300 and focus lens 301. Ex-1005, [0066], [0067], [0076], [0089], Figs. 3, 5; Ex-1003, ¶¶69-70, 120.



Ex-1005, Fig. 3 (annotation added).

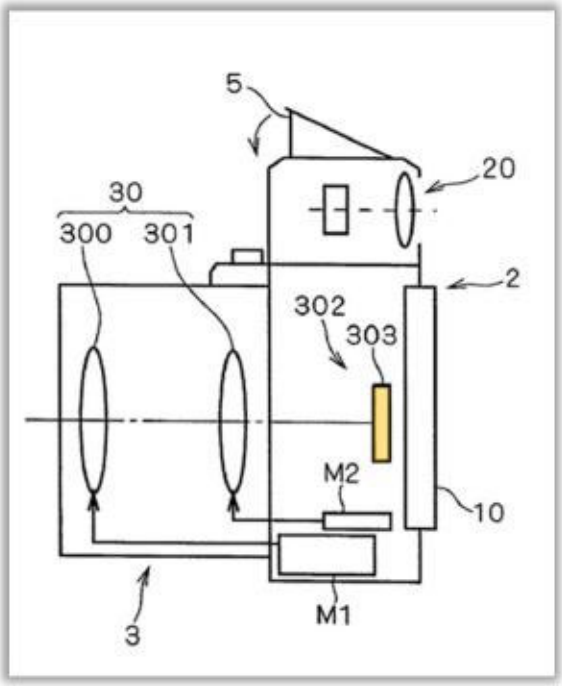


Ex-1005, Fig. 5 (annotation added).

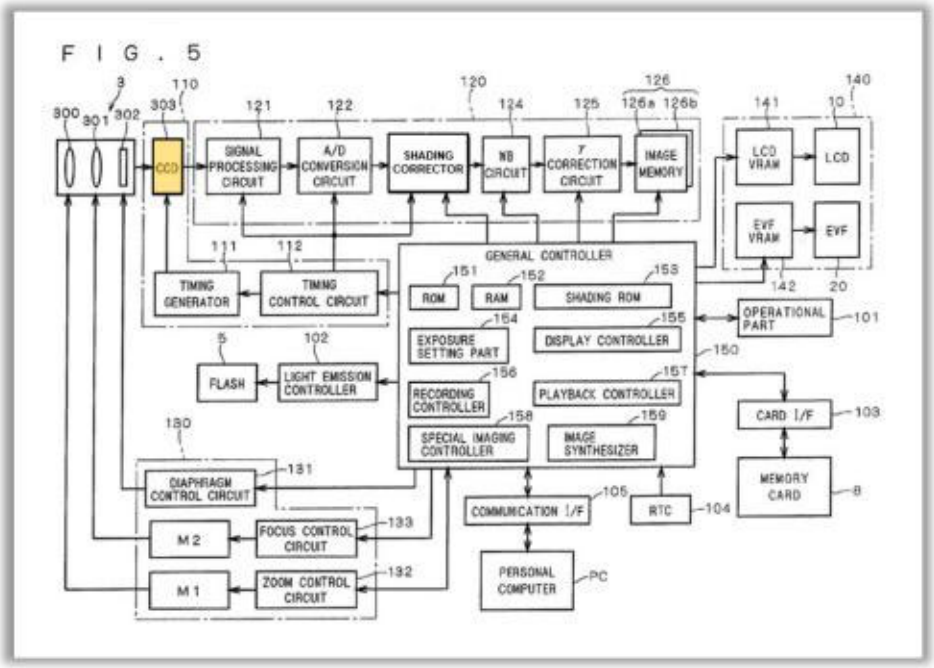
Niikawa thus discloses an optical lens mechanism (imaging lens 3). Ex-1003, ¶120.

[6A-3] a digital sensor,

Niikawa discloses that digital camera 1 has a digital sensor in the form of CCD 303 (yellow). Ex-1005, [0067], [0077], Figs. 3, 5, Claim 8 ("an image sensor for acquiring a first image and a second image for the same subject in different timings"). A CCD is a digital sensor according to the '339 Patent. Ex-1001, 2:48-51, 2:65-67, 5:6-22, 8:15-17, 13:63-66, 17:47-50, 18:25-30, 34:29-31.



Ex-1005, Fig. 3 (annotation added).

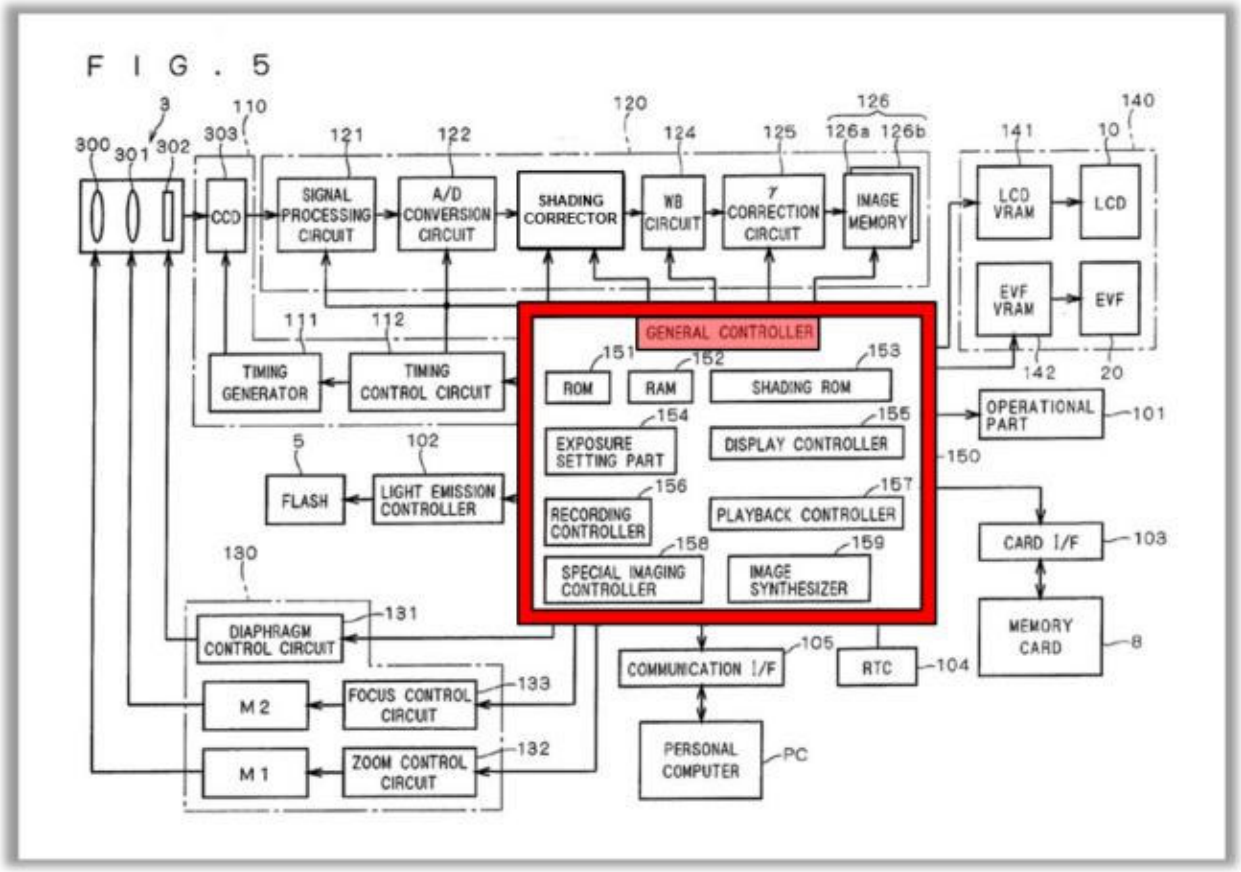


Ex-1005, Fig. 5 (annotation added).

Niikawa discloses a digital sensor (CCD 303). Ex-1003, ¶¶69, 72, 121-122.

[6A-4] an integrated circuit,

Niikawa discloses that digital camera 1 includes general controller 150 (red), which "is implemented by a microcomputer and performs centralized control of the exposure function and playback function." Ex-1005, [0082], [0084], [0095], Fig. 5. A POSA would have understood that a microcomputer is an integrated circuit. Ex-1003, ¶123.



Ex-1005, Fig. 5 (annotation added).

To the extent not disclosed by Niikawa, a POSA would have been motivated to implement Niikawa's general controller 150 as an integrated circuit. As reflected in claim 12 of the '339 Patent, microprocessors, application specific integrated

circuits (ASICs), or systems on a chip (SoCs) are examples of integrated circuits. Ex-1001, 39:8-11. A POSA knew that digital cameras used integrated circuits such as ASICs and microprocessors to perform various camera-related functionality. *E.g.*, Ex-1003, ¶¶39-41, 44-49, 113-114, 123-128; *see also* Ex-1029, [Abstract], [0023], [0027], [0029]-[0032], [0045], Figs. 1, 2 (disclosing an ASIC and CPU for correcting aberrations); Ex-1033, 2:7-8 ("Digital cameras include microprocessors . . . ."), 5:46-51 ("[M]any of the processes implemented in the digital camera may be implemented in or controlled by software operating in a microcomputer (μC) or digital signal processor (DSP) and/or an application specific integrated circuit."); Ex-1036, ¶[0014] ("[W]hile illustrated using a single ASIC 102, the digital camera 100 may include additional processors, digital signal processors (DSPs) and ASICs."). A POSA would know that implementing Niikawa's general controller 150 as an integrated circuit would have used conventional technologies (*e.g.*, a microprocessor) for its intended purpose of performing the functionality dictated by Niikawa's executable code. Ex-1003, ¶¶39-41, 113-114, 128, 131-134.

Indeed, even if Niikawa's general controller 150 was not fully integrated, a POSA would have understood that by integrating Niikawa's general controller would have enabled higher speeds, which is one of Niikawa's goals. Ex-1003, ¶¶129-130; Ex-1005, [0122]; Ex-1034, p.84 ("[S]hrinking dimensions on an integrated structure makes it possible to operate the structure at higher speed for the

same power per unit area."). A POSA would also have known that implementing electronics as an integrated circuit offers further advantages, including reduction in size of electronic components, reducing power consumption, and reducing cost. Ex-1003, ¶¶129-132 (citing Ex-1034, pp.82-83; Ex-1032, pp.545-546). This was a long-held understanding of the consequences of integration of electronics. *See, e.g.*, Ex-1034 (reprint of an article from 1965).

A POSA would have been motivated to implement Niikawa's general controller 150 as an integrated circuit because a POSA knew that electronics manufacturers were integrating "large-scale electronic systems on a single chip" as part of efforts toward miniaturization. Ex-1003, ¶131 (citing Ex-1032, pp.545-546). Integrating electronics into ICs allowed for more power, more reliable, smaller, and cheaper devices. Ex-1003, ¶132 (citing Ex-1034, pp.82-83). Thus, even if Niikawa's general controller was not an integrated circuit, it would have been obvious and advantageous to implement it as an IC. This would have simply substituted one known element (Niikawa's general controller 150) for another, more powerful, more reliable, smaller, and cheaper component (an integrated circuit) to obtain predictable results (implementing Niikawa's functionality in a more advanced and improved part). Ex-1003, ¶¶125-134.

A POSA would have had a reasonable expectation of success of implementing Niikawa's general controller 150 as an integrated circuit because integrated circuits

were known components and integrating computer hardware in integrated circuits had well-known benefits as outlined above. Ex-1003, ¶¶40-41, 130-131; Ex-1034, pp.82-83. Indeed, a POSA would have known that various integrated circuits were often used to perform various operations in digital cameras. *E.g.*, Ex-1033, 5:46-51 ("[M]any of the processes implemented in the digital camera may be implemented in or controlled by software operating in a microcomputer (μC) or digital signal processor (DSP) and/or an application specific integrated circuit (ASIC)."); Ex-1003, ¶¶40-43, 48, 127.

Niikawa thus discloses or renders obvious an integrated circuit. Ex-1003, ¶¶123-134.

[6A-5] a digital signal processor,

The claimed digital signal processor would have been obvious over Niikawa in view of Steinberg. Reference is made to the discussion of Limitation [6E] for a description of how the claimed DSP would have been obvious in the combined Niikawa-Steinberg system.

[6A-6] system software,

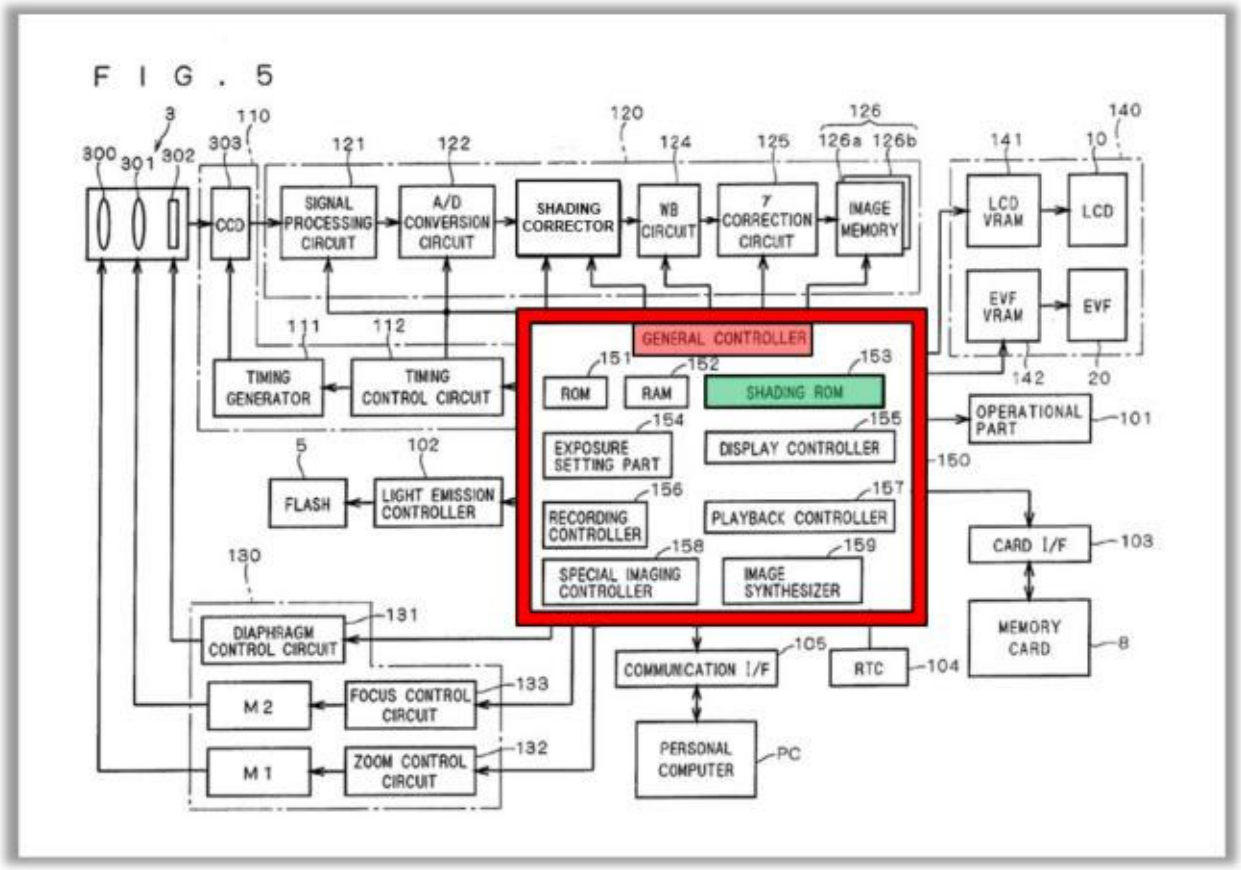
Niikawa discloses that general controller 150 has ROM 151 which stores programs for processing and controlling functions and components of digital camera 1. Ex-1005, [0096], *see also id.*, [0022] ("[T]he present invention is directed to a program product containing a program for executing an image processing."). The

'339 Patent describes "processing software" as "stored in either a microprocessor or an ASIC." Ex-1001, 21:67-22:1. A POSA would have understood that the programs stored in ROM 151 were system software. Ex-1003, ¶¶106-107, 136-137.

Niikawa thus discloses system software (programs stored in ROM 151). Ex-1003, ¶¶136-137. And, as explained above, and in further detail below, adding Steinberg's red eye filter software to Niikawa would have been obvious to a POSA in order to correct red eye caused from Niikawa's flash camera. *Supra* §IV.A.1; *infra*, discussion of Limitations [6D]-[6F].

[6A-7] a database management system and

Niikawa discloses that general controller 150 (red) accesses and retrieves correction tables stored in shading ROM 153, *i.e.*, the database (green). Ex-1005, [0082]-[0086], [0096], [0108] (teaching that correction tables store correction coefficients), Fig. 5. Each correction table is a matrix of inverse correction coefficients corresponding to the respective pixels of CCD 303 and the focal length and f-number at the time of imaging. *Id.*, [0083]-[0084]. A POSA would have understood that those correction tables are an example of a database. Ex-1014, 2:8-12 ("a database may be viewed as one or more tables of information"); Ex-1015, 1:36-39 ("Data records in a computer database are maintained in tables, which are a collection of rows all having the same columns."); Ex-1003, ¶¶138-143.



Ex-1005, Fig. 5 (annotation added).

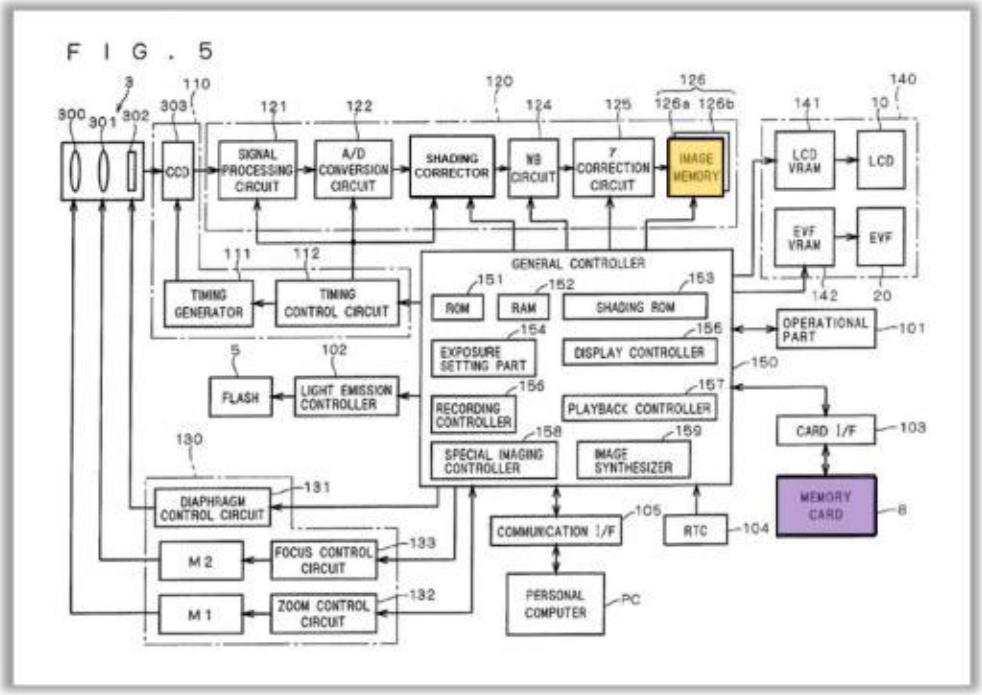
To the extent the claimed "database management system" ("DBMS") is not limited to a database, Niikawa also discloses a DBMS, as disclosed in the '339 Patent. General controller 150 includes ROM 151 which stores programs for controlling functions and components of digital camera 1. Ex-1005, [0096], Fig. 5. Those programs comprise a DBMS at least because they are software that retrieves image correction data associated with focal length and f-number at the time of imaging from the database among other things, discussed below (*e.g.*, Limitation

[6D]). *Id.*, [0082]-[0086], [0096], [0101], [0108], Figs. 5, 7-8; Ex-1003, ¶¶142-143, 153.

Niikawa thus discloses a database management system (the correction tables organized in shading ROM 153/general controller 150 and the programs stored in ROM 151). *Id.*, ¶121. And, as explained above and in further detail below, it would have been obvious to modify the Niikawa database management system to be able to store and retrieve reference and captured images as taught by Steinberg to allow for red eye removal in Niikawa's camera. *Supra* §IV.A.1; *infra*, discussion of Limitation [6D].

[6A-8] a memory storage sub-system;

Niikawa discloses that digital camera 1 has image memory 126 (orange) and memory card 8 (purple). Ex-1005, [0016], [0066], [0087], Figs. 2, 5. After image processing, the modified digital image files are stored in image memory 126 and memory card 8. *Id.*, [0032], [0079], [0086], [0092], [0100]-[0102], [0109]-[0110], [0121], Figs. 5, 8; Ex-1003, ¶¶71-72, 100-102, 144.

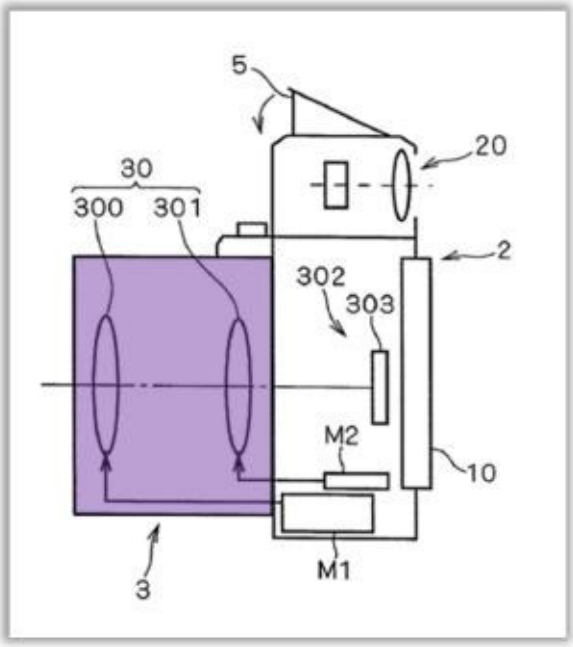


Ex-1005, Fig. 5 (annotation added).

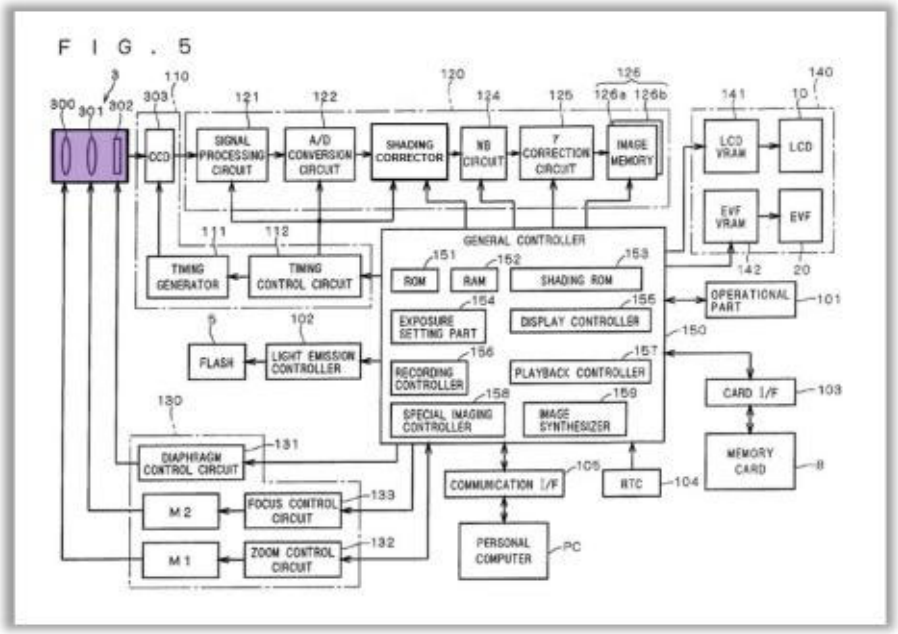
Niikawa thus discloses a memory storage sub-system (image memory 126 and/or memory card 8). Ex-1003, ¶144.

[6B] wherein the optical lens mechanism is a zoom lens or fixed focal length lens;

Niikawa discloses that digital camera 1 has an imaging lens 3 (purple), including zoom lens 300 and focus lens 301. Ex-1005, [0066], [0067], [0076], [0089], Figs. 3, 5; Ex-1003, ¶¶69, 120, 145-147.



Ex-1005, Fig. 3 (annotation added).



Ex-1005, Fig. 5 (annotation added).

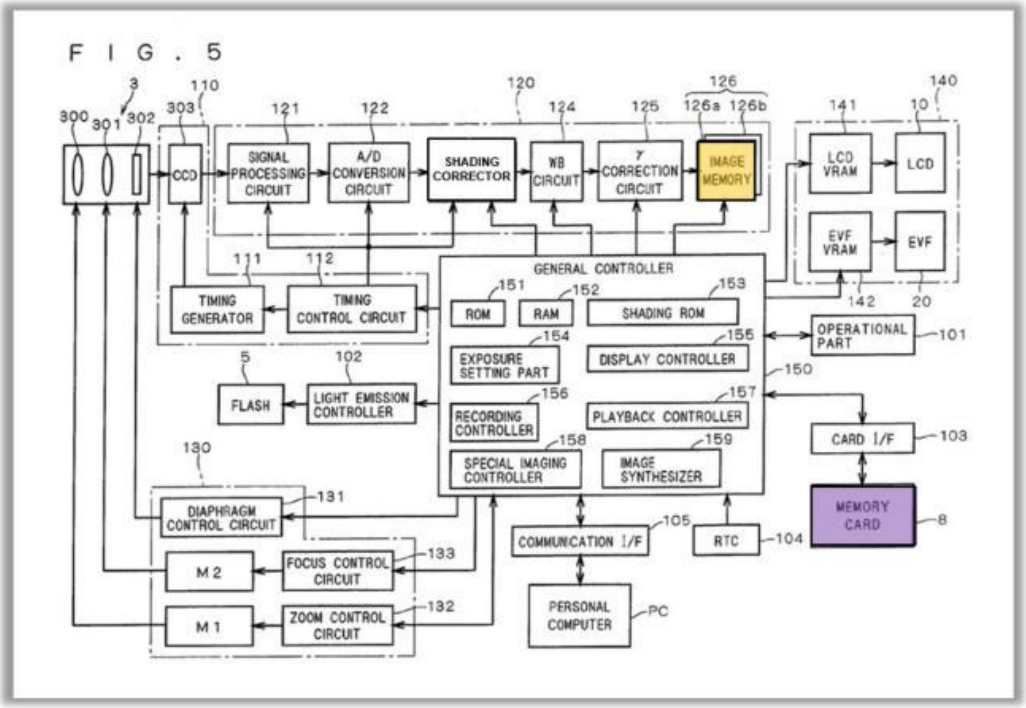
Niikawa disclose that the lens type (imaging lens 3 including zoom lens 300) may be a zoom lens. Ex-1003, ¶¶120, 145-147. Niikawa also discloses that the user can adjust zoom lens 300. Ex-1005, [0058] (describing settings for different focal

lengths), [0067], [0072], [0083]-[0084], [0089]-[0090], [0108]; *see also* Ex-1001, 26:18-19 ("This is as if each zoom lens contains a combination of multiple lenses of specific focal lengths."); Ex-1016, claim 9 ("wherein the [zoom] lens focal length alternates from specific fixed focal length lens settings in a succession of steps"); Ex-1003, ¶146.

Niikawa thus discloses that the optical lens mechanism is a zoom lens. Ex-1003, ¶¶145-147.

[6C] wherein the image data file is forwarded from the digital sensor to storage in memory;

Niikawa discloses that digital camera 1 has image memory 126 (orange) and memory card 8 (purple) which are memory in which image data is stored. Ex-1005, [0016], [0066], [0087], Figs. 2, 5. After image processing, the image is stored in image memory 126, then handled by recording controller (156) and stored on memory card 8 as a file (*e.g.*, a JPEG file). *Id.*, [0032], [0079], [0087], [0092], [0100]-[0102], [0109]-[0110], [0121], Figs. 5, 8; Ex-1003, ¶148.



Ex-1005, Fig. 5 (annotation added).

Niikawa thus discloses that the image data file is forwarded from the digital sensor (CCD 303), where it is captured, to storage in memory (either or both of image memory 126 or memory card 8). Ex-1003, ¶148.

[6D] wherein at least one optical and/or digital aberration in the image file are identified by comparing image files in the database management system by using the system software and the integrated circuit;

This limitation would have been obvious over Niikawa and Steinberg. Ex-1003, ¶¶90-115, 149-158. Further discussion of the Niikawa-Steinberg system and motivations to combine are explained above. *Supra* §IV.A.1. The following sections address the requirements of this limitation.

i. at least one optical and/or digital aberration in the image file are identified by comparing image files

As reflected in dependent claim 7 of the '339 Patent, an example of an optical aberration is "red eye." Ex-1001, 38:55-60. Steinberg thus teaches at least one optical and/or digital aberration in the image file—namely a red eye—is identified by comparing image files as recited in limitation [6D]. Ex-1003, ¶¶83-89, 150-151; Ex-1028, [0065] (explaining how regions from images are compared to determine if they are suspected of having red eye based on whether regions are red or not).

ii. in the database management system

As explained above, it would have been obvious to implement the combined Niikawa-Steinberg system such that the compared images used in the Steinberg technique are in the database management system. In other words, a POSA would have been motivated to temporarily store Steinberg's preview and captured images in a database management system when implemented in the context of Niikawa. Ex-1003, ¶¶95-105, 152-156; *supra* § IV.A.1. This is because a POSA would have appreciated that Niikawa's general controller 150 would need to have storage for the captured image and reference image(s) so that they may be accessed and compared to detect red eye. Ex-1003, ¶¶100-102.

Niikawa's general controller 150 performs "centralized control" of exposure and playback, as well as various image processing functions (*e.g.*, image synthesis and storage). Ex-1005, [0096]-[0097], [0111], [0118], [0121]. A POSA would have therefore been motivated to store the reference and captured images in storage within

general controller because captured images are operated on by the general controller before they are stored in memory card 8. Ex-1003, ¶¶152-156. Moreover, because Niikawa and Steinberg are silent as to the data structure(s) that the preview images would have been stored in, a POSA would have needed to select among a number of known storage techniques for storing images. One such choice available to a POSA was to store images in a database within the general controller. *See* Ex-1037, [0110], [0112], [0164], [0182]; Ex-1003, ¶¶42, 103-105.

iii. using the system software

As explained above, Niikawa describes a database management system including correction tables in ROM 153 and programs in ROM 151. *Supra*, discussion of Limitation [6A-7]. Steinberg explains that the preview or reference images should be stored in a "temporary storage space." Ex-1028, [0029]-[0030]. Niikawa's ROM 151, which is part of the database management system, stores a variety of "processing" and "control" programs. Ex-1005, [0096]. A POSA would have understood this to include Steinberg's red eye filtration programs. Ex-1003, ¶¶106-107, 157-158; *see also* Ex-1028, [0029] ("[M]any of the processes implemented in the digital camera may be implemented in or controlled by software . . . ."). Thus, as explained above, to implement Steinberg's red eye reduction technique in Niikawa's system, a POSA would have found installing Steinberg's algorithms alongside other camera control software in ROM 151 to be a good,

efficient, and effective choice because that is where Niikawa stores programs implementing camera functionality. Ex-1003, ¶¶106-107, 157-158.

Moreover, the storing of captured images that are compared in Steinberg's red eye removal process in a database maintained by Niikawa's general controller 150 would have combined prior art elements according to known methods (such as storing images in a database to be accessed later), using a known, conventional way to store images in digital cameras. Ex-1003, ¶¶95-105. Specifically, it was known to store images and use software for comparing those images to remove red eye as implemented by Steinberg. Ex-1003, ¶¶42, 95-105; Ex-1037, [0188] ("image database may be used to store images"). It was also a well-understood practice to store images in a database management system for later access, retrieval, and processing. Ex-1003, ¶¶42, 95-105. A POSA would have expected to succeed in comparing preview and captured images in a database management system to determine whether there were red eye artifacts based on a comparison of regions with red content.

Thus, storing Steinberg's programs and images in a database management system would have been obvious to a POSA seeking to implement Steinberg's red eye removal techniques in Niikawa's system. Ex-1003, ¶¶42, 95-105. Specifically, a POSA would have understood from Steinberg that one or more storage locations was needed in Niikawa's camera to store both the reference and captured images for

processing by the Steinberg red eye filtration algorithms. *Id*. Niikawa's general controller 150 performs "centralized control" of exposure and playback, as well as various image processing functions (*e.g*., image synthesis and storage), so a POSA would have been motivated to store the reference and captured images in storage within general controller 150 since captured images are operated on by the general controller before they are stored in memory card 8. Ex-1005, [0096]-[0097], [0111], [0118], [0121]; Ex-1003, ¶¶96-102. And since Niikawa and Steinberg are silent as to the data structure(s) that the preview images would have been stored in, a POSA would have needed to select among a number of known and available storage techniques for storing images, such as in a database within the general controller. *See* Ex-1037, [0110], [0112], [0164], [0182]; Ex-1003, ¶¶42, 103-105. Additional discussion of the obviousness of this aspect of the combined Niikawa-Steinberg system is discussed above. *Supra* §IV.A.1.

A POSA implementing Steinberg in the context of Niikawa would also have been motivated to use the system software and the integrated circuit to compare the preview and captured image to identify red eye. As explained above, Niikawa discloses a general controller 150 which is "implemented by a microcomputer." Ex-1005, [0082], [0084], [0095], Fig. 5. It would have been obvious to a POSA that Niikawa's general controller 150 is an integrated circuit, because as reflected in claim 12 of the '339 Patent, microprocessors, application specific integrated circuits

(ASICs), or systems on a chip (SoCs) are examples of integrated circuits. Ex-1001, 39:8-11; Ex-1003, ¶¶123-134. Niikawa's ROM 151 holds programs (system software), (Ex-1005, [0096]), and Steinberg explains that camera functionality is implemented using software executed by hardware, Ex-1028, [0029].

iv. using . . . the integrated circuit

Based on these teachings, a POSA would have used an integrated circuit and system software to perform Steinberg's comparison of captured and preview images to identify whether red eye is present in a captured image so that it may be corrected. Ex-1003, ¶¶94-108, 149-158. Not only would the express teachings of Niikawa and Steinberg lead a POSA to implement the combined Niikawa-Steinberg system in the claimed manner, but a POSA would have found it beneficial to use an integrated circuit to perform image processing functionality for the reasons explained above where the obviousness of using an integrated circuit in image processing is explained. *Supra*, discussion of Limitation [6A-4]; *see also* Ex-1001, 39:8-11 (claim 12 of the '339 Patent recites that microprocessors, application specific integrated circuits (ASICs), or systems on a chip (SoCs) are examples of integrated circuits); Ex-1003, ¶¶39-40, 129-132. And, Steinberg explicitly contemplates implementing pre-capture and red eye correction using software in the camera (system software). Ex-1028, [0032]; Ex-1003, ¶¶83-86.

And, a POSA would have reasonably expected to succeed in arriving at the combined Niikawa-Steinberg system using an integrated circuit given the benefits of integration and the fact that integration of electronic components had been around for decades before the '339 Patent's effective filing date and integrated circuits had often been used in dividual cameras. Ex-1003, ¶133; Ex-1034, pp.82-83. Additional discussion of the motivation to arrive at the combined Niikawa-Steinberg system is provided above along with a discussion of reasonable expectation of success. *Supra* §IV.A.1.

[6A-5] a digital signal processor; [6E] wherein the at least one filtration algorithms required to correct the at least one optical and/or digital aberration are sent from the integrated circuit to the digital signal processor;

These limitations would have been obvious over the combination of Niikawa and Steinberg. It would have been obvious to send at least one filtration algorithm required to correct the at least one optical aberration (*e.g.*, Steinberg's red eye filtration algorithm) from the integrated circuit to a digital signal processor (DSP) under the claim construction discussed above. *Supra* §III.E. More specifically, within the Niikawa-Steinberg system, POSA would have found it obvious to send the red eye filtration algorithm (from the Niikawa ROM that stores programs within the Niikawa integrated circuit) to Steinberg's DSP (which implements Steinberg's red eye identification and correction techniques within Niikawa's general controller 150) as demonstrated in the following discussion. Ex-1003, ¶160.

As explained above, Steinberg describes software that compares captured images and preview images to (1) identify whether the captured image includes red eye and (2) correct the red eye in the captured image. Ex-1028, [0032], [0055], [0059]; *supra* §IV.A.1. Steinberg's software is executed, for example, by a DSP. Ex-1028, [0029] ("It can be appreciated that many of the processes implemented in the digital camera may be implemented in or controlled by software operating in a . . . digital signal processor (DSP) . . . ."); Ex-1003, ¶¶162-165. A POSA would have understood that DSPs were better for use in embedded systems than general purpose microprocessors. Ex-1003, ¶¶39-41, 44-48; Ex-1038, p.1532 ("It is concluded that Digital Signal Processors (DSPs) are better suited to embedded systems . . . ."), p.1535 ("DSP devices definitely exhibit a clear advantage on performance per processor basis, and in embedded real time systems, they will prove more cost effective."). Steinberg's DSP is implemented as shown below in Fig. 1 (and given the generic name "processor," Ex-1028, [0029]).

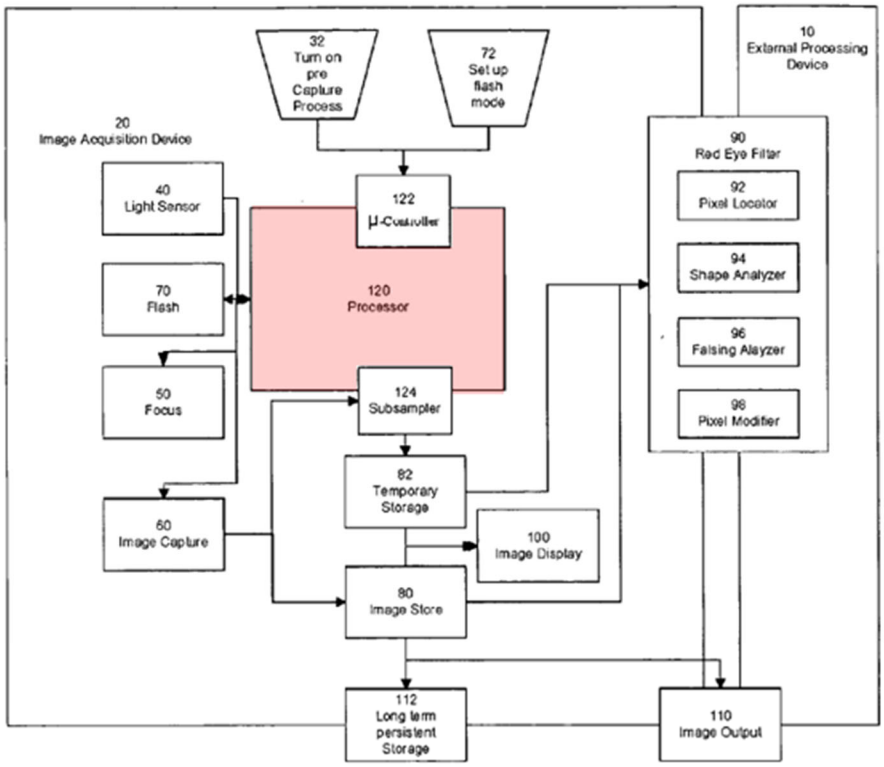


Figure 1

Ex-1028, Fig. 1 (annotation added).

A POSA implementing the combined Niikawa-Steinberg system would have found it obvious to implement Steinberg's DSP in Niikawa's general controller/integrated circuit for the reasons described above. *Supra* §IV.A.1. The POSA would have found the claimed configuration obvious over Niikawa and Steinberg because Steinberg uses software executed by a digital signal processor (DSP) to (1) compare images—at least one taken without a flash and one taken with a flash, (2) identify suspected red eye in the image, and (3) correct the red eye by

modifying pixel values, and Niikawa's ROM 151 stored software to control various camera functions. Ex-1028, [0030], [0032], [0054], [0065]; Ex-1005, [0096]; Ex-1003, ¶¶109-115, 159-167. In combining Steinberg and Niikawa, Steinberg's software stored in ROM 151 would have been sent from Niikawa's IC (*i.e.*, ROM 151 integrated into the IC making up the general controller) to the Steinberg DSP implemented in the Niikawa IC so that red eye artifacts that are identified in the captured image can be removed using Steinberg's techniques. Ex-1003, ¶¶166-167.

A POSA would have been motivated to execute Steinberg's red eye correction (*i.e.*, "filtration") algorithms in the digital signal processor (Steinberg's processor 120) and provide those algorithms from Niikawa's ROM 151 in the integrated circuit (general controller 150). Ex-1003, ¶¶101-102, 160, 166-167; Ex-1028, [0010]-[0011], [0030]-[0032], Fig. 1 (describing a "red-eye filter" performing red-eye identification and removal processes implemented in computer code).

A POSA would have been motivated to modify the programs stored in general controller 150 to include red eye correction because it would have used a known technique (identifying algorithms in a database) to improve a similar device (general controller 150 and Steinberg's processor 120) in the same way (correcting different types of aberrations). Ex-1003, ¶¶95, 106-108. Specifically, Niikawa's ROM 151 stored software to control various camera functions, and a POSA would have been motivated to incorporate Steinberg's red eye filtration algorithms into Niikawa's

ROM 151 to enable Niikawa's camera to remove undesirable red eye from images, thus providing better quality images. Ex-1005, [0096]; Ex-1028, [0032]; Ex-1003, ¶¶106-108, 166-167. Additional discussion of the motivation to arrive at the combined Niikawa-Steinberg system is provided above along with a discussion of reasonable expectation of success. *Supra* §IV.A.1.

Accordingly, Niikawa in view of Steinberg render obvious wherein the at least one filtration algorithms required to correct the at least one optical and/or digital aberration (multiplication using correction coefficients/or other aberration correction algorithms, including red eye corrections) are sent from the integrated circuit (general controller 150) to the digital signal processor (Steinberg's processor 120). Ex-1003, ¶¶159-167.

[6F] wherein the at least one optical and/or digital aberration from the optical lens mechanism are corrected by using the digital signal processor to apply digital filtration algorithm; and

The combined Niikawa-Steinberg system would have been configured to correct the at least one optical aberration from the optical lens mechanism, which, according to claim 7 of the '339 Patent, includes "red eye," Ex-1001, 38:55-60. As explained above in connection with Limitation [6E], using Steinberg's DSP and executing Steinberg's "red-eye filter 90" in Niikawa's general controller 150 would have allowed the DSP to apply Steinberg's digital filtration algorithm to perform red eye correction. *Supra*, discussion of Limitation [6E]. Therefore, for the reasons

already explained, the combined Niikawa-Steinberg system would have corrected the at least one optical aberration from the optical lens mechanism by using the DSP to apply the Steinberg digital filtration algorithm to identify and correct red eye. *Supra* §IV.A.1, discussion of Limitation [6E]; Ex-1003, ¶¶109-115, 159-168.

[6G] wherein the modified digital file consisting of the digital data optimized from the at least one aberration that are corrected from the original optical image is stored in memory.

Niikawa discloses that digital camera 1 has memory card 8 (purple). Ex-1005, [0016], [0066], [0087], Figs. 2, 5. After image processing, the modified digital image files are stored in memory card 8. *Id.*, [0032], [0092], [0095], [0100]-[0102], Figs. 5, 8; Ex-1003, ¶¶71, 100-102, 169-170. In the combined Niikawa-Steinberg system, a POSA would have stored the modified digital file—*i.e.*, a file that included the corrections to the original optical image applied by Niikawa and the red-eye removal of Steinberg—in memory card 8. Ex-1003, ¶¶169-170. Indeed, both Niikawa and Steinberg store modified digital files in memory such as memory card 8. Ex-1005, [0101], Fig. 8; Ex-1028, [0030] ("The modified image may be . . . saved on a persistent storage 112 which can be . . . removeable storage such as CF card, SD card or the like . . . ."). Thus, in the combined system, a POSA would have understood that the modified digital file consisting of the digital data optimized from the at least one aberration (*e.g.*, the image after red eye removal) that are corrected

from the original optical image (*e.g.*, the original captured image before red eye removal) is stored in memory (*e.g.*, Niikawa's memory card 8).

3. Claim 7

[7] The system of claim 6: wherein the optical aberrations include spherical, comatic, lens distortion, astigmatism, chromatic aberrations, curvature of field, pin cushion, barrel distortion, scattered light, red eye, dust and/or flare types of optical aberrations.

As explained in connection with the discussion of claim 6, the combined Niikawa-Steinberg system would have corrected aberrations including "red eye." *Supra* §IV.A.2. Therefore, for the reasons explained in connection with claim 6, claim 7 would have been obvious. Ex-1003, ¶171

4. Claim 10

[10] The system of claim 6: wherein the digital signal processor applies color filtration to the image file.

Claim 10 would have been obvious over Niikawa in view of Steinberg. As explained above, in the combined Niikawa-Steinberg system, Steinberg's DSP would be used to perform the red eye filtration techniques described by Steinberg. *Supra* §IV.A.1. A POSA would have appreciated that Steinberg's red eye filtration applies color filtration to the image file. Ex-1003, ¶¶172-176. For example, Steinberg explains in the following when comparing images (and regions of images that have suspected red eye):

> If the regions are red in both cases, 592-6=YES, the region will not be marked as red-eye, no action will be taken and

> the process will continue to the next suspected region, 592-3. If the region is red in the acquired image I′(x,y) while the corresponding region is not red in the preview image P″(x,y), 592-6=NO, then the region will be marked as suspected red-eye, 592-8.

Ex-1028, [0065]. Then, a pixel modifier is used to modify "the color of the pixels within a regio indicative of a red-eye phenomenon." *Id.*, [0014]; *see also id.*, [0030], [0054] (explaining how the pixel modifier of U.S. Patent No. 6,407,777 (Ex-1039) is incorporated by reference). Because Steinberg modifies the color of pixels, to perform red eye filtration, a POSA would understand that it applies color filtration to the image file. Ex-1003, ¶¶172-176.

B. Secondary Considerations of Non-Obviousness

Petitioner is unaware of any applicable secondary considerations of non-obviousness. None were identified or asserted during prosecution. *See generally* Ex-1002. Regardless, even if such considerations existed, none would overcome the strong prima facie showing of obviousness.

V. Discretionary Denial is Unwarranted

A. *General Plastic* Does Not Weigh Against Institution

Each *General Plastic* factor favors institution or is neutral. The '339 Patent has been subject to four IPR Petitions: *Canon Inc., v. Optimum Imaging Technologies, LLC*, No. IPR2020-01322 ("Canon IPR"), denied on discretionary

grounds, *Sony Corp., v. Optimum Imaging Technologies*, *LLC*, No. IPR2024- 00925 ("Sony IPR"), instituted, *Nikon Corp. v. Optimum Imaging Technologies, LLC*, No. IPR2024-01372 ("Nikon IPR"), pending, and *Samsung Electronics Co., Ltd. et al v. Optimum Imaging Technologies LLC*, No. IPR2025-00462 ("Samsung Copycat IPR"), pending.

Factor One favors institution because this Petition challenges claims that have not been challenged in any previous IPR. Moreover, Petitioners have had no involvement with the Sony IPR, Canon IPR, or Nikon IPR, and Petitioners lack any legally significant relationship with Sony, Canon, or the group of parties that filed the Nikon IPR. Moreover, the Samsung's Copycat IPR on the '339 Patent is substantively identical to the Nikon IPR, and will be followed by a motion for joinder promptly following a favorable institution decision in the Nikon IPR. Moreover, Samsung's Copycat IPR challenges different claims than the present Petition. "[F]actor one necessarily outweighs the other *General Plastic* factors," and as such it strongly weighs against discretionarily denying this inaugural challenge to claims 6, 7, and 10 of the '339 Patent. *Videndum Production v. Rotolight*, IPR2023-01218, Paper 12 at 6 (PTAB Apr. 19, 2024) (Director Review).

Factor Two is at least neutral. While this is Petitioner's second challenge to the '339 Patent and raises prior art Petitioner was aware of at the time it filed the Samsung Copycat IPR, Petitioner has taken an approach before the Board that is

intended to reduce the burden on the Board and Patent Owner. The timing of the Petitions vis-à-vis the timing of Patent Owner's infringement contentions and disclosure of asserted claims reveals the issue Samsung faced when evaluating its pursuit of *inter partes* review. That timeline is:

- **May 20, 2024** – Sony IPR filed on '339 Patent;
- **August 30, 2024** – Nikon IPR filed on '339 Patent;
- **September 27, 2024** – Patent Owner serves its Infringement Contentions, Ex-1035, p.4.

Thus, both Sony and Nikon filed their IPR petitions before Patent Owner disclosed which claims it was asserting in litigation. While Patent Owner had not previously asserted claim 6 or its dependent claims against Canon in earlier litigation, Patent Owner chose to assert those claims in this case, perhaps to avoid having all asserted claims being subject to pending IPR petitions. Ex-1035, p.4. And, while Patent Owner withdrew allegations of infringement of certain previously-unchallenged patent claims in January 2025, it has not withdrawn its allegations of infringement as to the claims challenged in this Petition. Ex-1052. To minimize the burden on the Board and Patent Owner, Petitioner has chosen to file two petitions—one that presents the same challenges in the Nikon IPR, which was filed with the intention of seeking joinder to the Nikon IPR—and this Petition, which raises only previously unchallenged claims. Thus, while Petitioner knew of both Niikawa and

Steinberg when it filed its earlier IPR petition, that prior art was not applied because Petitioner was seeking to mirror the issues presented by Nikon for trial in that earlier-filed proceeding to allow for joinder. Thus, although Petitioner was aware of the prior art when it filed its Copycat IPR against the '339 Patent, that factor should not weigh against institution and should be neutral here on these particular facts.

Factor Three favors institution. While Patent Owner has filed preliminary responses in both the Sony IPR and Nikon IPR, those preliminary responses are directed to different claims and do not address the combination of references presented here. Moreover, while the Petitioner has received the Board's Institution Decision in the Sony IPR, that IPR was instituted as to different claims and different references than those presented here. Thus, the gamesmanship concerns that underly the third *General Plastic* factor is not present in this case. Thus, this factor should favor institution.

Factors Four and Five favor institution. Petitioner had no involvement with the Sony IPR, Canon IPR, or Nikon IPR, so—unlike in *General Plastic*—it does not make sense to hold Petitioner responsible for the time elapsed since filing of an unrelated petition. And, as described above, the Samsung Copycat IPR is substantively identical to the Nikon IPR and will be followed by a motion for joinder promptly following a favorable institution decision in the Nikon IPR. Regardless, Petitioner pursued its unpatentability ground promptly and is filing this petition

within weeks of filing its Copycat IPR against the '339 Patent. Indeed, as to Factor Five, this Petition does not challenge the same claims as those challenged in the earlier petitions, and thus there has been no delay between filings of multiple petitions directed to the "same claims of the same patent." *General Plastic*, IPR2016-01357, p.9.

Factor Six favors institution because this Petition raises grounds not raised in the Sony IPR, Canon IPR, Nikon IPR, or Samsung Copycat IPR, in part because the present Petition challenges claims of the '339 Patent that are not subject to any other IPR challenges. Accordingly, IPR of the ground raised here makes good use of the Board's limited resources for "improving patent quality by reviewing the merits of the [raised] challenges." *Code200, UAB v. Bright Data, Ltd*., IPR2022-00861, Paper 18 at 6.

Factor Seven favors institution because nothing in this Petition will impede the Board from issuing a final written determination within one year of IPR institution. In fact, it challenges three claims on a single ground and should present a streamlined review for the Board.

B. *Sotera* Stipulation Moots *Fintiv*

Petitioner hereby stipulates that if trial is instituted on this Petition, it will not asserted that any of the claims challenged in this proceeding are invalid on any ground that Petitioner raised or reasonably could have raised during this *inter partes*

review. The current guidance from the Office states that "the PTAB will not discretionarily deny institution in view of parallel district court litigation where petitioner presents [such] a stipulation…." *See* Director Vidal's June 21, 2022 interim procedure for discretionary denials (the "June 21st Memo") available at: https://www.uspto.gov/sites/default/files/documents/interim_proc_discretionary_denials_aia_parallel_district_court_litigation_memo_20220621_.pdf. In light of Petitioner's stipulation, discretionary denial under *Fintiv* is unwarranted.

C. The Board Should Not Deny Institution Under 35 U.S.C. § 325(d)

Discretionary denial is unwarranted because the Office never considered the patentability of Challenged Claims over any of the grounds here, or art substantially similar thereto, failing *Advanced Bionics* step one. Moreover, the Canon IPR was denied on discretionary grounds and the Office did not consider Niikawa or the substantive arguments.

VI. Mandatory Notices

A. Real Party-in-Interest

Petitioner certifies that they are the only real parties-in-interest.

B. Related Matters

As mentioned above, the Canon IPR, Sony IPR, Nikon IPR, and Samsung Copycat IPR involved the '339 Patent. *See* IPR2020-01322, IPR2024-00925, and IPR2024-01372, IPR2025-00462.

The following district court actions involve the ’339 Patent.

1. U.S. District Court for the Eastern District of Texas.

(i) *Optimum Imaging Technologies LLC v. FUJIFILM Corporation*, Case No. 4-23-cv-00922; (ii) *Optimum Imaging Technologies LLC v. Nikon Corporation*, Case No. 4-23-cv-00923; (iii) *Optimum Imaging Technologies LLC v. Olympus Corporation, et al*., Case No. 4-23-cv-00924; (iv) *Optimum Imaging Technologies LLC v. Panasonic Corporation*, Case No. 4-23-cv-00926; (v) *Optimum Imaging Technologies LLC v. Sony Corporation*, Case No. 4-23-cv-00928; (vi) *Optimum Imaging Technologies LLC v. Samsung Electronics Co., Ltd*., Case No. 4:23-cv-00927; (vii) *Panasonic Entertainment & Communication Co., Ltd.* v. *Optimum Imaging Technologies LLC*, No. 4:24-cv-00847.

2. U.S. District Court for the Western District of Texas

Canon Inc. v. Optimum Imaging Technologies LLC, Case No. 1:20-cv-01238 (Terminated April 28, 2021).

3. U.S. District Court for the Northern District of California

FUJIFILM North America Corporation v. Optimum Imaging Technologies LLC, Case No. 4:24-cv-03297.

Out of an abundance of caution, Petitioner also notes that the ’339 Patent is in the same family as U.S. Patent No. 10,877,266. Nikon is currently challenging the ’266 Patent in IPR2024-01374. Sony has challenged the ’266 Patent in IPR2024-01046. Samsung is currently challenging the ’266 Patent in IPR2025-00463.

C. Lead and Back-up Counsel Under 37 C.F.R. §42.8(b)(3) and Service Information under 37 C.F.R. §42.8(b)(4)

Petitioner designates the following lead and back-up counsel:

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Service on Petitioner may be made by mail or hand delivery to: Greenberg Traurig, LLP, 1750 Tysons Boulevard, Suite 1000, McLean, VA 22102. Petitioner also consents to and prefers electronic service by emailing Samsung-OIT-IPRs@gtlaw.com and counsel of record.

D. Fees

The required fee is being paid electronically through P-TACTS.

Dated: February 21, 2025

Respectfully Submitted,

/Andrew R. Sommer/

Andrew R. Sommer
Reg. No. 53,932

CERTIFICATE OF WORD COUNT

The undersigned certifies that the foregoing PETITION FOR *INTER PARTES* REVIEW complies with the type volume limitation in 37 C.F.R. § 42.24(a)(1)(i). According to the utilized word-processing system's word count, the petition—excluding the caption, table of contents, table of exhibits, mandatory notices, certificate of word count, and certificate of service—contains 8,852 words.

Dated: February 21, 2025

/Andrew R. Sommer/

Andrew R. Sommer

Attorney for Petitioner

CERTIFICATE OF SERVICE

The undersigned certifies that the foregoing **Petition for *Inter Partes Review***, the associated **Powers of Attorney**, and **Exhibits 1001 to 1005, 1014 to 1016, 1021 to 1022, 1025 to 1030, and 1032 to 1054** were served by UPS Priority Overnight on the correspondence address of record indicated in the Patent Office's Patent Center system for U.S. Patent No. 8,451,339:

The Law Office of Michael J. Scheer
5531 Murietta Avenue
Sherman Oaks, CA 91401
UNITED STATES

Dated: February 21, 2025

/Andrew R. Sommer/

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Attorney for Petitioner