

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

APPLE, INC.,
Petitioner,

v.

COREPHOTONICS LTD.,
Patent Owner.

IPR2020-00906
Patent 10,225,479 B2

Before BRYAN F. MOORE, JOHN F. HORVATH, and
MONICA S. ULLAGADDI, *Administrative Patent Judges*.

HORVATH, *Administrative Patent Judge*.

JUDGMENT
Determining No Challenged Claims Unpatentable
35 U.S.C. § 318(a)

I. INTRODUCTION

A. *Background and Summary*

Apple, Inc. (“Petitioner”) filed a Petition requesting *inter partes* review of claims 19–22 (“the challenged claims”) of U.S. Patent No. 10,225,479 B2 (Ex. 1001, “the ’479 patent”). Paper 3 (“Pet.”), 10. Corephotonics Ltd. (“Patent Owner”) filed a Preliminary Response. Paper 8 (“Prelim. Resp.”). Upon consideration of the Petition and Preliminary Response, we instituted *inter partes* review of all challenged claims on all grounds raised. Paper 10 (“Dec. Inst.”).

Patent Owner filed confidential (Paper 15) and public (Paper 16) versions of a Response to the Petition. *See* Paper 16 (“PO Resp.”).¹ Petitioner filed confidential (Paper 24) and public (Paper 23) versions of a Reply. *See* Paper 23 (“Pet. Reply”). Patent Owner filed a Sur-Reply. *See* Paper 33 (“PO Sur-Reply”). An oral hearing was held on August 12, 2021, and the hearing transcript is included in the record. *See* Paper 52 (“Tr.”).

We have jurisdiction under 35 U.S.C. § 6(b). This is a Final Written Decision under 35 U.S.C. § 318(a) and 37 C.F.R. § 42.73. For the reasons set forth below, we find Petitioner has failed to demonstrate by a preponderance of evidence that claims 19–22 of the ’479 patent are unpatentable on the grounds raised in the Petition.

B. *Real Parties-in-Interest*

Petitioner and Patent Owner identify themselves, respectively, as the real parties-in-interest. Pet. 1; Paper 5, 1.

¹ Throughout this Decision, unless noted otherwise, we cite to the public versions of the papers filed by the parties.

C. Related Matters

Petitioner and Patent Owner identify *Corephotonics Ltd. v. Apple Inc.*, 5:19-cv-04809 (N.D. Cal.), as a district court proceeding that can affect or be affected by this proceeding, and Petitioner also identifies IPR2020-00905 as an *inter partes* review that can affect or be affected by this proceeding. Pet. 1; Paper 5, 1. In addition, we note that the '479 patent is part of a family of patents and patent applications that include at least U.S. Patent Nos. 10,326,942; 10,015,408; 9,661,233; and 9,185, 291. Ex. 1001, code (63). Many of these patents were or currently are involved in *inter partes* review proceedings that could affect or be affected by a decision in this proceeding.

D. Evidence Relied Upon²

Reference		Effective Date	Exhibit
Parulski	US 7,859,588 B2	Dec. 28, 2010	1005
Soga ³	JP 2007/259108 A	Oct. 4, 2007	1006
Morgan-Mar	US 8,989,517 B2	Mar. 24, 2015	1009
Kawamura ⁴	JP S5862609 A	Apr. 14, 1983	1012
Ogata	US 5,546,236	Aug. 13, 1996	1026

E. Instituted Grounds of Unpatentability

We instituted review on the following grounds:

Ground	Claims	35 U.S.C. §	References
1	19, 20	103(a)	Parulski, Ogata, Kawamura, Soga

² Petitioner also relies upon the Declarations of Fredo Durand, Ph.D. (Exs.1003, 1038) and José Sasián, Ph.D. (Exs. 1021, 1039).

³ Soga is a *non-certified* translation of a Japanese Patent Application Publication originally published in Japanese. *See* Ex. 1006, 18–30.

⁴ Kawamura is a certified translation of an Unexamined Japanese Patent Application Publication originally published in Japanese. *See* Ex. 1012, 10–16.

Ground	Claims	35 U.S.C. §	References
2	21, 22	103(a)	Parulski, Ogata, Kawamura, Soga, Morgan-Mar

II. ANALYSIS

A. The '479 Patent

The '479 patent is directed to “a thin (e.g., fitting in a cell-phone) dual-aperture zoom digital camera with fixed focal length lenses” that is configured to use “partial or full fusion to provide a fused image in still mode.” Ex. 1001, 3:18–23. Figure 1A, reproduced below, illustrates dual-aperture zoom digital camera 100.

100

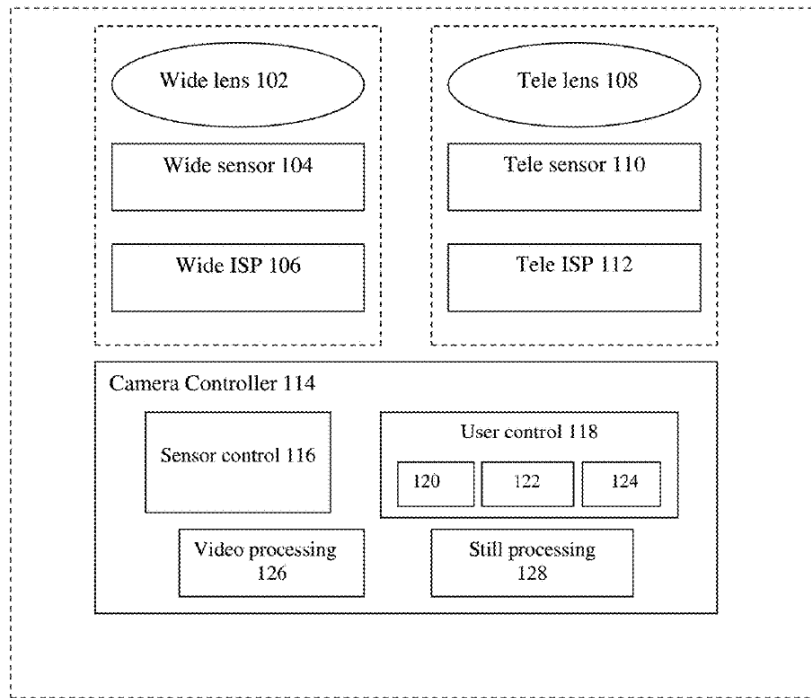


FIG. 1A

Figure 1A is a “block diagram illustrating a dual-aperture zoom” digital camera 100. *Id.* at 5:64–65. Camera 100 includes a wide imaging subsystem consisting of wide lens 102, wide sensor 104, and wide image

signal processor (“ISP”) 106, and a tele imaging subsystem consisting of tele lens 108, tele sensor 110, and tele ISP 112. *Id.* at 6:24–29.

Camera 100 also includes controller 114, which includes sensor control 116, user control 118, video processing module 126 and still processing module 128. *Id.* at 6:33–37. User control 118 controls various camera functions, including, operational mode 120, region of interest (“ROI”) 122, and zoom factor (“ZF”) 124. *Id.* at 6:38–40. Zoom factor 124 allows a user “to choose a zoom factor.” *Id.* at 6:50–51. Sensor control 116 chooses “which of the sensors is operational” based on the selected zoom factor. *Id.* at 6:41–45. ROI function 122 allows a user to “choose a region of interest,” i.e., a sub-region “on which both sub-cameras are focused.” *Id.* at 6:46–50.

The dual lenses allow camera 100 to take an image having a shallow depth-of-field (“DOF”) “by taking advantage of the longer focal length of the Tele lens.” *Id.* at 4:23–27. The image taken with the Tele lens can be enhanced “by fusing data from an image captured simultaneously with the Wide lens.” *Id.* at 4:27–30. For example, the Tele lens can focus “on a subject of the photo” and the Wide lens can focus on “a closer distance than the subject so that objects behind the subject appear very blurry.” *Id.* at 4:30–34. Then, a shallow depth-of-field image can be formed when “information from the out-of-focus blurred background in the Wide image is fused with the original Tele image background information, providing a blurrier background and even shallower DOF.” *Id.* at 4:34–38.

The process for fusing images taken with the Wide and Tele lenses is shown in Figure 5 of the ’479 patent, which is reproduced below.

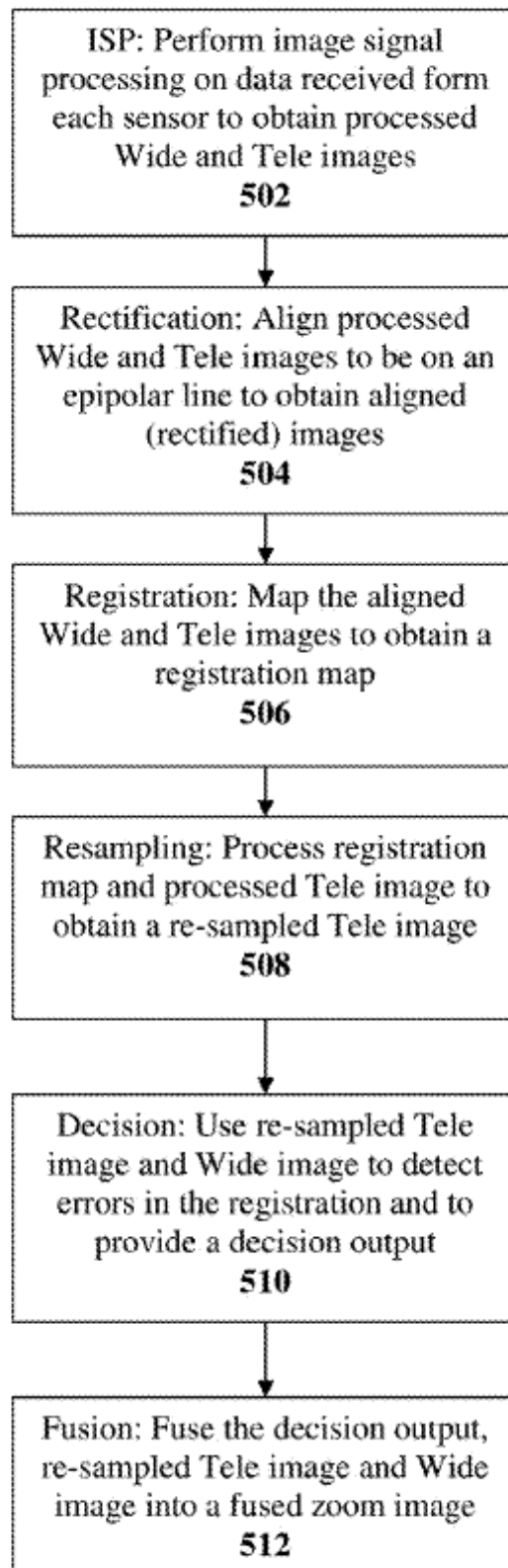


Figure 5 is a flow chart depicting a method for acquiring a zoom image in a dual lens camera. *Id.* at 9:39–40. At step 502, separate images are captured by each of the Wide and Tele lenses. *Id.* at 9:40–44. At step 504, these images are aligned on an epipolar line. *Id.* at 9:46–47. At step 506, a registration map is generated. *Id.* at 9:47–49. At step 508, the registration map is used to resample the Tele image. *Id.* at 9:50–51. At step 510, Tele image pixel values are compared to Wide image pixel values, and if a significant difference is detected, the Wide image pixel values are chosen for the output image. *Id.* at 9:51–58. Finally, at step 512, a fused image is generated from the re-sampled Tele image and the Wide image. *Id.* at 9:58–60.

B. Illustrative Claim

Claims 19 is the only independent claim challenged. *See* Ex. 1001, 14:66–15:32. Claims 20–22 depend directly or indirectly from claim 19. *Id.* at 15:33–15:48. Claim 19 is illustrative of the challenged claims and is reproduced below.

19. A dual-aperture digital camera for imaging an object or scene, comprising:
 - a) a Wide camera comprising a Wide lens and a Wide image sensor, the Wide camera having a respective field of view FOV_W and being operative to provide a Wide image of the object or scene;
 - b) a Tele camera comprising a Tele lens and a Tele image sensor, the Tele camera having a respective field of view FOV_T narrower than FOV_W and being operative to provide a Tele image of the object or scene, wherein the Tele lens has a respective effective focal length EFL_T and total track length TTL_T fulfilling the condition $EFL_T/TTL_T > 1$;
 - c) a first autofocus (AF) mechanism coupled mechanically to, and used to perform an AF action on the Wide lens;

- d) a second AF mechanism coupled mechanically to, and used to perform an AF action on the Tele lens, wherein the Wide and Tele lenses have different F numbers $F\#_{Wide}$ and $F\#_{Tele}$, wherein the Wide and Tele image sensors have pixels with respective pixel sizes Pixel size_{Wide} and Pixel size_{Tele} wherein Pixel size_{Wide} is not equal to Pixel size_{Tele}, and wherein the Tele camera has a Tele camera depth of field (DOF_T) shallower than a DOF of the Wide camera (DOF_W); and
- e) a camera controller operatively coupled to the first and second AF mechanisms and to the Wide and Tele image sensors and configured to control the AF mechanisms, to process the Wide and Tele images to find translations between matching points in the images to calculate depth information and to create a fused image suited for portrait photos, the fused image having a DOF shallower than DOF_T and having a blurred background.

Id. at 14:66–15:32.

C. Level of Ordinary Skill in the Art

Petitioner identifies a person of ordinary skill in the art (“POSITA”) at the time of the invention as someone that would have had “a bachelor’s or the equivalent degree in electrical and/or computer engineering or a related field and 2-3 years of experience in imaging systems including optics and image processing.” Pet. 7 (citing Ex. 1003 ¶ 13). In our Institution Decision, we adopted this description as our own. *See* Dec. Inst. 9–10. Neither party disputes that preliminary finding, which we maintain for purposes of this decision. *See* PO Resp. 4–5; Pet. Reply 1–26.

D. Claim Construction

In *inter partes* reviews, we interpret a claim “using the same claim construction standard that would be used to construe the claim in a civil action under 35 U.S.C. 282(b).” 37 C.F.R. § 42.100(b) (2019). Under this standard, a claim is construed “in accordance with the ordinary and

customary meaning of such claim as understood by one of ordinary skill in the art and the prosecution history pertaining to the patent.” *Id.* Only claim terms which are in controversy need to be construed and only to the extent necessary to resolve the controversy. *See Nidec Motor Corp. v. Zhongshan Broad Ocean Motor Co.*, 868 F.3d 1013, 1017 (Fed. Cir. 2017).

The parties dispute the meaning of the camera controller limitation recited in claim 19. *See* Pet. 8–10; PO Resp. 9–11; Pet. Reply 1–4; PO Sur-Reply 2–3. We did not provide a preliminary construction for this term in our Institution Decision because Patent Owner initially did not dispute Petitioner’s proposed construction or argue for an alternative construction. *See* Dec. Inst. 10–11. Although the parties currently dispute the meaning of this limitation, we need not construe it because our decision does not depend on its meaning. *See Nidec*, 868 F.3d at 1017.

E. Patentability of Claims 19–21

Petitioner argues claims 19 and 20 are unpatentable over Parulski, Ogata, Kawamura, and Soga, and claims 20 and 21 are unpatentable over Parulski, Ogata, Kawamura, Soga, and Morgan-Mar. Pet. 12–74. Patent Owner disagrees. PO Resp. 36–80.

For the reasons discussed below, we find Petitioner has failed to produce sufficient evidence to demonstrate that a person having ordinary skill in the art would have known that a scaled version of Ogata’s lens could have been used in Parulski’s camera with reasonable expectation of success. This failure is dispositive of all grounds in the Petition. Accordingly, we limit our analysis below to the evidence and argument presented regarding the teachings of Parulski, Ogata, and the reasons to combine these references.

1. Parulski

Parulski discloses “a digital camera that uses multiple lenses and image sensors to provide an improved imaging capability.” Ex. 1005, 1:8–10. A schematic illustration of Parulski’s camera is shown in Figure 1, which is reproduced below.

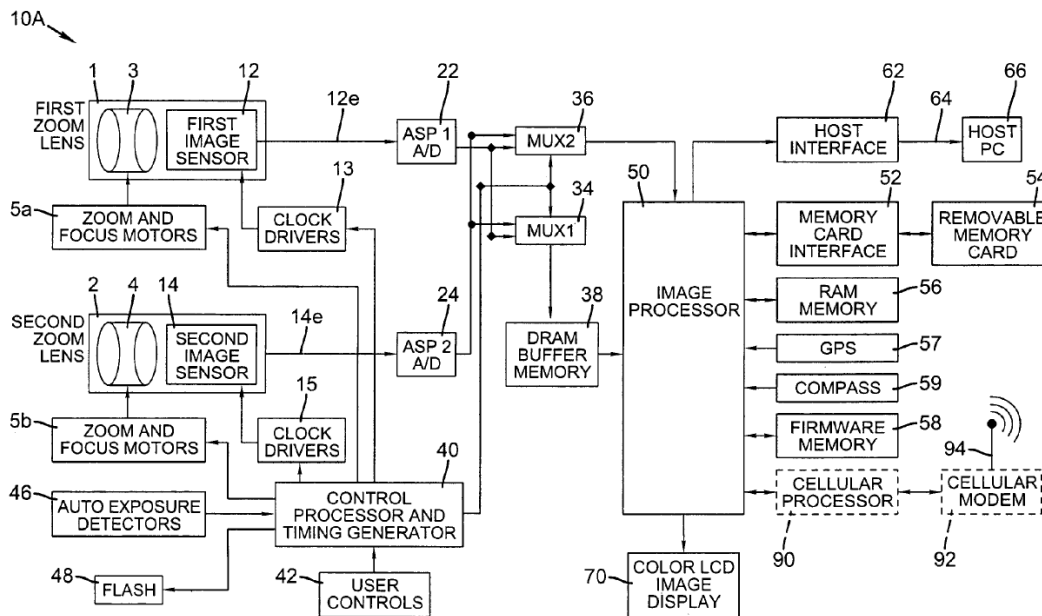


FIG. 1

Figure 1 is “a block diagram . . . of a digital camera using a first zoom lens [3] with a first image sensor [12], and a second zoom lens [4] with a second image sensor [14].” *Id.* at 8:28–30, Fig. 1. Each of zoom lenses 3 and 4 could be “replaced with a fixed focal length lens.” *Id.* at 13:3–6. Image sensors 12 and 14 can “have a variety of aspect ratios” and “do not have to have the same specifications.” *Id.* at 13:26–32. Parulski’s digital camera could be, for example, the Kodak Easyshare V610 dual lens digital camera, which uses a 6MP (megapixel) 1/2.5” charge coupled device (CCD) as an image sensor. *Id.* at 5:21–35; *see also* Ex. 1033, 62 (showing the Easyshare V610 uses a 6 MP 1/2.5” CCD). Charge coupled devices of this type were rectangular with a 7.18 mm diagonal. *See* Ex. 1030, 1.

In Parulski's digital camera, analog data captured by image sensors 12 and 14 are digitized by analog signal processors 22 and 24, respectively, and sent to multiplexers 34 and 36. Ex. 1005, 13:48–59. Control processor 40 uses multiplexer 34 to select data from one of image sensors 12 or 14 as image data and uses multiplexer 36 to select data from the other of image sensors 12 or 14 as autofocus data. *Id.* at 14:1–5. Image processor 50 generates an image from the selected image data and autofocus signals for first and second zoom lenses 3 and 4 from the selected autofocus data. *Id.* at 14:5–16.

2. Ogata

Ogata discloses “[a] wide-angle photographic lens system which has a short total length . . . a high aperture ratio and excellent optical performance, and is suited for use with the collapsible mount type cameras.” Ex. 1026, 3:2–5. Ogata's wide-angle lens system is shown in Figure 1, which is reproduced below.

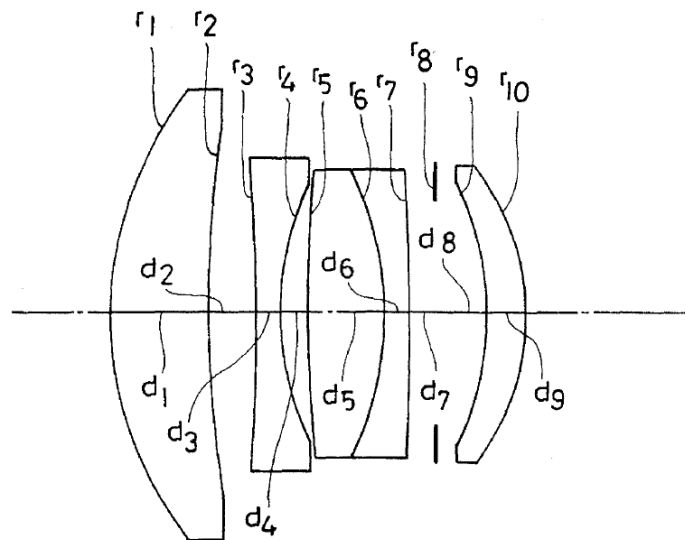


Figure 1 of Ogata is a schematic illustration of a first embodiment of Ogata's wide-angle lens system. *Id.* at 12:1–4.

Lens prescription data for the first embodiment of Ogata's lens is provided in tabular form in column 7. An annotated version of that table is reproduced below.

Embodiment I			
$f = 35.0, f_b = 26.1, F/2.9, 2\omega = 63.4^\circ$			
$r_1 = 14.1000$			
	$d_1 = 3.700$	$n_1 = 1.79952$	$v_1 = 42.24$
$r_2 = 47.5750$			
	$d_2 = 1.800$		
$r_3 = -81.2140$			
	$d_3 = 1.000$	$n_2 = 1.76182$	$v_2 = 26.52$
$r_4 = 12.0220$ (aspherical surface)			
	$d_4 = 1.000$		
$r_5 = 55.8920$			
	$d_5 = 3.000$	$n_3 = 1.83481$	$v_3 = 42.72$
$r_6 = -11.3420$			
	$d_6 = 1.000$	$n_4 = 1.53172$	$v_4 = 48.90$
$r_7 = -106.9860$			
	$d_7 = 1.000$		
$r_8 = \infty$ (stop)			
	$d_8 = 2.000$		
$r_9 = -10.4990$			
	$d_9 = 1.500$	$n_5 = 1.51633$	$v_5 = 64.15$
$r_{10} = -9.0360$ (aspherical surface)			
aspherical surface coefficients			
(4th surface)	$P = 1.0396, A_4 = 0.66373 \times 10^{-4}$		
	$A_6 = 0.13983 \times 10^{-5}, A_8 = -0.97157 \times 10^{-8}$		
	$A_{10} = 0.42114 \times 10^{-9}$		
(10th surface)	$P = 1.3037, A_4 = 0.44302 \times 10^{-4}$		
	$A_6 = -0.17498 \times 10^{-5}, A_8 = 0.10177 \times 10^{-6}$		
	$A_{10} = -0.17446 \times 10^{-8}$		
$D_R/f = 0.043, f_R/f = 2.660, (R_{2a} - r_{2b})/(r_{2a} + r_{2b}) = 1.347,$			
$N_p = 1.717, r_{1a}/r_{2b} = 1.173, (r_{1b} - r_{2a})/r_{1b} + r_{2a} = -3.829,$			
$(r_{3a} - r_{3b})/(r_{3a} + r_{3b}) = -3.188$			

Id. at 7:35–62. The Figure shows lens prescription data in tabular form for the first embodiment of Ogata's lens, annotated to highlight the index of refraction (n_3) and Abbe⁵ number (v_3) for the third lens element.

⁵ An Abbe number is an approximate measure of how a material's index of refraction depends on the frequency of light passing through it. *See, e.g.,* Darryl Meister, Understanding Reference Wavelengths (April 12, 2010), available at http://www.opticampus.opti.vision/files/memo_on_reference_wavelengths.pdf (last visited October 18, 2021).

3. Reasons to Combine Parulski and Ogata

Petitioner argues that it would have been obvious to modify Parulski to include a scaled version of Ogata's wide-angle lens because "Parulski does not indicate lens prescription data for . . . [the] lens systems in its camera." Pet. 29. Thus, a skilled artisan would have looked to Ogata for "lens data that specifies the properties and configuration that teaches . . . how to construct a wide-angle lens unit." *Id.* (citing Ex. 1003 ¶ 63).

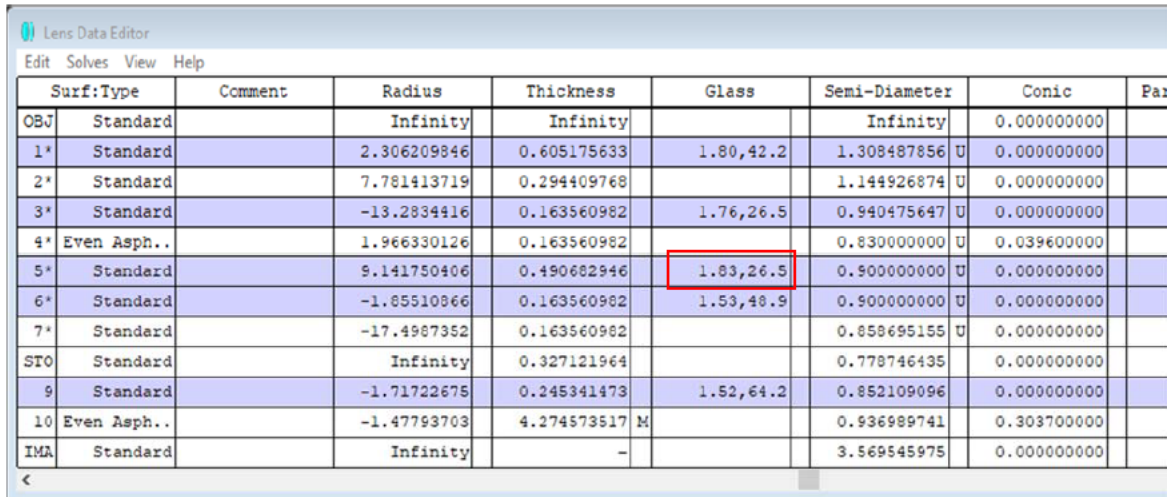
Petitioner argues that a skilled artisan would have known that the wide-angle lens described in Parulski ("40 mm equiv.") would have had a 56.8 degree FOV⁶ and focused its image onto the 43.27 mm diameter image plane of a 35 mm camera. *Id.* at 29–30 (citing Ex. 1003 ¶ 68; Ex. 1005, 23:23–43; Ex. 1019, 107). Petitioner further argues that such an artisan would have also known that scaling Ogata's lens to instead focus its image onto the 7.12 mm diameter image plane of a 1/2.5" CCD would have resulted in a scaled lens having a similar 63.4 degree FOV and 2.9 F-number, but a 5.72 mm effective focal length (EFL) and a 6.89 mm total track length (TTL). *Id.* at 26–28 (citing Ex. 1005, 5:21–35; 1020, 57; Ex. 1021 ¶¶ 37–39; Ex. 1022, 254–255; Ex. 1026, 7:35–61, Fig. 1; Ex. 1029; Ex. 1030; Ex. 1033, 62).

Petitioner supports its argument with the testimonial evidence of Dr. Sasián. *See* Pet. 26–27 (citing Ex. 1021 ¶ 38). According to Dr. Sasián, a person skilled in the art could have used Zemax lens design software to scale Ogata's lens. Ex. 1021 ¶ 39 (citing Ex. 1021, App'x, Figs. 3A–3C). The appendix to Dr. Sasián's declaration includes a heading "C" entitled "Fig. 3 - Ogata scaled to fill a 1/2.5" image sensor using Zemax (v.02/14/2011)."

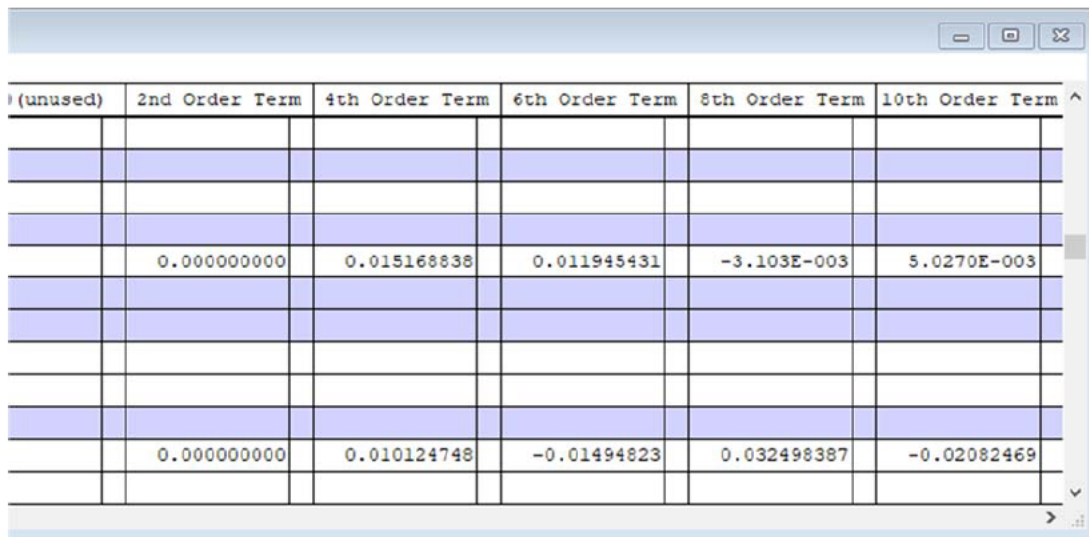
⁶ Corresponding to a 28.40 degree HFOV or half field-of-view.

Id. at 34.⁷ The appendix also includes a heading “C.3” entitled “Figure 3C – Prescription Data,” followed by a “Lens Data Editor” spreadsheet, an annotated version of which is reproduced below.⁸

3. *Fig. 3C – Prescription Data*



Surf:Type	Comment	Radius	Thickness	Glass	Semi-Diameter	Conic	Par
OBJ	Standard	Infinity	Infinity		Infinity	0.000000000	
1*	Standard	2.306209846	0.605175633	1.80,42.2	1.308487856	U 0.000000000	
2*	Standard	7.781413719	0.294409768		1.144926874	U 0.000000000	
3*	Standard	-13.2834416	0.163560982	1.76,26.5	0.940475647	U 0.000000000	
4*	Even Asph..	1.966330126	0.163560982		0.830000000	U 0.039600000	
5*	Standard	9.141750406	0.490682946	1.83,26.5	0.900000000	U 0.000000000	
6*	Standard	-1.85510866	0.163560982	1.53,48.9	0.900000000	U 0.000000000	
7*	Standard	-17.4987352	0.163560982		0.858695155	U 0.000000000	
STO	Standard	Infinity	0.327121964		0.778746435	0.000000000	
9	Standard	-1.71722675	0.245341473	1.52,64.2	0.852109096	0.000000000	
10	Even Asph..	-1.47793703	4.274573517	M	0.936989741	0.303700000	
IMA	Standard	Infinity	-		3.569545975	0.000000000	



(unused)	2nd Order Term	4th Order Term	6th Order Term	8th Order Term	10th Order Term
	0.000000000	0.015168838	0.011945431	-3.103E-003	5.0270E-003
	0.000000000	0.010124748	-0.01494823	0.032498387	-0.02082469

The Figure is an annotated version of “Fig. 3C – Prescription Data” showing lens prescription data entered into a “Lens Data Editor” spreadsheet and

⁷ When citing to the appendix, we cite to the declaration page numbers.

⁸ In Zemax, a “Lens Data Editor is the primary spreadsheet where the majority of the lens data will be entered.” Ex. 1022, 789.

annotated to highlight the index of refraction (1.83) and Abbe number (26.5) of the third lens element in the “Glass” column.

A few inconsistencies between the lens prescription data for Ogata’s first embodiment lens and the data entered into the “Lens Editor Data” spreadsheet are noticeable. First, the Abbe number for the third lens element is 42.72 in Ogata’s first embodiment lens and 26.5 (i.e., 38% smaller) in the “Lens Data Editor” spreadsheet. *Compare* Ex. 1026, 7:46, *with* Ex. 1021, 36. Second, the data for the fourth and tenth aspherical surfaces are noticeably different. For example, the fourth order term (A_4) for the fourth aspherical surface is 0.66×10^{-4} in Ogata’s first embodiment lens and 151.69×10^{-4} (i.e., 0.015) in the “Lens Data Editor” spreadsheet. *Compare* Ex. 1026, 7:55, *with* Ex. 1021, 36. Neither Petitioner nor Dr. Sasián explain these discrepancies.

Patent Owner identifies the Abbe number discrepancy for the third lens element between Ogata’s first embodiment lens and the “Lens Data Editor” spreadsheet. *See* PO Resp. 31. Patent Owner argues that, due to this discrepancy, “Dr. Sasián’s field curvature, distortion and OPD [optical path difference] fan plots on page 35 of his declaration do not accurately reflect the performance of a scaled version of Ogata’s Embodiment 1 lens.” *Id.* (citing Ex. 2015 ¶ 62). Moreover, Dr. Moore opines that “[a] significant change in the index of refraction or the Abbe number can change a highly performing lens design into an unacceptable design.” Ex. 2015 ¶ 88.

Petitioner was provided an opportunity to try to explain or correct this Abbe number discrepancy in its Reply, but did not attempt to do so. *See* Pet. Reply, 1–26. Instead, Petitioner argued that “Petitioner and Dr. Sasián have provided detailed lens design software analysis, which confirms the viability of . . . Ogata’s lens designs in Parulski and reinforces the Petition’s

motivation to use the same.” *Id.* at 15 (citing Pet. 21–24, 28–30; Ex. 1021 ¶¶ 35–45, App’x; Ex. 1039 ¶ 22, App’x).⁹ But Dr. Sasián’s lens design analysis appears to be based on the erroneous data discussed above, calling into question Petitioner’s contention that a person skilled in the art would have known that Ogata’s lens could be scaled to work in Parulski’s camera with a reasonable expectation of success. Indeed, Petitioner criticized Patent Owner for offering opinions that were *not* based on lens design software analysis because a person skilled in the art “would have performed lens design software analysis and formed its opinion based on the lens design software.” *Id.*

In an *inter partes* review, Petitioner is “master of its complaint.” *SAS Institute, Inc. v. Iancu*, 138 S.Ct. 1348, 1355 (2018). Thus, the Petition is “the centerpiece of the proceeding both before and after institution.” *Id.* at 1358. Moreover, Petitioner “has the burden from the onset to show with particularity why the patent it challenges is unpatentable.” *Harmonic Inc. v. Avid Tech., Inc.*, 815 F.3d 1356, 1363 (Fed. Cir. 2016). Petitioner’s contention that a person skilled in the art would have found it obvious that Ogata’s lens could have been scaled to work in Parulski’s camera with a reasonable expectation of success is entirely based on Dr. Sasián’s opinion, which is based on Dr. Sasián’s Zemax lens design software analysis. *See* Pet. 24–30; *see also* Ex. 1021 ¶¶ 35–39, App’x, 34–36. But, as noted above, the lens prescription data used for that analysis appears to differ from the

⁹ Petitioner cites paragraphs 50–55 and 61–65 of Dr. Sasián’s declaration, which has 46 enumerated paragraphs. *See* Ex. 1021, 27. Dr. Sasián analyzes scaling Ogata’s lens in paragraphs 35–39 of his declaration and scaling Kawamura’s lens in paragraphs 40–45. We make that correction here.

lens prescription data for Ogata’s first embodiment lens.¹⁰ *Compare* Ex. 1026, 7:46, *with* Ex. 1021, 36. We accept as true Petitioner’s contention that a person skilled in the art “would have performed lens design software analysis and formed [an] opinion based on the lens design software.” Pet. Reply 15 (citing Ex. 1039 ¶ 22). A logical consequence of that contention is that the opinion of a person skilled in the art will be only as reliable as the lens design software analysis that person performed, which will be only as reliable as the data used to perform that analysis.

Moreover, as also discussed above, Patent Owner pointed out this Abbe number discrepancy in its Patent Owner Response. *See* PO Resp. 31. This put Petitioner on notice of the discrepancy and shifted the burden of production to Petitioner to either correct its analysis or explain why the Abbe number discrepancy did not affect the analysis. *See Dynamic Drinkware, LLC v. National Graphics, Inc.*, 800 F.3d 1375, 1378 (Fed. Cir. 2015) (explaining the shifting burden of production in an *inter partes* review may require “producing additional evidence and presenting persuasive argument based on new evidence or evidence already of record”) (internal citations omitted). Petitioner neither corrected its reason to combine analysis nor explained why it would not be affected by the apparent Abbe number discrepancy. *See* Pet. Reply 1–26.

Finally, in response to Patent Owner’s argument that a person skilled in the art “would not have used the Ogata lens design scaled down,” but would have instead constructed a miniature camera lens using “a fully

¹⁰ We note, as well, that the lens prescription data for example 1 of Kawamura’s lens appears to differ from the lens prescription data Dr. Sasián used to perform the Zemax analysis for scaling Kawamura’s lens. *Compare* Ex. 1012, 3, *with* Ex. 1021, 37, 39.

aspheric design with plastic elements” having an aperture stop near the front of the lens (PO Resp. 58–59), Petitioner argues that a person of ordinary skill in the art “could have used lens design software to modify and adjust an older lens design into a miniaturized version” because the “modifications or adjustments [needed] were within the skill” level of a person of ordinary skill in the art (Pet. Reply 15–16 (citing Ex. 1039 ¶¶ 24–31)).¹¹ Patent Owner argues that “Dr. Sasián’s new Zemax analyses should be disregarded as an untimely obviousness theory presented in reply” because “[t]he Zemax analyses in Dr. Sasián’s original declaration simply took the lens prescriptions in the Kawamura and Ogata patents and confirmed that Zemax would scale them.” PO Sur-Reply 13–14.

We agree with Patent Owner. The Petition contends that a person of ordinary skill in the art would have known that Ogata’s lens (using glass lens elements) could have been *scaled* to focus an image onto a 1/2.5” image sensor for use in Parulski’s camera. *See* Pet. 24–30; Ex. 1021, 36. Petitioner’s reply evidence and argument is not introduced to support that contention but a different contention—that a person of ordinary skill in the art would have known that Ogata’s lens could have been *redesigned* using aspheric plastic lens elements to focus an image onto a 1/3” image sensor. *See* n.11, *supra*. This is a new contention that does not support Petitioner’s

¹¹ We note that Dr. Sasián’s analysis discloses how Kawamura’s lens can be modified by replacing the spherical glass lens elements with aspherical plastic lens elements, moving the aperture stop to the first lens element, changing the F number to 2.8, and reducing the effective focal length to focus an image onto a 1/3” image sensor rather than a 1/2.5” image sensor. *See* Ex. 1039 ¶¶ 25–30; App’x, 17–18. Dr. Sasián also opines that although this analysis illustrates how Kawamura’s lens could have been modified, a person skilled in the art “would have recognized that Ogata could have been similarly adjusted to yield a miniaturized form-factor.” *Id.* ¶ 25.

original contention that Ogata’s lens could simply be scaled. Therefore, because it is a new and untimely contention, we do not consider it further. *See Consolidated Trial Practice Guide* (Nov. 2019)¹² (“Petitioner may not submit new evidence or argument in reply that it could have presented earlier, e.g., to make out a prima facie case of unpatentability.”); *see also Ariosa Diagnostics v. Verinata Heath, Inc.*, 805 F.3d 1359, 1368 (Fed. Cir. 2015) (“The Board must make judgments about . . . when a Reply contention crosses the line from the responsive to the new.”); *Intelligent Bio-Sys., Inc. v. Illumina Cambridge Ltd.*, 821 F.3d at 1359, 1369–70 (Fed. Cir. 2016) (affirming the Board’s rejection of a reply argument presenting an “entirely new rationale to explain why one of skill in the art would have been motivated to combine” prior art references); *Henny Penny Corp. v. Frymaster LLC*, 938 F.3d 1324, 1330–31 (Fed. Cir. 2019) (affirming the Board’s rejection of a reply argument presenting an “entirely new rationale” for why a claim would have been obvious).

For the reasons discussed above, we find Petitioner has failed to muster sufficient evidence to demonstrate by a preponderance of evidence that a person or ordinary skill in the art at the time of the invention would have known that Ogata’s lens could have been scaled to work in Parulski’s camera with a reasonable expectation of success. Accordingly, we find Petitioner has failed to demonstrate that claims 19 and 20 are unpatentable over Parulski, Ogata, Kawamura, and Soga or that claims 20 and 21 are unpatentable over Parulski, Ogata, Kawamura, Soga, and Morgan-Mar.

¹² Available at <https://www.uspto.gov/TrialPracticeGuideConsolidated>

III. CONCLUSION

We have reviewed the Petition, Patent Owner Response, Petitioner Reply, and Patent Owner Sur-Reply. We find, on this record, Petitioner has failed to demonstrate by a preponderance of evidence that claims 19–22 of the '479 patent are unpatentable.

Claims	35 U.S.C. §	Reference(s) /Basis	Claims Shown Unpatentable	Claims Not Shown Unpatentable
19, 20	103(a)	Parulski, Ogata, Kawamura, Soga		19, 20
21, 22	103(a)	Parulski, Ogata, Kawamura, Soga, Morgan-Mar		21, 22
Overall Outcome				19–22

IV. ORDER

In consideration of the foregoing, it is hereby:

ORDERED that Petitioner has failed to show by a preponderance of evidence that claims 19 and 20 are unpatentable under 35 U.S.C. § 103(a) over Parulski, Ogata, Kawamura, and Soga; and

FURTHER ORDERED that Petitioner has failed to show by a preponderance of evidence that claims 21 and 22 are unpatentable under 35 U.S.C. § 103(a) over Parulski, Ogata, Kawamura, Soga, and Morgan-Mar; and

FURTHER ORDERED that this Decision is final, and a party to this proceeding seeking judicial review of the Decision must comply with the notice and service requirements of 37 C.F.R. § 90.2.

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