

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

ARASHI VISION (U.S.) LLC (D/B/A INSTA360),
Petitioner,

v.

GOPRO, INC.,
Patent Owner.

Case No. IPR2025-00017
U.S. Patent No. 10,529,052

PATENT OWNER'S PRELIMINARY RESPONSE

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No.	Exhibit
2001	Declaration of Hassan Foroosh, Ph.D.
2002	<i>Curriculum vitae</i> of Hassan Foroosh, Ph.D.
2003	“GoPro Celebrates Surpassing 50 Million Cameras Sold,” produced as GOPRO_00063291 in <i>In the Matter of Certain Cameras, Camera Systems, and Accessories Used Therewith</i> , Inv. No. 337-TA-1400
2004	 produced as GOPRO_00009580 in <i>In the Matter of Certain Cameras, Camera Systems, and Accessories Used Therewith</i> , Inv. No. 337-TA-1400
2005	“NHL, NHLPA Partner with GoPro To Deliver Hockey Fans Unique Perspectives Of The Game,” produced as GOPRO_00063270 in <i>In the Matter of Certain Cameras, Camera Systems, and Accessories Used Therewith</i> , Inv. No. 337-TA-1400
2006	Complaint, <i>In the Matter of Certain Cameras, Camera Systems, and Accessories Used Therewith</i> , Inv. No. 337-TA-1400
2007	E-mail from Alex S. Yap on October 9, 2024
2008	“GoPro Named Exclusive Action Camera of Red Bull Rampage, the World’s Biggest Freeride Mountain Bike Event,” produced as GOPRO_00063323 in <i>In the Matter of Certain Cameras, Camera Systems, and Accessories Used Therewith</i> , Inv. No. 337-TA-1400
2009	“GoPro and Adobe Collaborate to Bring Unique Content to Adobe Stock Users,” produced as GOPRO_00063341 in <i>In the Matter of Certain Cameras, Camera Systems, and Accessories Used Therewith</i> , Inv. No. 337-TA-1400

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2010	“73 rd Annual Technology & Engineering Emmys,” produced as GOPRO_00000009 in <i>In the Matter of Certain Cameras, Camera Systems, and Accessories Used Therewith</i> , Inv. No. 337-TA-1400
2011	“Believe the Hype: GoPro Showcases Award-Winning HERO7 Cameras at CES 2019,” produced as GOPRO_00063251 in <i>In the Matter of Certain Cameras, Camera Systems, and Accessories Used Therewith</i> , Inv. No. 337-TA-1400
2012	“GoPro Wins Second Emmy® Award for Groundbreaking Digital Imaging Technology,” produced as GOPRO_00063339 in <i>In the Matter of Certain Cameras, Camera Systems, and Accessories Used Therewith</i> , Inv. No. 337-TA-1400
2013	“J.P. Morgan – North America Equity Research (21 September 2018),” produced as GOPRO_00359592 in <i>In the Matter of Certain Cameras, Camera Systems, and Accessories Used Therewith</i> , Inv. No. 337-TA-1400
2014	“GoPro Hero 9 Black vs Hero 8 Black: 9 key differences you need to know,” produced as GOPRO_00010039 in <i>In the Matter of Certain Cameras, Camera Systems, and Accessories Used Therewith</i> , Inv. No. 337-TA-1400
2015	 served in <i>In the Matter of Certain Cameras, Camera Systems, and Accessories Used Therewith</i> , Inv. No. 337-TA-1400

VI. INTRODUCTION

Founded in 2002 in San Mateo, California, Patent Owner GoPro, Inc. (“Patent Owner” or “GoPro”) is a pioneer in developing cameras and digital imaging techniques, particularly for mountable and wearable use cases. As a company built on innovation, GoPro has received numerous patents protecting its technological advancements, including the '052 Patent, which is directed to virtual lens technology that addresses key challenges in digital imaging. This innovation enables realistic and seamless zooming, re-pointing, and tracking of video or images by selecting sub-frames representing portions of input images. These sub-frames include reduced fields of view and enable advanced imaging effects, such as virtual zooming and object tracking.

The prior art cited by Petitioner—including Okubo, Sokeila, and Eder—fails to disclose or suggest multiple core limitations of the '052 Patent. For example, Okubo does not disclose “selecting sub-frames representing portions of the input images, the sub-frames including reduced fields of view of the scene smaller than the fields of view of the input images.” Instead, Okubo merely records predetermined portions of the sensor’s range, which it refers to as an “image cutout.” Okubo also fails to disclose selecting sub-frames with “different lens distortion effects” based on “different positions

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[or] sizes of the areas” within the input images, as its so-called sub-frames remain fixed in size and position.

Petitioner attempts to combine Okubo with Sokeila to address these deficiencies, relying on Sokeila's disclosure of adaptive cropping for video stabilization. However, Okubo's two-stage lens distortion correction process—the very process the Petition relies on to produce the alleged “desired lens distortion”—is limited to still images and does not apply to video. Thus, even if Sokeila's motion-based cropping were applied to Okubo, the resulting system would not meet the claims of the '052 Patent, as it would fail to generate output images with the required lens distortions.

Finally, Eder is directed to “rear view mirror simulation” for a vehicle and fails to disclose critical limitations of the '052 Patent. Specifically, Eder does not disclose “selecting sub-frames representing portions of the input images” because its image sections (such as “area A”) are fixed in size and predefined rather than derived from larger input images. Nor does Eder disclose “the output images include the sub-frames remapped from the input lens distortion centered in the fields of view of the input images to the desired lens distortion centered in the reduced fields of view.”

GoPro's virtual lens technology has not only addressed a long-felt but unmet need in the industry but has also achieved widespread commercial success. Its ability to select sub-frames representing portions of input images and remap distortions for seamless transitions has enabled transformative features such as object tracking, virtual zooming, and enhanced image stabilization, which were previously unattainable in wide-angle imaging. The impact of these innovations is underscored by their adoption in GoPro's HERO camera series, which have revolutionized the action camera market. Additionally, documented instances of competitor copying further highlight the significance of the '052 Patent's technological contributions.

As detailed below, the Petition fails to establish that the claims of the '052 Patent are unpatentable. GoPro's innovations are not only novel and non-obvious over the prior art but have also delivered profound advancements in digital imaging, underscoring the validity of the challenged claims. For these reasons, the Board should uphold the claims of the '052 Patent.

VII. OVERVIEW OF THE '052 PATENT

The '052 Patent describes a system and method for simulating a virtual lens effect by selecting sub-frames from different positions of areas of the input images and processing them to achieve desired lens distortions, centered

in the reduced fields of view of the sub-frames and consistent with the input lens distortion. Ex. 2001, ¶¶35-38. The system accepts “input images . . . including fields of view of a scene captured through a lens of a camera, the input images depicting the scene with an input lens distortion centered in the fields of view.” Ex. 1001, 13:28–31; Ex. 2001, ¶35. Sub-frames are then selected, representing “portions of the input images,” with “reduced fields of view of the scene smaller than the fields of view of the input images.” Ex. 1001, 13:32–35; Ex. 2001, ¶35. These sub-frames include “different lens distortion effects as a function of the input lens distortion,” which vary based on “different positions of areas of the input images . . . and a size of the areas of the input images.” Ex. 1001, 13:35–40; Ex. 2001, ¶35.

The system further processes the sub-frames to remap the input lens distortion to a “desired lens distortion centered in the reduced fields of view,” ensuring that the output images maintain coherent distortion effects. Ex. 1001, 13:42–54; Ex. 2001, ¶36. This allows the output images to “simulate the same effect that would have been achieved by a camera operator manually re-orienting and/or physically moving the camera.” Ex. 1001, 3:24–28; Ex. 2001, ¶36.

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Applications of the '052 Patent include virtual zooming, object tracking, and panning effects. For instance, sub-frames may be selected from different regions of an input image to track a moving subject or to create zoom effects. Ex. 1001, 1:32–37; 3:16–28; Ex. 2001, ¶37. By processing the sub-frames to maintain consistent lens characteristics, the invention enables seamless and realistic transitions between frames in the output video or image sequences. Ex. 2001, ¶37.

In summary, the '052 Patent provides a transformative solution for producing high-quality images and videos by selecting and processing sub-frames from input images, ensuring that output images exhibit coherent and realistic lens distortion effects across selected sub-frames and with the input lens distortion. *Id.*, ¶38.

VIII. OVERVIEW OF CERTAIN CITED ART

The petition challenges the '052 Patent's claims 1 to 20 on three grounds. Ex. 2001, ¶39. Ground 1 asserts that Okubo renders the claims obvious. *Id.* Ground 2 asserts that the combination of Okubo and Sokeila also renders the claims obvious. Ground 3 asserts that Eder renders the claims obvious. Below are short summaries of these references. *Id.*

A. Petitioner's Cited Art

1. Okubo (Ex. 1004)

Okubo is directed to an “image pick-up apparatus and image restoration method.” Ex. 1004, Title; Ex. 2001, ¶¶40-43. It discloses two distinct modes: a “moving image” or “video mode” and a “still image” mode, controlled by a mode switch. Ex. 1004, Fig. 7, [0093] (“it is judged whether a mode is a still or moving image mode (S106), and the process shifts to S120 of FIG. 8 in the moving image mode in which the mode key 7 is positioned on the M-side”); Ex. 2001, ¶40. In the still image mode, processing continues through blocks 122 and 123 of the circuit. Ex. 1004, [0095] (“After picking up the still image, the resultant image is processed by the image processing circuit 117,” and discussing use of circuits 122 and 123); Ex. 2001, ¶40. In the moving image mode, processing follows a separate through blocks 131 and 132. Ex. 1004, [0096] (“a main flowchart for the moving image will be described with reference to FIG. 8,” and describing use of blocks 131 and 132); Ex. 2001, ¶40.

Okubo's “two-stage lens distortion correction process,” described in connection with Fig. 12, applies exclusively to still images. Ex. 1004, [0013], [0055]; Ex. 2001, ¶41. The process includes a single step, step S301, to “pick

up image.” Ex. 1004, Fig. 12, [0113]; Ex. 2001, ¶41. No intermediate step is disclosed in which a larger image is recorded, and a smaller sub-frame is later selected. Ex. 2001, ¶41.

In still image mode, the apparatus “picks up” only the portion of the sensor’s range necessary for its further processing. Ex. 2001, ¶42. For example, Okubo states that “the picked-up image in this *image pick-up range* [i.e., the cutout range] is subjected to the electronic vibration correcting, and *recorded*.” Ex. 1004, [0088] (emphasis added); Ex. 2001, ¶42. This “image cutout” is described as the recorded image. Ex. 1004, [0090] (“range to be picked up and recorded”), [0091] (same); Ex. 2001, ¶42. Okubo confirms that “picked up” refers to the image captured directly by the sensor: “A light beam passed through the lenses **12, 13, 14** is formed into an image on the image pick-up device **114**, and photoelectrically converted by each pixel of the image pick-up device. Accordingly, the *image is picked up*.” Ex. 1004, [0072] (emphasis added); Ex. 2001, ¶42.

Finally, Okubo’s image cutouts are fixed in size and remain centered on the CCD sensor. Ex. 2001, ¶43. For example, in the moving image mode, the cutout corresponds to 70% of the sensor’s diagonal length, while in the

still image mode, it corresponds to 95%. Ex. 1004, [0088]-[0089], Fig. 6B; Ex. 2001, ¶43.

2. Sokeila (Ex. 1005)

Sokeila discloses a system for “motion adaptive cropping for video stabilization,” which dynamically adjusts the cropping factor of video frames to stabilize images. Ex. 1005, Title, Abstract; Ex. 2001, ¶¶44-45. The system determines “an amount of motion in a second frame of video with reference to a first frame of video” and uses this information to “[a]daptively predict[] a cropping factor for the second frame.” Ex. 1005, Abstract; Ex. 2001, ¶44. The cropping factor specifies the portion of the frame to exclude, with the goal of “providing a stable video image with a maximized field-of-view and a maximized level of quality.” Ex. 1005, 5:25-30; Ex. 2001, ¶44. Adjustments are based on motion analysis, allowing for a “smooth change for the cropping factor over time (to avoid bad user experience).” Ex. 1005, 5:25-34; Ex. 2001, ¶44.

Sokeila focuses exclusively on global camera motion-based cropping adjustments for stabilization and does not involve or disclose any processing related to lens distortion correction or remapping. Ex. 2001, ¶45. The system’s adaptive cropping prioritizes preserving important content, noting that “if

there is a face (or another object of interest) detected in the received image frames, it may be desired to avoid cropping the object altogether.” Ex. 1005, 3:32-35; Ex. 2001, ¶45. These features aim to maintain content visibility while minimizing reductions in the field of view. Ex. 1005, 5:25-34; Ex. 2001, ¶45. Additionally, the system supports stabilization “either during the capture or after the capture as an editor feature.” Ex. 1005, 3:65-67; Ex. 2001, ¶45.

3. Eder (Ex. 1009)

Eder discloses a “rear view mirror simulation” system for vehicles that replaces or supplements traditional mirrors with a camera-based system. Ex. 1009, Title; Ex. 2001, ¶¶46-48. The system includes an optical sensor that captures “wide-angle video images,” which are processed by an “image rectification device [that] modifies the continuous images and transmits the improved images by video data to the display device 20, in order to help the driver.” Ex. 1009, 3:14-16, 3:67-4:2; Ex. 2001, ¶46. This rectification addresses “visual distortion, which is caused by a wide-angle lens used in the camera,” and uses a mathematical model to adjust pixel positions. Ex. 1009, 4:15-25; Ex. 2001, ¶46.

The rectified images are further processed to simulate traditional mirror appearances, with Eder explaining that the system “distorts the image of the

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wide-angle camera and applies post-distortion to this image, in order to give this image the same view as that of the desired mirror glass.” Ex. 1009, 4:4-7; Ex. 2001, ¶47. This includes simulating mirrors with “an aspheric curve” or “a convex additional mirror,” depending on the specific mirror type being replicated. Ex. 1009, 4:66-5:6; Ex. 2001, ¶47.

Eder describes that its system processes these rectified images to display them on a screen, providing the driver with a view that is “adjusted depending on the application of the vehicle.” Ex. 1009, 5:23-26; Ex. 2001, ¶48. The system uses fixed parameters for processing, including a “defined number of pixels” for specific mirror effects. Ex. 1009, 5:6-8, 5:33-35; Ex. 2001, ¶48. Eder also discloses asymmetric and radially asymmetric displays, such as those depicted in Figure 2A, for simulating rear-view mirrors with customized shapes. *See* Ex. 1009, Fig. 2A; Ex. 2001, ¶48.

IX. LEVEL OF ORDINARY SKILL IN THE ART

Petitioners propose that the level of a POSITA at the time of the '052 patent “would have had a bachelor’s degree in Electrical Engineering, Computer Science, Physics, Optics, or an equivalent field, and one to two years of academic or industry experience working on image or video processing, or comparable academic or industry experience.” Petition, 2-3.

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For purposes of this preliminary response, Patent Owner applies Petitioner's proposed level of skill. Ex. 2001, ¶¶17-21. Patent Owner's expert, Dr. Hassan Foroosh, was a POSITA under Petitioner's definition at the time of the '052 patent. *Id.*, ¶21.

X. CLAIM CONSTRUCTION

In an *inter partes* review, claim terms receive their plain and ordinary meaning in light of the specification of the patent in which they appear, following the same standard used in district court. 37 C.F.R. § 42.100(b); *see Phillips v. AWH Corp.*, 415 F.3d 1303 (Fed. Cir. 2005). Petitioner states that no formal constructions are necessary. See Petition, 3. Patent Owner agrees that no claim terms presently require construction to resolve any current dispute between the parties. Ex. 2001, ¶34.

XI. GROUND 1: PETITIONER FAILS TO ESTABLISH THAT OKUBO RENDERS CLAIMS 1-20 OBVIOUS**A. Okubo Does Not Disclose "Selecting Sub-Frames Representing Portions Of The Input Images, The Sub-Frames Including Reduced Fields Of View Of The Scene Smaller Than The Fields Of View Of The Input Images"**

Claims 1 and 11 require "accessing input images, the input images including fields of view of a scene captured through a lens of a camera," and then "selecting sub-frames representing portions of *the* input images, the sub-

frames including reduced fields of view of the scene smaller than the fields of view of the input images.” Ex. 1001, 13:28-35, 14:18-25; Ex. 2001, ¶49. The claims therefore plainly require a first image, the “input image,” and then selecting sub-frames that represents a smaller portion of that image. Ex. 2001, ¶¶49-60.

Okubo does not disclose selecting sub-frames from any image—rather, it “picks up” only that portion of the sensor’s range necessary for its further processing. Ex. 2001, ¶50. The Petition relies on Okubo’s disclosure of an “image cutout” as representing the sub-frame. Pet., 9, 20; Ex. 2001, ¶50. However, Okubo discloses that this “image cutout” does not represent a portion of a larger input image, but rather is the size of the image that is “picked up” and recorded in the first instance. Ex. 2001, ¶50. That is, Okubo does not use the entirety of the sensor, but only a portion that it needs, and that portion of the sensor that is used is the image cutout, which is the input that is recorded. *Id.* For example, Okubo discloses that “the picked-up image in this *image pick-up range* [i.e., the cutout range] is subjected to the electronic vibration correcting, and *recorded*.” Ex. 1004, [0088] (emphasis added); Ex. 2001, ¶50. Subsequent paragraphs also refer to the “image

cutout” as the image that is recorded in the first instance. *See* Ex. 1004, [0090] (“range to be picked up and recorded”), [0091] (same); Ex. 2001, ¶50.

Prior disclosures in Okubo confirm that Okubo uses the term “picked up” to refer to the image that is taken in the first instance. Ex. 2001, ¶51. For example, paragraph [0072] states that a “light beam passed through the lenses **12, 13, 14** is formed into an image on the image pick-up device **114**, and photoelectrically converted by each pixel of the image pick-up device. Accordingly, the ***image is picked up.***” Ex. 1004 (emphasis added); Ex. 2001, ¶51.

The flow-charts relied upon in the Petition further confirm that there is no two step process in which an image that represents 100% of the CCD is recorded, and then a sub-frame is taken from that image. Ex. 2001, ¶52. The Petition relies on the “two stage lens correction process” of Fig. 12. Pet, 10, 13, 15, 20, 27-29; Ex. 2001, ¶52. That process shows only a single step, step S301, to “pick up image.” Ex. 1004, Fig. 12; Ex. 2001, ¶52. The corresponding discussion contains no disclosure of any alleged selection of sub-frames from a larger image. Ex. 1004, [0113]; Ex. 2001, ¶52. There is no disclosure or discussion of picking up a 100% size image and then selecting a portion of that as the image cutout. Ex. 2001, ¶52. This description confirms

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the discussion above that, rather than recording a full-size image and selecting a crop thereof, Okubo simply records only that portion of the sensor it requires. *Id.*

The Petitioner euphemistically argues that the image cutout is a sub-frame representing part of some “CCD image.” Pet 9, 20; Ex. 2001, ¶53. But the CCD is the *sensor*, not an image itself. Ex. 1004, [0072]; Ex. 2001, ¶53. The '052 patent recognizes the distinction between a sensor, and an image recorded by the sensor. Ex. 1001, 7:23-26 (“image sensor 414 . . . captures images”); Ex. 2001, ¶53.

B. Okubo Does Not Disclose “Selecting Sub-Frames Representing Portions of the Input Images” with “Different Lens Distortion Effects” Based on “Different Positions” or “Sizes” of the Areas

Claims 1 and 11 also require:

selecting sub-frames representing portions of the input images, the sub-frames including reduced fields of view of the scene smaller than the fields of view of the input images, *the sub-frames including different lens distortion effects as a function of the input lens distortion present in the input images, different positions of areas of the input images included within the reduced fields of view, and a size of the areas of the input images included within the reduced fields of view.*

Ex. 1001, 13:32-41; 14:22-32 (emphasis added); Ex. 2001, ¶54.

The Petition, at most, appears to argue that “the sub-frames include[e] different lens distortion effects as a function of the input lens distortion present in the input images.” Ex. 2001, ¶55. It fails to address at all the requirements that the sub-frames be a function of “different positions” and a function of “size” of the sub-frames included in the reduced fields of view. *Id.*

The '052 patent discloses that “output images may include zooming and/or panning effects in which a reduced field of view image may be extracted which may be of **varying size and location** in different images.” Ex. 1001, 2:46-49; Ex. 2001, ¶56. That is the effect of this claim limitation, which states that the distortion in the sub-frames is a function of, not only the input lens distortion in the input image, but also of the size and position of those sub-frames. Ex. 2001, ¶56. The claim language directed to “different positions of areas of the input images included within the reduced fields of view, and a size of the areas of the input images included within the reduced fields of view” would have no patentable weight otherwise. *Id.*

The Petition's conclusory analysis only confirms that Okubo does not disclose this limitation. Ex. 2001, ¶57. It states that a “POSITA would further understand the sub-frames to include different lens distortion effects as a function of different positions of areas of the input images included within the

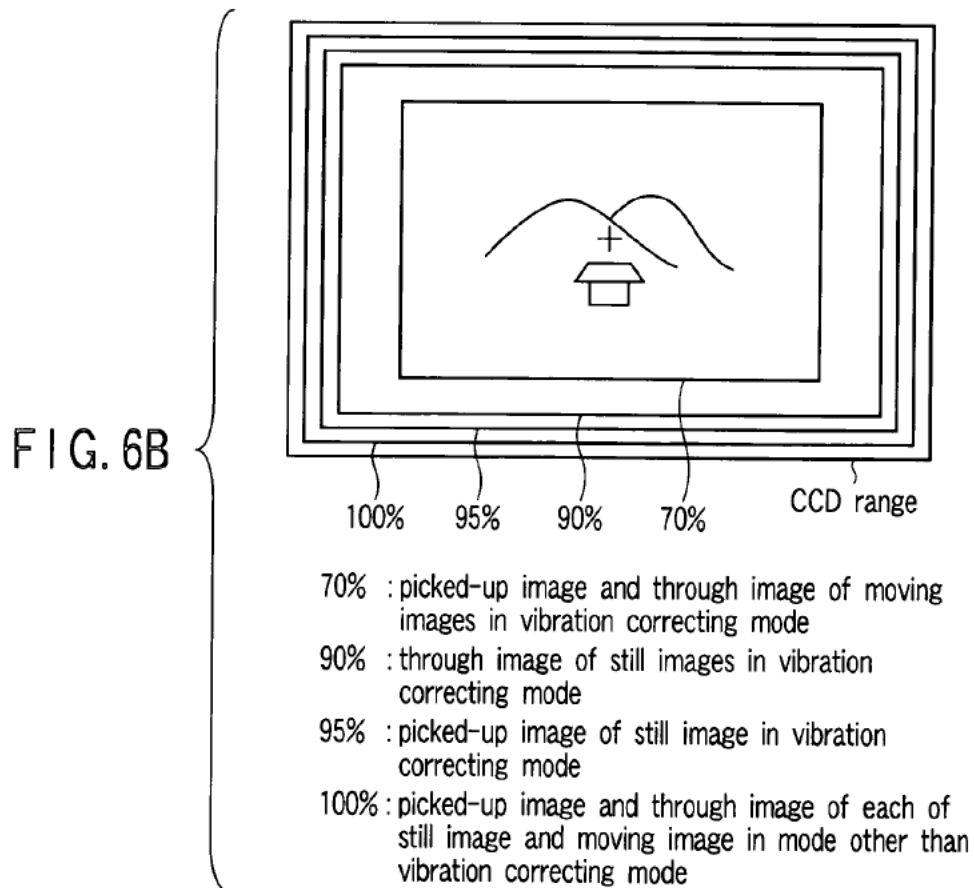
reduced fields of view, and a size of the areas of the input images included within the reduced fields of view” because “as described above for FIGs. 11D and 11E, the lens distortion effects in an input image—and thus a sub-frame of that image—are expressed as a function of the position and/or size (i.e., image height d) of an area within the input image.” Pet., 26; Ex. 2001, ¶57. But what the Petition is describing there is not different positions and sizes of the “areas of the input images included within the reduced fields of view,” i.e., of the location and size of the sub-frames within the input. Ex. 2001, ¶57. The Petition there is merely restating its position that there is varying distortion in the input image. *Id.*

In fact, this argument in the Petition confirms that Okubo fails to disclose this limitation. Ex. 2001, ¶58. It states that the distortion effects are a function of position and size of “an area” within the input image. *Id.* But that is not what the claim requires—the claim requires that the distortion effects are a function of the position and the size of the “areas of the input images included within the reduced fields of view,” i.e. the area captured by the sub-frame. *Id.* The Petition fails to even allege that this limitation is met. *Id.*

The Petition’s failure in this regard is no accident. Ex. 2001, ¶59. The alleged “sub-frames” that the Petition points to, the image cutouts, are both

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fixed in size in any given mode on which the Petition relies (*see* Pet., 9, relying on the 70% cutout range associated with the “moving image” mode), and remain centered on the CCD sensor, as shown in Fig. 6B (Ex. 2001, ¶59):



In other portions of the Petition, Petitioner in fact agrees that the alleged sub-frame size in Okubo is fixed. Pet., 55 (Okubo “has fixed cropping factors that are based on metadata”); Ex. 2001, ¶60.

The failure to identify a reference that discloses key limitations of the independent claims of the '052 Patent is dispositive. *See Univ. of Strathclyde v. Clear-Vu Lighting LLC*, 17 F.4th 155, 160-62 (Fed. Cir. 2021) (reversing obviousness decision in IPR where substantial evidence did not support finding that prior art taught all of the claim limitations).

XII. GROUND 2: PETITIONER FAILS TO ESTABLISH THAT OKUBO IN VIEW OF SOKEILA RENDERS CLAIMS 1-20 OBVIOUS

A. Sokeila Does Not Cure Okubo's Deficiencies

Petitioner relies on Sokeila, a reference that Petitioner correctly notes is related to “stabilizing video” (Pet., 54), for its disclosure of adaptive cropping of video on a frame-by-frame basis. *See* Ex. 1005 at Abstract (“Determining an amount of motion in a second frame of video with reference to a first frame of video. Adaptively predicting a cropping factor for the second frame in response to the determined amount of motion.”); Ex. 2001, ¶61.

But even if Okubo were modified to apply Sokeila's adaptive cropping of video frames, Sokeila cannot remedy the deficiencies of Okubo identified with respect to Ground 1. Ex. 2001, ¶62. That is because the “two-stage lens distortion correction process” Petitioner relies on (and indeed requires) to

demonstrate created output images with “desired distortion,” is limited to *still* images—Okubo does not use that process for “moving images,” i.e., video. *Id.* Thus, although Okubo modified in view of Sokeila may allegedly modify the size and position of sub-frames from frame to frame of a video, the alleged “desired lens distortion” would never be applied to such sub-frames. *Id.* Thus, Petitioner has failed to establish a *prima facie* case of obviousness. *Id.*

Okubo discloses two distinct modes, a “moving image” or “video mode,” and a “still image” mode, that is controlled by a mode switch. Ex. 1004, Fig. 7, [0093] (“it is judged whether a mode is a still or moving image mode (S106), and the process shifts to S120 of FIG. 8 in the moving image mode in which the mode key 7 is positioned on the M-side”); Ex. 2001, ¶63. In the still image mode, processing continues to, e.g., blocks 122 and 123 of the circuit. Ex. 1004, [0095] (“After picking up the still image, the resultant image is processed by the image processing circuit 117,” and discussing use of circuits 122 and 123); Ex. 2001, ¶63.

In the moving image mode, processing takes a different path and continues to different circuits, i.e. circuits 131 and 132. Ex. 1004, [0096] (“a main flowchart for the moving image will be described with reference to FIG. 8,” and describing use of blocks 131 and 132); Ex. 2001, ¶64.

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The Petition relies exclusively on the “two-stage lens distortion correction process,” described in connection with Fig. 12, for the “desired lens distortion.” Pet., 27-28; Ex. 2001, ¶65. However, this process *only applies to still images, not video*. Ex. 2001, ¶65. That is evinced by the fact that Okubo discloses the alleged desired distortion being applied in circuit 123 which, as mentioned previously, is only in the still image mode. Ex. 1004, [0013]; Ex. 2001, ¶65. The Petition’s analysis of other limitations confirms that the Petition is relying on the still image path for its mapping. Ex. 2001, ¶65. For example, in connection with claim 2, the Petition relies on Okubo’s disclosure of “correction of the vibration in a still image.” Pet., 35, Ex. 1004, [0055]; Ex. 2001, ¶65.

Petitioner’s proposed modification of Okubo in view of Sokeila therefore does nothing to address the deficiencies of Okubo, in that Sokeila would not modify the still image mode of Okubo that Petitioner relies on for its “two-stage” distortion correction process. Ex. 2001, ¶66. Petitioner has failed to establish a *prime facie* case of obviousness.

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EDER RENDERS CLAIMS 1-20 OBVIOUS****A. Eder Does Not Disclose “Selecting Sub-Frames
Representing Portions of the Input Images,” Where “The
Input Images Including Fields Of View Of A Scene
Captured Through A Lens Of A Camera, The Input Images
Depicting The Scene With An Input Lens Distortion
Centered In The Fields Of View”**

Eder does not disclose selecting sub-frames representing portions of the input images, where the input images include fields of view captured through a lens of the camera. Ex. 2001, ¶67.

The Petition plainly relies on “area A” in Fig. 8 as the alleged “sub-frame,” and “B” as the input image. Pet. 75-76 (“as annotated below with respect to Fig. 8, area A represents a subset, and thus a portion, of the total pixels B”); Ex. 2001, ¶68. This is demonstrated through Petitioner’s annotation of Fig. 8:

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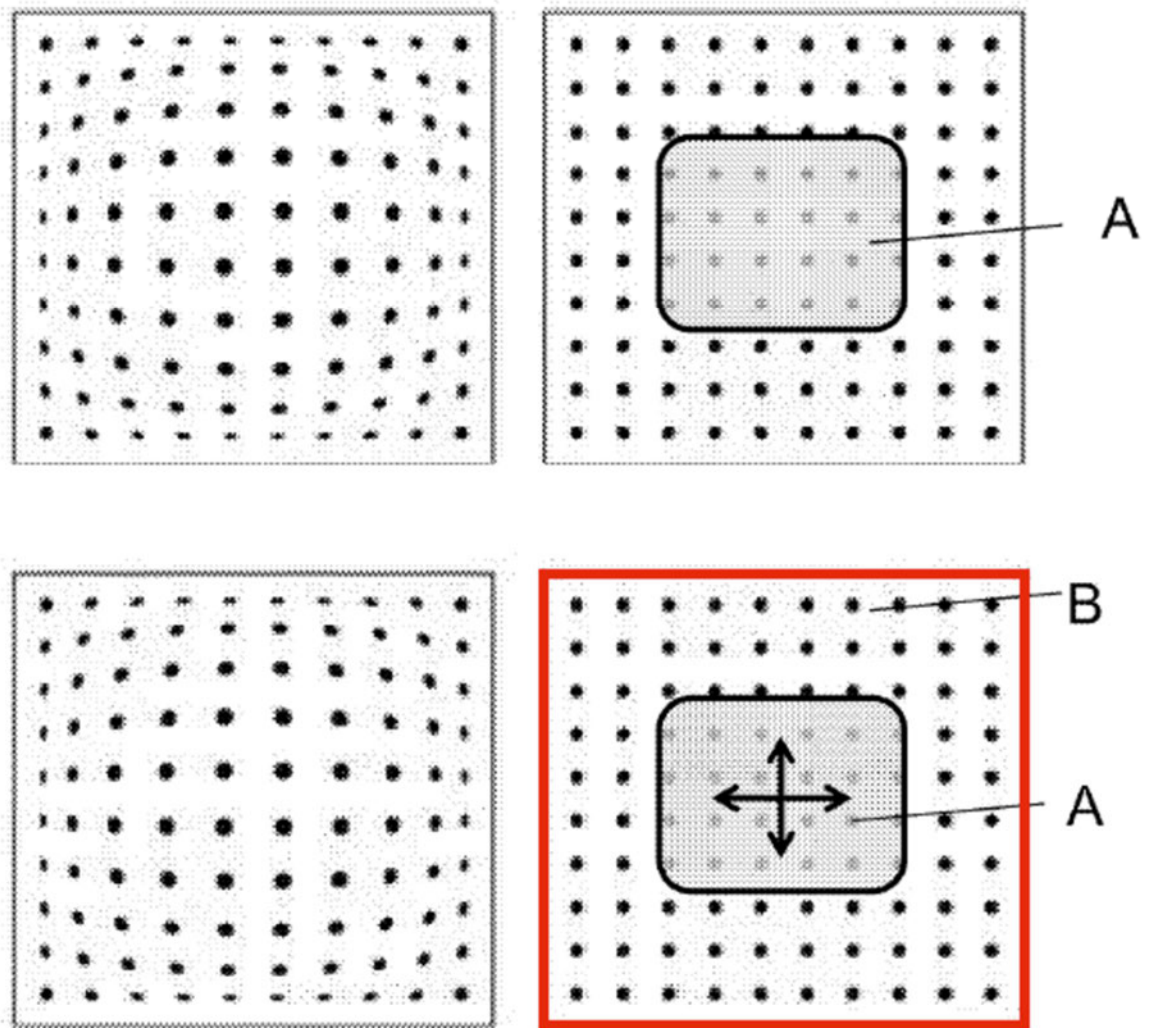


Fig. 8

Pet., 76 (annotating Ex. 1009, Fig. 8); Ex. 2001, ¶68.

However, the images on the right (including area B that Petitioner identified as the input image) is *not* an “input image[] including fields of view of a scene captured through a lens of a camera.” Ex. 2001, ¶69. The right

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images in Fig. 8 are not the images that were captured through the lens of the camera, but are rather “rectified” images. *Id.* The images on the *left* of Fig. 8 represent images captured through the lens of the camera. *Id.* But the Petition does not allege that those images have sub-frames selected from them. *Id.* The Petition in fact acknowledges that the images on the left are the input images, as it pointed to the *left* images as those showing the “input lens distortion” that is “centered in the field of view.” Pet., 74; Ex. 2001, ¶69. The images on the right are not distorted, and thus plainly not the claimed “input images” having input lens distortion. Ex. 2001, ¶69.

B. Eder Does Not Disclose “Selecting Sub-Frames Representing Portions of the Input Images” with “Different Lens Distortion Effects” Based on “Different Positions” or “Sizes” of the Areas

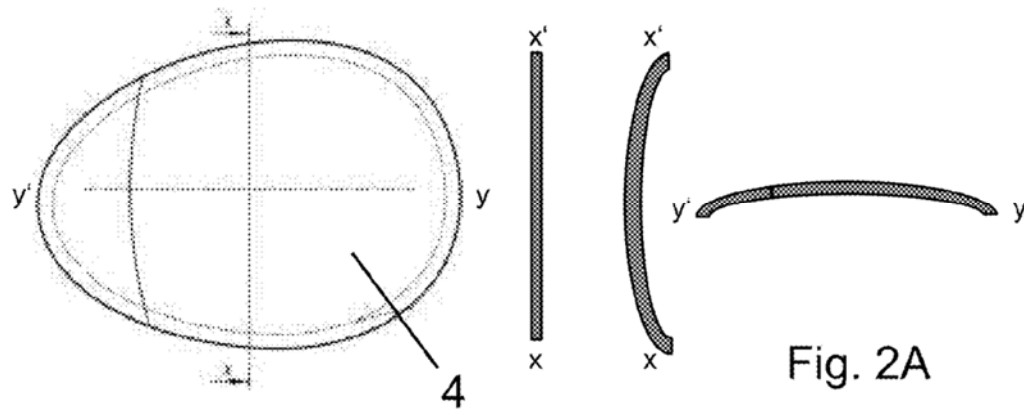
Claims 1 and 11 of the '052 Patent also require: “selecting sub-frames representing portions of the input images, the sub-frames including reduced fields of view of the scene smaller than the fields of view of the input images, the sub-frames including different lens distortion effects as a function of the input lens distortion present in the input images, different positions of areas of the input images included within the reduced fields of view, and a size of the areas of the input images included within the reduced fields of view.” Ex. 1001, 13:32-41; 14:22-32; Ex. 2001, ¶70.

Eder discloses that its alleged sub-frames are always fixed in size. Area A in Fig. 8 relates to what Eder calls the “plane mirror. Ex. 1009 at 5:8-9 (“it is area A which shows plane surfaces in the middle of the optical sensor”); Ex. 2001, ¶71. However, Eder plainly discloses that the size of area A is fixed. Ex. 2001, ¶71. For example, it states that “a defined number of pixels is chosen for the display of the plane mirror surface.” Ex. 1009 at 5:7-8; Ex. 2001, ¶71. It similarly states again that the “number of pixels, and therefore the size of the section, is not changed.” Ex. 1009 at 5:33-35; Ex. 2001, ¶71.

C. Eder Does Not Disclose “The Output Images Include The Sub-Frames Remapped From The Input Lens Distortion Centered In The Fields Of View Of The Input Images To The Desired Lens Distortion Centered In The Reduced Fields Of View”

Claims 1 and 11 require that the output images include the sub-frames remapped to the desired lens distortion *centered in the reduced field of view*. Ex. 2001, ¶72. The Petition never once alleges that the desired lens distortion is centered in the reduced fields of view. *See* Pet., 84 *et seq.*; Ex. 2001, ¶72.

There is good reason why that would be the case. Ex. 2001, ¶73. Eder discloses an asymmetric, and radially asymmetric display for use as a simulated rear-view mirror. *See* Ex. 1009, Fig. 2A (Ex. 2001, ¶73):

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Although Eder also discloses a mirror with an ovoid shape (Fig. 2B), Eder is entirely lacking in any disclosure about how the alleged desired distortion is applied to these shapes. Ex. 2001, ¶74.

Petitioner's expert similarly fails to even allege that Eder discloses that the output images include the alleged desired distortion *centered* in the reduced fields of view. Ex. 1002 at 95-98; Ex. 2001, ¶75.

XIV. SECONDARY CONSIDERATIONS CONFIRM THE NON-OBVIOUSNESS OF THE '052 PATENT

Secondary considerations, or “objective indicia,” of non-obviousness are critical in the overall inquiry under 35 U.S.C. § 103. As the Federal Circuit has noted, these indicia can “often establish that an invention appearing to have been obvious in light of the prior art was not.” *See Stratoflex, Inc. v. Aeroquip Corp.*, 713 F.2d 1530, 1538 (Fed. Cir. 1983); *Liqwd, Inc. v. L'Oreal USA, Inc.*, 941 F.3d 1133, 1136-37 (Fed. Cir. 2019). Objective indicia “may

often be the most probative and cogent evidence' of nonobviousness." *Liqwd*, 941 F.3d at 1136. These considerations are crucial in preventing hindsight bias, which can distort the obviousness analysis. *See Bristol-Myers Squibb Co. v. Teva Pharms. USA, Inc.*, 752 F.3d 967, 977 (Fed. Cir. 2014). When a nexus exists between these secondary considerations and the claimed invention, this evidence can carry substantial weight. *See Rambus Inc. v. Rea*, 731 F.3d 1248, 1256 (Fed. Cir. 2013).

Moreover, as emphasized in *KSR Int'l Co. v. Teleflex Inc.*, 550 U.S. 398, 421 (2007), secondary considerations play a pivotal role in avoiding the pitfalls of hindsight bias, which can improperly influence the determination of obviousness. Objective indicia offer concrete evidence that helps ground the analysis in real-world achievements and market realities, rather than retrospective rationalization of prior art.

In the case of GoPro's '052 Patent, the following secondary considerations have a nexus to the claimed inventions and therefore strongly support non-obviousness (Ex. 2001, ¶¶76-88):

A. Nexus

The virtual lens technology claimed by the '052 patent [REDACTED]

[REDACTED]

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[REDACTED]. Ex. 2001, ¶77. [REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]. Ex. 2015 at 2-3;

Ex. 2001, ¶77.

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]. Ex. 2015 at 4, 6; Ex. 2001, ¶78. [REDACTED]

[REDACTED]

[REDACTED]. Ex. 2015 at 8, 10, 13; Ex.

2001, ¶78. [REDACTED]

[REDACTED]

[REDACTED]. Ex. 2015 at

14-16, 19-21; Ex. 2001, ¶78.

[REDACTED]

[REDACTED]

[REDACTED]

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[REDACTED]. Ex. 2015 at 23-24; Ex. 2001, ¶79.

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]. Ex. 2015 at 27-28; Ex. 2001, ¶79.

B. Commercial Success

GoPro's virtual lens technology has driven significant commercial success. Ex. 2001, ¶80. GoPro has sold over 50 million action cameras since 2009, with its HERO series cameras, featuring virtual lens technology, at the forefront of this success. *See* Ex. 2003 ("GoPro Celebrates Surpassing 50 Million Cameras Sold"); Ex. 2001, ¶80. [REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]. *See* Ex. 2004 ([REDACTED])

[REDACTED]

[REDACTED]); Ex. 2001, ¶80.

GoPro's dominant position in the U.S. action camera market, holding a larger share than all competitors combined, further illustrates the commercial

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strength of its patented technologies. Ex. 2001, ¶81. GoPro's partnerships with leading brands like Red Bull, NHL, and Adobe reflect the substantial demand for and market confidence in GoPro's products, driven in large part by its patented technologies. *See* Ex. 2005 (NHL Senior VP of Programming and Production said, "[O]nly GoPro has the technology to help us and our media partners showcase the beauty and intensity of hockey in new and deeper ways."); Ex. 2008 (GoPro "named the exclusive action camera of Red Bull" mountain bike competition; GoPro athletes will capture their runs wearing HERO11); Ex. 2009 (Vice President of Adobe Stock said, "Adding GoPro's unique footage to Adobe Stock gives our community access to a library of immersive 'wow' moments that will take their audience to new places and deliver an additional level of depth and perspective to their creations"); Ex. 2001, ¶81.

This success is closely linked to specific features of GoPro's patented technologies, such as GoPro's virtual lens technology described in the '052 Patent. Ex. 2001, ¶82.

C. Long-Felt but Unmet Need

The '052 Patent addresses a long-standing problem in image and video processing: how to remap lens distortions in cropped images or video while

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maintaining consistent distortion characteristics. Ex. 2001, ¶83. Before the '052 Patent, cropping or zooming into wide-angle images often produced inconsistencies in distortion effects, resulting in a disjointed viewing experience. *Id.* Existing methods failed to preserve the appearance that the cropped or zoomed frame had been captured independently by a virtual lens, making it difficult to simulate seamless camera movements or object tracking. *Id.*

The '052 Patent solves this problem by introducing a method of remapping lens distortions across sub-frames, ensuring that cropped or zoomed sub-frames maintain distortion characteristics consistent with the original images. *Id.*, ¶84. This innovation enables virtual lens simulation, creating the impression that a camera has physically moved to reframe a scene, even when it has not. *Id.* The claimed method eliminates the undesirable frame-to-frame variation in distortion effects, enhancing the usability of cropping and zooming functions for wide-angle or spherical cameras. *Id.* It further enables the selection of sub-frames from distinct regions of the input image, ensuring seamless transitions in scenarios like object tracking or dynamic zooming. *Id.*

By addressing these long-standing issues, the '052 Patent meets a recognized need in the industry. *Id.* Solving such long-felt but unmet needs strongly supports non-obviousness. *See Tec Air, Inc. v. Denso Mfg. Michigan Inc.*, 192 F.3d 1353, 1360 (Fed. Cir. 1999).

D. Unexpected Results

The '052 Patent yields unexpected results by enabling realistic manipulation of sub-frames while preserving consistent lens distortion effects across the output images and with the original images. Ex. 2001, ¶85. Prior to the '052 Patent, methods for processing cropped or zoomed frames often led to visible inconsistencies in lens distortion, particularly when sub-frames were selected from different regions of the input images. *Id.* This lack of consistency hindered the ability to produce visually cohesive outputs and disrupted the viewer's experience during tasks such as object tracking or virtual zooming. *Id.*

The '052 Patent addresses these challenges by enabling the selection of sub-frames with varying lens distortion effects—based on their size and position within the input image—and ensuring that output images maintain a cohesive and natural appearance. *Id.*, ¶86. This capability was unexpected in the industry, as prior art systems were incapable of seamlessly combining sub-

frames from different regions while preserving a consistent distortion effect. The ability to simulate smooth panning, zooming, and object tracking across such diverse sub-frames represents a breakthrough in wide-angle imaging technology. *Id.*

By achieving these results, the '052 Patent provides a transformative advancement over the prior art and demonstrates unexpected benefits that further support the non-obviousness of the claimed invention. *Id.*, ¶87.

E. Copying by Competitors

Copying by competitors is a strong indicator of non-obviousness. *See Liqwd, Inc. v. L'Oreal USA, Inc.*, 941 F.3d 1133, 1137 (Fed. Cir. 2019). In this case, Insta360, a direct competitor, is accused of copying GoPro's virtual lens technology, further highlighting the innovative and valuable nature of the '052 Patent.¹ Ex. 2001, ¶88; Ex. 2006 (Complaint).

¹ Patent Owner understands that in the ITC litigation, Petitioner served an interrogatory response requesting Patent Owner's contentions regarding secondary considerations. In related proceedings, on October 3, 2024, Lead Counsel for Patent Owner emailed Petitioner, asking that Petitioner produce any documents relevant to secondary indicia under Petitioner's self-executing

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These secondary considerations—commercial success, long-felt need, unexpected results, and copying by competitors—collectively confirm that the

obligation to produce any “relevant information that is inconsistent with” its obviousness grounds, including evidence of secondary considerations. 37 C.F.R. § 42.51(b)(1)(iii); Ex. 2007; *see Becton, Dickinson & Co. v. B. Braun Melsungen AG*, IPR2017-01586, Paper 20 at 2-5 (PTAB Feb. 28, 2018) (finding that documents demonstrating copying and long-felt need must be produced as “routine discovery” because they are inconsistent with Petitioner’s obviousness positions). Petitioner responded on October 9, 2024, that it was aware that Patent Owner had responded to the interrogatory by “cit[ing] to some Arashi documents in arguing secondary considerations of non-obviousness.” Ex. 2007. However, Petitioner disagreed that it was obligated to produce those identified documents and has, at the time this POPR has been filed, refused to produce those documents. *Id.* If Petitioner and Patent Owner are unable to come to agreement, Patent Owner will seek guidance from the Board. Patent Owner further may request that the Board grant authority to Patent Owner to file additional briefing once those documents are produced.

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inventions claimed in the '052 Patent were not obvious. Ex. 2001, ¶¶76-88. GoPro's virtual lens technology has driven consumer demand and prompted competitors to replicate its success. *Id.* For these reasons, the Board should find that the claims of the '052 Patent are non-obvious and uphold their validity.

XV. CONCLUSION

For the foregoing reasons, Patent Owner respectfully submits that the Board should uphold the challenged claims.

Date: January 30, 2025

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CERTIFICATE OF LENGTH (37 C.F.R. §§ 42.24)

The undersigned hereby certifies that, according to the word-processing system used to prepare the foregoing document, this document has 6,508 words and thus complies with the applicable word limit.

Date: January 30, 2025

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CERTIFICATE OF SERVICE (37 C.F.R. §§ 42.6(E), 42.105(A))

The undersigned hereby certifies that the foregoing document was served in its entirety on January 30, 2025 upon the following parties via

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