

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

APPLE INC.
Petitioner

v.

IMMERVISION, INC.,
Patent Owner

Case IPR2023-00472
Patent No. 10,795,120

SUPPLEMENTAL DECLARATION OF DR. DAVID KESSLER, Ph.D.

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I. INTRODUCTION

1. My name is Dr. David Kessler, and I have been retained by counsel for Petitioner Apple Inc. (“Apple” or “Petitioner”) as an expert witness to provide assistance regarding U.S. Patent No. 10,795,120 (“the ’120 Patent”). Specifically, I have been asked to consider the validity of claims 1-7 of the ’120 Patent (“Challenged Claims”) in view of prior art, anticipation and obviousness considerations, and the understanding of a person of ordinary skill in the art at the time of the invention (“POSITA”) as it relates to the ’120 Patent.

2. I am being compensated for my time at my standard consulting rate. I am also being reimbursed for expenses that I incur during the course of this work. My compensation is not contingent upon the results of my study, the substance of my opinions, or the outcome of any proceeding involving the Challenged Claims. I have no financial interest in the outcome of this matter or on the pending litigation between Petitioner and Patent Owner.

3. I previously submitted a Declaration in this proceeding that I signed on January 18, 2023, and I understand that Declaration was marked as EX1003. That Declaration contained my opinions as of that date and the bases for them. Since submitting my Declaration (EX1003) I have considered the Board’s Institution Decision (Paper 6), Patent Owner’s Response (Paper 10), and the Declaration of Dr.

Michael Lebby (EX2002) in support of Patent Owner's Response. My opinions from my previous declaration have not changed.

II. BACKGROUND AND QUALIFICATIONS

4. My background and qualifications are set forth in my January 18, 2023 declaration (EX1003). I incorporate that section of my previous declaration here by reference.

III. MATERIALS CONSIDERED AND RELIED UPON

5. In reaching the conclusions described in this declaration, I have relied on the documents and materials cited herein as well as those documents listed in Section III of my January 18, 2023 declaration (EX1003).

6. I have also relied on my education, training, research, knowledge, and personal and professional experience in the relevant technologies and systems that were already in use prior to and within the timeframe of the earliest asserted priority date of the claimed subject matter in the '120 Patent, which I have been informed by counsel is December 23, 2015.

IV. LEGAL STANDARDS

7. I am not a lawyer and do not provide any legal opinions, but I have been advised that certain legal standards are to be applied by technical experts in forming opinions regarding meaning and validity of patent claims. I set forth relevant legal

standards in my previous declaration, and I incorporate those legal standards here by reference. *See* EX1003, ¶¶19-34.

8. Further, it came to my attention during my deposition on October 12, 2023 that my original January 18, 2023 declaration (EX1003) did not include a discussion of the legal standard for anticipation. This was an oversight. My opinions in my January 18, 2023 declaration (EX1003) and this declaration conform with the following legal standards for anticipation.

A. Legal Standards for Anticipation

9. I have been informed and understand that a patent claim is anticipated under 35 U.S.C. § 102, and is therefore invalid, if all of the elements of the claim are disclosed by a single prior art reference.

10. I understand that a claim is anticipated if each and every element as set forth in the claim is found, either expressly or inherently, in a single prior art reference. For example, I understand that a claim limitation is inherently disclosed if it is not explicitly present in the written description of the prior art, but would necessarily be embodied or met by an apparatus or method as taught by the prior art. Moreover, I understand that anticipation does not require that the prior art use the same terminology recited within the patent claims.

V. CLAIM CONSTRUCTION

11. As noted above, I have reviewed Dr. Lebby's declaration (EX2001). In it, he provides his opinion of a construction for limitation [1e], which recites:

a non-linear targeted resolution to intentionally create a zone in an image captured by the miniature wide-angle optical apparatus with a lower or higher object to image magnification compared to linear targeted resolution, the lower or higher object to image magnification being used to compensate, at least in part, for a lower image quality due to at least one of a drop of relative illumination or a drop of [modulation transfer function] MTF in a zone of the image

EX1001, 7:19-8:2.

12. In his declaration, Dr. Lebby argues that the first clause of limitation [1e] (i.e., "a non-linear targeted resolution to intentionally create a zone in an image captured by the miniature wide-angle optical apparatus with a lower or higher object to image magnification compared to linear targeted resolution") "introduces the concepts of the zones of lower or higher magnification that result from having a non-linear targeted resolution." EX2001, ¶65. Dr. Lebby asserts that "this language alone does not explain to the POSA where these zones are to be arranged," and so he argues that the second clause of limitation [1e] (i.e., "the lower or higher object to image magnification being used to compensate, at least in part, for a lower image quality due to at least one of a drop of relative illumination or a drop of MTF in a zone of the image") "tells the POSA where the magnification zones need to be placed

in order to accomplish their purpose.” EX2001, ¶¶65-66 (emphasis in original). Dr. Lebby argues that “the zones need to align with appropriate regions exhibited in a relative illumination *or* MTF curve.” EX2001, ¶66¹. Specifically, Dr. Lebby argues that “the ‘120 Patent has located the zone of higher magnification to correspond to the regions where the relative illumination is lowest” and/or “the zone of higher magnification corresponds to the regions where the MTF is the lowest.” EX2001, ¶¶60, 62. Thus, under Dr. Lebby’s construction, the claims require that a zone of higher magnification be located at a position within the field of view (FOV) where the relative illumination or MTF curve is low.

13. I note that Dr. Lebby’s construction seems to significantly narrow the plain language of the claim without any justification beyond the fact that the narrowing may be necessary to avoid technical problems with the claim language. For example, the claims language states that “the *lower or higher* object to image magnification being used to compensate, at least in part, for *a lower* image quality due to at least one of *a drop* of relative illumination or *a drop* of MTF in a zone of the image.” Thus, to the extent that there is correspondence between an image magnification zone and a zone with lower image quality, the claims make clear that

¹ Throughout my declaration, emphasis in quotations has been added unless I otherwise note.

the image magnification zone may be *either* higher *or* lower object to image magnification, and are therefore not limited to just zones of higher magnification, as Dr. Lebby's explanation would require. *See* EX2001, ¶¶60, 62. Similarly, the higher or lower image magnification need not correspond to regions where the relative illumination or MTF is the "lowest," as Dr. Lebby provides, but need only correspond to "a drop." *See id.*

14. Moreover, it is not clear to me how Dr. Lebby's construction satisfies the requirements of the claim language, and particularly the second clause of limitation [1e]. Specifically, the '120 Patent does not explain how a zone of higher magnification, in and of itself, "compensate[s], at least in part, for a lower image quality due to at least one of a drop of relative illumination or a drop of MTF in a zone of the image." Dr. Lebby claims that "a POSA can tolerate the low relative illumination at the edges of this lens because the lens is projecting that area of the image onto more pixels," and he cites to column 6, lines 19-27 of the '120 Patent for support. EX2001, ¶60. However, this portion of the '120 Patent simply explains that, "[i]n the zone where the resolution is higher, there are more pixels of the sensors used to image a given angle of the object space," and that "having more pixels in this zone . . . compensates for the lower image quality in this zone." EX1001, 6:19-24. The '120 Patent appears to suggest that this compensation occurs because the "final resulting image can then be processed to create a resulting image with constant

image quality across the whole field of view.” EX1001, 6:24-27. Assuming for the sake of argument this is true, it is not the lens that compensates for the lower image quality—as apparently shown in FIGS. 4 and 5, the image quality remains low in the image—it is the processing of the image data after it is captured by the sensor that compensates for the lower image quality. In other words, it would be some unclaimed electrical software or hardware, not the claimed miniature wide-angle optical apparatus, that is responsible for the claimed compensation.

15. This is why my initial analysis focused on FIG. 7 of the '120 Patent. With respect to FIG. 7, the '120 Patent describes how the shape and position of the targeted resolution curve of the lens system itself can directly alter the relative illumination and MTF of the image and therefore provides “the best image quality on the lens and camera system” by creating “more balanced relative illumination” and “more balanced MTF.” *See* EX1001, 6:28-61. As the '120 Patent explains in its background, “[i]n wide-angle lenses, the relative illumination is usually maximum in the center and drops continuously toward the edge of the field of view,” and “the image MTF is usually maximum in the center and drops continuously toward the edge of the field of view.” *See* EX1001, 1:53-2:3. Thus, FIG. 7 purports to show a structure by which the lens system itself “compensates” for the drop in relative illumination or MTF experienced in these “usual” wide-angle lenses based on the shape and position of the targeted resolution curve.

16. As I noted above, Dr. Lebby's own explanation of FIG. 6 is that "the '120 Patent has located the zone of higher magnification to correspond to the regions where the relative illumination is lowest" and/or "the zone of higher magnification corresponds to the regions where the MTF is the lowest." EX2001, ¶¶60, 62. But the claim language also explicitly encompasses situations in which, for example, a *lower*, not higher, magnification is used to compensate for a lower image quality due, for example, to a drop of relative illumination. See EX1001, 7:23-8:2. This is not described with respect to the targeted resolution curve illustrated in FIG. 6, but is arguably described with respect to targeted resolution curve illustrated in FIG. 7. See EX1001, 6:28-41 ("This downward curve between maximum value 712 and position 714 allows the lens system to have *a higher relative illumination value toward the edge of the field of view by having a lower object to image magnification ratio in that region* and hence redirecting the same quantity of light from an object to a smaller region in the image with more illumination."). Thus, a more complete consideration of the claim language ought to encompass at least FIG. 6 and FIG. 7, even if the outer boundaries of the claim language remains difficult to parse.

17. For at least these reasons, I stand by the analysis in my original declaration, which utilizes the explicit teachings of the '120 Patent to identify the characteristics of the targeted resolution curve presented in FIG. 7 that allegedly

provide for “more balanced relative illumination” and “more balanced MTF” (i.e., the shape of the targeted resolution curve after its absolute maximum within the field of view). *See* EX1003, ¶¶79-81, 117-124, 161-167, 192-198.

18. Dr. Lebby argues that I based my analysis “on a theory that ImmerVision conflated a low magnification with a downward sloped curve,” but this characterization is a vast oversimplification of my analysis. *See* EX2001, ¶83. I did not focus on just any given downward slope within the curve presented in FIG. 7 or in the corresponding curves in the prior art, but instead I focused on the downward slope that succeeded the absolute maximum resolution across the entire field of view (FOV) in the targeted resolution curve. *See* EX1003, ¶¶123, 167, 198. As Dr. Lebby notes in his declaration, when a non-linear targeted resolution curve is compared to a corresponding linear targeted resolution curve, the area of the non-linear targeted resolution curve above and below the linear targeted resolution curve should be equal. *See* EX2001, ¶57. As a result, an area around the absolute maximum resolution in a non-linear targeted resolution curve will always be a zone of increased magnification, because that area must be above the comparable linear targeted resolution curve in order to provide the balance described by Dr. Lebby. According to the '120 Patent's description of FIG. 7, this downward slope after an absolute maximum corresponds to the benefits the '120 Patent purports to claim. *See* EX1001, 6:28-41; EX1002, 27.

19. Dr. Lebby appears to agree that FIG. 7 shows a targeted resolution curve where the lens system itself improves at least relative illumination (and therefore image quality, of which relative illumination is at least one measure), but argues that “[t]his is different from the other technique described in the ‘120 Patent with respect to Figs. 4-6 and recited in claim 1.” EX2001, ¶¶89-91. However, this argument is inconsistent with the prosecution history of the ‘120 Patent, where the Applicant explicitly explained that claim 1 is supported by both FIGS. 6 and 7, as well as their supporting description. See EX1002, 27 (“Support for the further amendments to claim 1 can be found, for example, *at least in original Figs. 6 and 7*, and in the original specification at paragraphs [0040]-[0041].”). As I noted above, this makes sense, as it would arguably provide an example of a lower magnification is used to compensate for a lower image quality due, for example, to a drop of relative illumination, as the claims appear to encompass.

20. Furthermore, Dr. Lebby’s argument that “[t]here is also no relative illumination curve provided in the ‘120 Patent to compare with the Fig. 7 resolution plot” (EX2001, ¶91) is directly counter to the teachings of the ‘120 Patent, which describe that “the exact values of the relative illumination [illustrated in FIG. 4] with respect to the field of view vary between each embodiment of the present invention, but the overall shape . . . *is present in all families of miniature wide-angle lenses according to the present invention.*” EX1001, 5:57-65. Thus, the ‘120 Patent

makes clear that “the overall shape” of the relative illumination curve of FIG. 4 and the MTF curve of FIG. 5 are intended to apply all embodiments—including, presumably, FIG. 7. *See* EX1001, 5:57-65; 6:1-8.

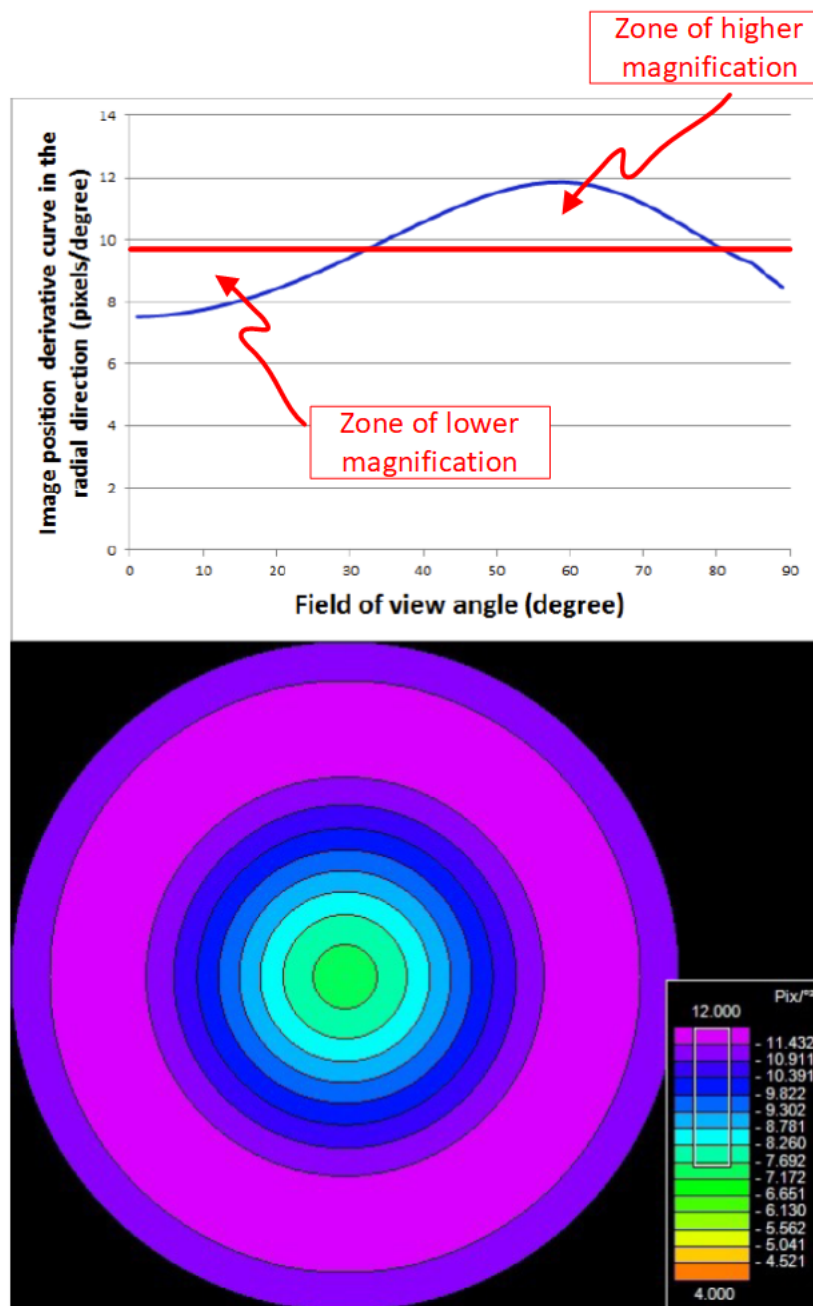
21. Regardless, even if, for the sake of argument, a POSITA were to accept Dr. Lebby’s construction of the claim language, that POSITA would still find that at least Thibault and Matsusaka meet this new claim construction. And having performed no Zemax or any other optical CAD analysis of his own, Dr. Lebby never argues to the contrary.

VI. THIBAUT’S LENS MEETS DR. LEBBY’S NEW CLAIM CONSTRUCTION

22. Dr. Lebby argues that “Petitioner has failed to identify magnification zones in Thibault’s resolution curve.” EX2001, ¶82. This is not true. As I explained in my original declaration (EX1003), “[i]n Figure 6, the zone shown in magenta has the highest number of pixels per degree associated with it.” EX1003, ¶87. I further explained that, “[c]ollectively, Figure 6 shows an increase in the number of pixels in various zones of the resulting image.” *Id.* Thus, the zone shown in magenta in the bottom of FIG. 6 is a zone of increased magnification. The surfacic resolution over the full circular panomorph image shown at the bottom of FIG. 6 is simply another way to visualize the location of the zones of magnification, as opposed to the method that Dr. Lebby in paragraphs 57-58 of his declaration. EX2001, ¶¶57-58.

23. Dr. Lebby asserts that “[t]he resolution plot in Fig. 6 of Thibault then could have been compared to the calculated linear resolution to determine the locations of zones with higher and lower magnification, similar to what Petitioner did for Matsusaka and Kim.” EX2001, ¶82. While Dr. Lebby complains that “[i]t is difficult to determine whether the zones are properly correlated to the relative illumination regions shown in Thibault’s Fig. 7 without this information,” the explanation provided in paragraphs 57-58 demonstrates that the methodology is exceptionally simple. According to Dr. Lebby, one need only place “the equivalent horizontal line . . . on the graph where the area under the line is the same as the area under the non-linear targeted resolution curve.” EX2001, ¶57. Had Dr. Lebby done so, he would have seen that the colored surfacic resolution plot shown at the bottom of FIG. 6 is consistent with and an alternative visualization of his “horizontal line” method when applied to the image position derivative curve shown at the top of FIG. 6.

6. Below, I apply Dr. Lebby’s horizontal line method to the image position derivative curve shown at the top of FIG. 6:

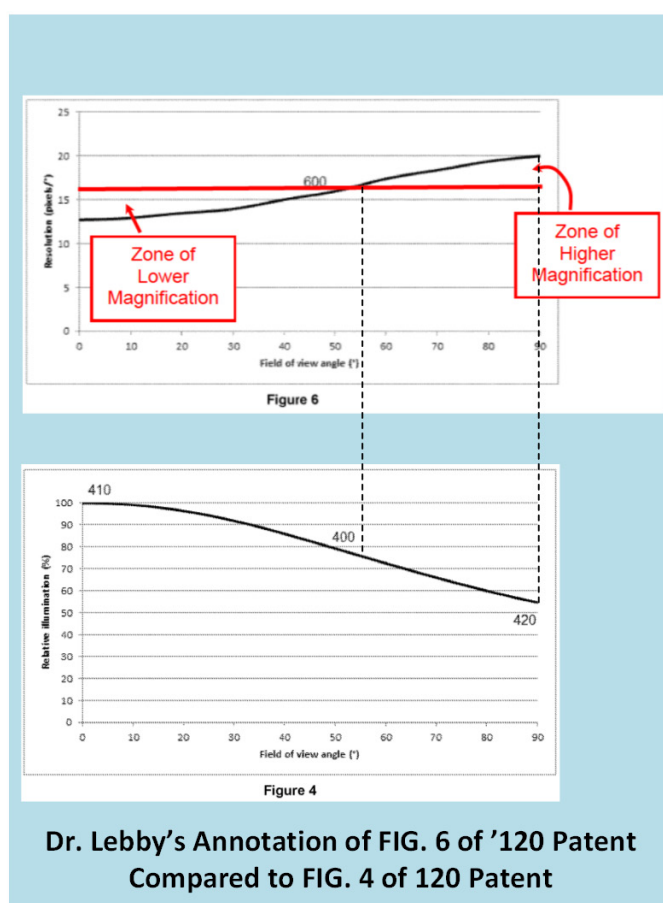
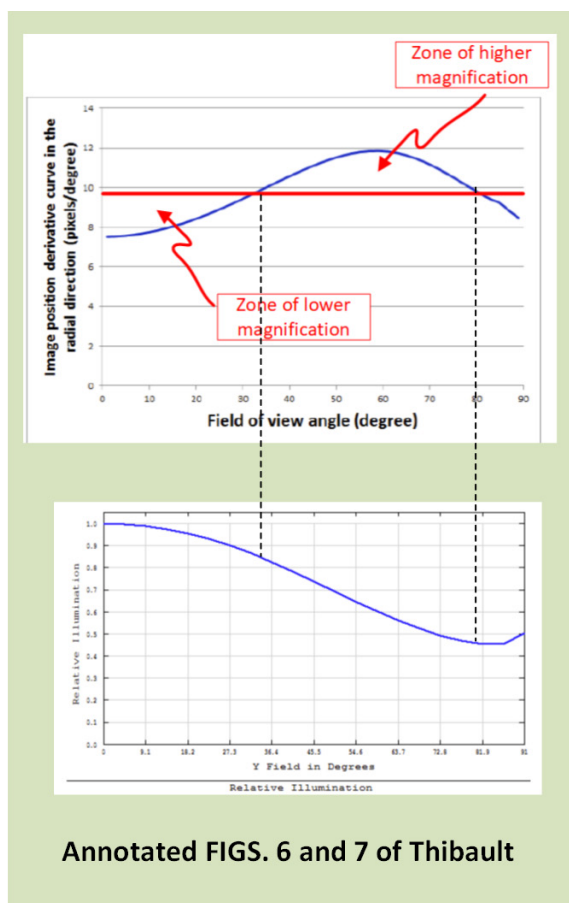


24. As shown above, applying Dr. Lebby's horizontal line method to the image position derivative curve shown at the top of FIG. 6 confirms that the magenta zone that I identified in my original declaration corresponds to a zone of higher magnification. See EX1003, ¶87. Thus, even under Dr. Lebby's alternative

methodology, I correctly identified the zone of higher magnification in Thibault's lens.

25. This zone of higher illumination that I identified in my original declaration also meets Dr. Lebby's new claim construction. Specifically, the zone of higher magnification in Thibault's lens is positioned where the relative illumination curve is lower, just as Dr. Lebby argues it is for the '120 Patent (*see* EX2001, ¶¶57-60).²

² Notably, the annotated versions of Thibault's FIGS. 6 and 7 that I provide here also show a second zone of lower magnification after the zone of higher magnification. As shown in Thibault's FIG. 7, this second zone of lower magnification corresponds to an increase in the relative illumination from its lowest point at around 80°, which is consistent with the '120 Patent's description of FIG. 7. *See* EX1001, 6:35-41 ("This downward curve between maximum value 712 and position 714 allows the lens system to have ***a higher relative illumination value toward the edge of the field of view by having a lower object to image magnification ratio in that region*** and hence redirecting the same quantity of light from an object to a smaller region in the image with more illumination."). Thus, Thibault's FIGS. 6 and 7 cover both scenarios described in the '120 Patent with respect to its FIGS. 6 and 7.



26. Thus, even under Dr. Lebbly's new construction, in which the "the zones need to align with appropriate regions exhibited in a relative illumination or MTF curve," Thibault's lens meets the claim language.

VII. MATSUSAKA'S LENS MEETS DR. LEBBY'S NEW CLAIM CONSTRUCTION

27. As I explained in my original declaration, using the construction data provided by Matsusaka for Example 19, I was able to model the lens in a program called Zemax to evaluate various of its properties. *See* EX1003, ¶¶94-99. From this model, I explained that a POSITA would have been able to calculate the derivative of the image height and convert it to resolution in terms of pixels/degree, which is

reproduced below. EX1003, ¶164. As I further explained, areas where the blue curve are above the red curve are areas of increased magnification with respect to the linear targeted resolution, and areas where the blue curve are below the red curve are areas of decreased magnification with respect to the linear targeted resolution. EX1003, ¶165. Dr. Lebby does not specifically contend with the accuracy of my analysis, nor does he provide any analysis of any independent Zemax model(s) he may have created.³ See EX2001, ¶¶73, 93-98.

³ Despite having not made any effort to “confirm[] the accuracy of [my] plot,” Dr. Lebby “note[s] some inconsistencies in [my] data.” EX2001, ¶73. However, as I explained in my deposition when confronted with these alleged inconsistencies, a POSITA would “only care about, especially for these kind of items [i.e., distribution curves, distortion, and magnification zones], the position of the central beam, okay, which is not affected -- or the behavior of the distribution function is not affected by the F number at all and affected on the field only in the sense that if you do 100, you don't get all the way to 104, you run it at 104 and you get the image distribution all the way to 104.” EX2002, 36:2-43:7. In other words, as I explained, these are “small changes” and “not indicative of anything.” *Id.* However, to confirm this, I went back into my models and corrected these minor

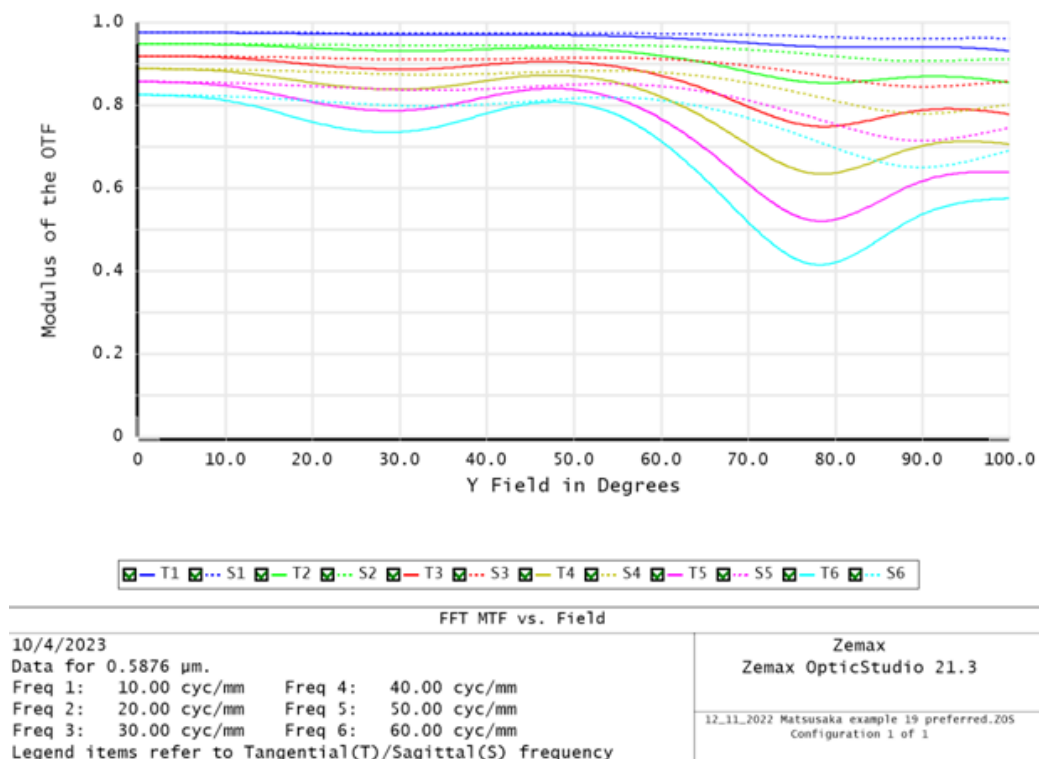


28. Instead, Dr. Lebby argues that I did not provide the data from my Zemax model necessary to evaluate his new construction. That is because I was unaware of this construction at the time of preparing my original declaration. Had either he or Immervision requested a copy of my Zemax model or created their own from Matsusaka's data, they would have readily found that the Matsusaka's Example 19 lens meets this new construction.

29. A POSITA would have understood how to utilize his/her sequential Zemax model, like the one I created for my original declaration, to plot the MTF for Matsusaka's Example 19 lens. Having done so, the POSITA would have been

issues. I found that the outcome did not substantively change, and my original analysis and conclusions remain the same.

provided with the following MTF curves corresponding to Matsusaka's Example 19 lens:

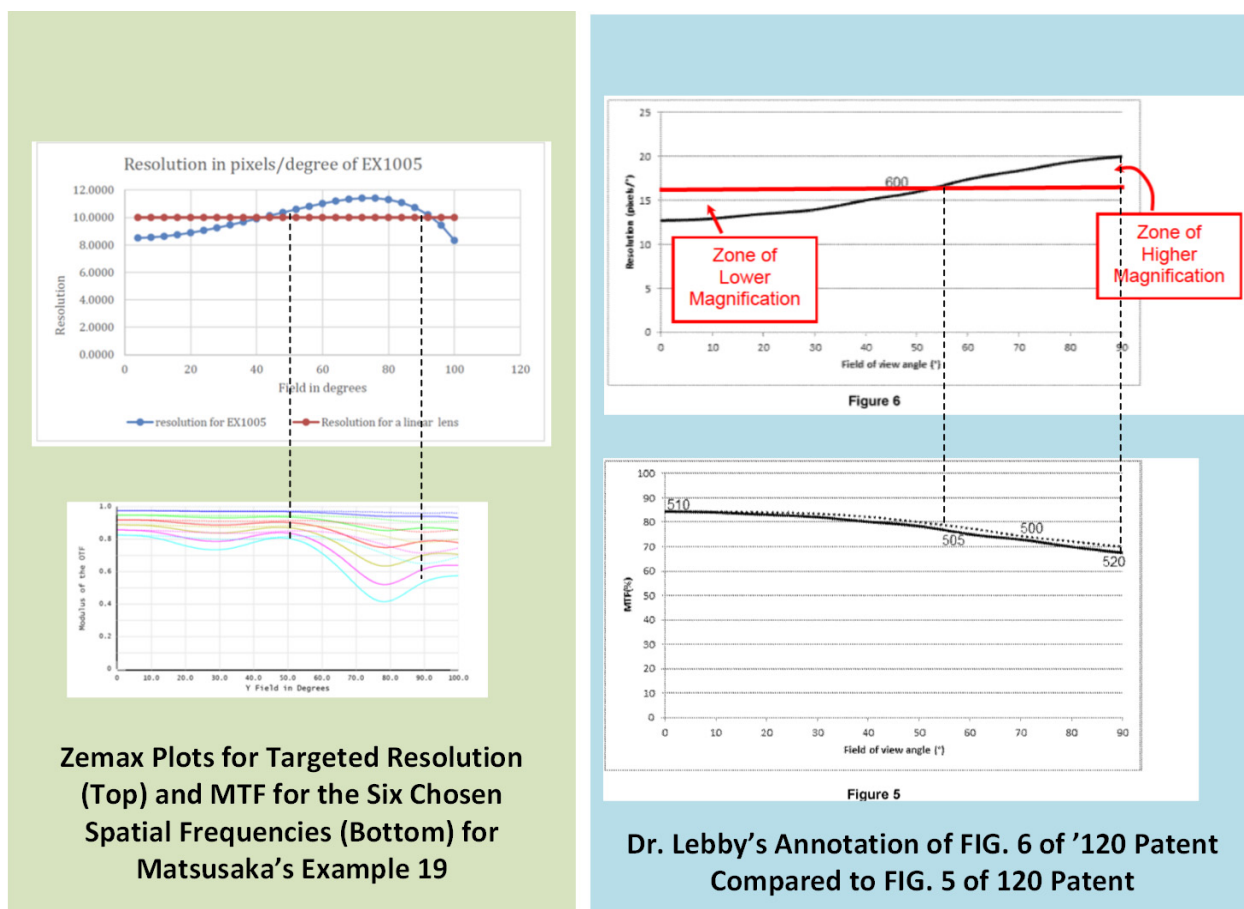


30. The MTF curve referred to by Dr. Leiby and similarly in the '120 is quite poorly defined. The MTF is actually a multi-parameter function for almost all lenses. The '120 Patent only refers to the tangential and sagittal MTFs. *See* EX1001, 5:66-6:8. When using the MTF curves as a function of the field one has to specify at which spatial frequency the MTF is shown. Commonly one would show a collection of MTF curves as a function of the field for a chosen collection of spatial frequencies, each of which often can be significantly different. Thus the term “MTF curve” requires a mention of a **particular spatial frequency** and if it is a tangential or sagittal curve. Alternately, a designer could seek to utilize an average MTF over

a specified range of spatial frequencies or a weighted MTF curve over the spatial frequencies over a given range (e.g., 10 cycles per mm to 90 cycles/mm). However, the '120 Patent does not provide sufficient description of the MTF curves shown in FIG. 5 to know with certainty exactly which type of MTF curve is illustrated. Regardless, independent claim 1 does not appear to be limited to the MTF curves in FIG. 5 or an MTF curve under any specific parameters when evaluating “a drop of MTF in a zone of the image,” as recited in limitation [1e].

31. Because the '120 Patent does not specify the spatial frequency at which the MTF is to be considered, I have plotted the MTF curve for Matsusaka's Example 19 lens at six different spatial frequencies. Each frequency shows the tangential MTF and the sagittal MTF (the dashed line).

32. When compared with the targeted resolution curve from my original declaration, it is clear that the zone of higher magnification aligns with a zone of lower MTF on several of the tangential MTF curves for the chosen six spatial frequencies (e.g., the blue tangential MTF curve T6, which corresponds to 60 cycles/mm), just as Dr. Leiby argues it is for the '120 Patent (*see* EX2001, ¶¶57-59, 61-62):



33. Notably, limitation [1e] recites “the lower or higher object to image magnification being used to compensate, at least in part, for a lower image quality due to at least one of a drop of relative illumination or ***a drop of MTF in a zone of the image.***” As the Zemax plots show at left, there is a marked drop in MTF in the region corresponding to the zone of increased magnification. Thus, even under Dr. Lebbly’s new construction, in which the “the zones need to align with appropriate regions exhibited in a relative illumination or MTF curve,” Matsusaka’s Example 19 lens anticipates or at least renders obvious the claim language.

VIII. ADDITIONAL REMARKS

I currently hold the opinions expressed in this declaration. But my analysis may continue, and I may acquire additional information and/or attain supplemental insights that may result in added observations.

I hereby declare that all statements made are of my own knowledge are true and that all statements made on information and belief are believed to be true. I further declare that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of the Title 18 of the United States Code and that such willful false statements may jeopardize the validity of this proceeding.

Dated: 1/30/2024

By:

A handwritten signature in blue ink that reads "Dave Kessler". The signature is written in a cursive, flowing style.