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YANBIN YU and ZHONGXUAN ZHANG

UNITED STATES DISTRICT COURT

NORTHERN DISTRICT OF CALIFORNIA

SAN FRANCISCO DIVISION

YANBIN YU and ZHONGXUAN ZHANG,

Plaintiffs,

v.

SAMSUNG ELECTRONICS CO., LTD. and SAMSUNG ELECTRONICS AMERICA, INC.,

Defendants.

Case No. 3:18-cv-06339-JD

FIRST AMENDED COMPLAINT FOR PATENT INFRINGEMENT

DEMAND FOR JURY TRIAL

Judge: Hon. James Donato
Trial Date: August 17, 2020

COMPLAINT FOR PATENT INFRINGEMENT

Plaintiffs Yanbin Yu ("Yu") and Zhongxuan Zhang ("Zhang") (collectively "Plaintiffs") hereby file this Original Complaint against Defendants Samsung Electronics Co., Ltd. ("SEC") and Samsung Electronics America, Inc. ("SEA") (collectively, "Defendants" or "Samsung") seeking damages for Samsung's direct and indirect willful infringement of U.S. Patent No. 6,611,289 (the "'289 Patent"), and allege as follows:

THE PARTIES

1. Yu is an individual and a resident of the State of California who resides in Fremont, California.

2. Zhang is an individual and a resident of the State of California who resides in San Diego, California.

3. SEC is a multinational corporation incorporated under the laws of the Republic of Korea and having its headquarters located at 129 Samsung-ro, Yeongtong-gu, Suwon-si, Gyeonggi-do, Korea. On information and belief, SEC has approximately 263 subsidiaries, including Defendant SEA, which collectively with SEC operate four business divisions: Consumer Electronics ("CE"), which designs, manufactures, and sells products such as digital televisions and computer monitors; Information Technology & Mobile Communications ("IM"), which designs, manufactures, and sells products such as mobile phones, communication systems, and computers; Device Solutions ("DC"), which designs, manufactures, and sells products and services within its Semiconductor Business including memory products, LSI products such as system-on-chip ("SoC") semiconductor devices and image sensors, and foundry services, as well as products within its Display Business such as LCD and OLED panels; and Harman, which designs, manufactures, and sells connected car systems, audio and visual products, enterprise automation solutions, and connected services.

4. SEA is a New York corporation having its principal place of business at 85 Challenger Road, Ridgefield Park, New Jersey, 07660. On information and belief, SEA is a wholly-owned subsidiary of SEC that markets and sells products and services within the United States that are designed, manufactured, and/or provided by SEC and/or one or more of SEC's

approximately 263 subsidiaries and that fall within at least one of SEC's CE, IM, and DC business divisions, including Samsung smartphones that infringe the '289 Patent. On information and belief, SEA maintains an office at 665 Clyde Avenue, Mountain View, California, 94043, that is involved in the marketing and selling of Samsung smartphones that infringe the '289 Patent.

5. On information and belief, SEC and SEA work collectively with one another, and with SEC's other subsidiaries, in the design, manufacture, importation, distribution, marketing, and selling of Samsung smartphones that infringe the '289 Patent.

JURISDICTION AND VENUE

6. This Court has original subject matter jurisdiction over this action pursuant to 28 U.S.C. §§ 1331 and 1338(a) because this action arises under the patent laws of the United States, 35 U.S.C. §§ 1 et seq.

7. This Court can exercise personal jurisdiction over Samsung because Samsung maintains substantial operations located in this District, and therefore Samsung's affiliations with this District are so substantial as to render it essentially at home in this District. Additionally, this Court can exercise personal jurisdiction over Samsung in this action because Samsung has committed acts of infringement and/or inducement of infringement in this District, because Plaintiffs' claims arise out of and relate to Samsung's acts of infringement and/or inducement of infringement in this District, and because the exercise of jurisdiction by this Court over Samsung in this action would be reasonable. Accordingly, Samsung has minimum contacts with this District such that the maintenance of this action within this District would not offend traditional notions of fair play and substantial justice.

8. Venue is proper in this Court pursuant to 28 U.S.C. §§ 1391(b) and (c) and/or 1400(b) because Samsung resides in this District and because a substantial part of Samsung's acts of infringement and/or inducement of infringement occurred in this District.

INTRADISTRICT ASSIGNMENT

9. This action involves Intellectual Property Rights and, therefore, is subject to assignment on a district-wide basis pursuant to Local Rule 3-2(c).

THE '289 PATENT

10. The '289 Patent, entitled "Digital Cameras Using Multiple Sensors With Multiple Lenses," was filed on January 15, 1999 and was issued to Yu and Zhang by the United States Patent and Trademark Office ("USPTO") on August 26, 2003. A copy of the '289 Patent is attached hereto as Exhibit A.

11. Plaintiffs are the sole owners of the '289 Patent.

12. The claims of the '289 Patent focus on an improvement to the functionality of digital cameras that is achieved by utilizing a new camera architecture that includes multiple lenses and multiple image sensors – arranged in a specific configuration, and of a specific type – to produce digital images having improved quality compared with prior digital cameras. While digital cameras having multiple lenses and multiple image sensors existed prior to the filing date of the '289 Patent, the conventional approach at that time was to use image sensors that are responsive to only a portion of the visible color spectrum, such as a red sensor, a green sensor, and a blue sensor. The '289 Patent, however, departed from the conventional approach by utilizing at least one image sensor that is "sensitive to a full region of visible color spectrum." This unconventional approach enabled the improved digital camera of the '289 patent to produce images having improved qualities, such as higher resolutions and greater dynamic ranges, compared with prior digital cameras, including those that included multiple lenses and multiple image sensors. Moreover, many prior multiple lens and multiple image sensor digital cameras utilized complex lens arrangements that included a prism for separating light into its component colors and then directing those components onto the respective image sensors. Not only did this approach greatly increase the complexity of the system, but it also introduced the possibility of large registration errors between the images generated by the multiple image sensors. The '289 Patent, on the other hand, avoided the need for such a complex lens arrangement by making the image sensors "closely positioned with respect to a common plane." In other words, the

unconventional approach of the '289 Patent provided a digital camera architecture that was less complex than prior designs, while at the same time achieving improved image quality.

13. The '289 Patent covers only the specific configurations and types of image sensors recited in the claims. It does not cover camera architectures that utilize only a single lens or a single image sensor, camera architectures that do not include either at least one image sensor that is "sensitive to a full region of visible color spectrum" (claims 1 and 6) or at least four sensors that are "monochromatic and identical in resolution" (claim 26), or camera architectures that rely on complex lens arrangements to direct color components to the respective image sensors instead of utilizing image sensors that are "closely positioned with respect to [or in] a common plane." And, the '289 Patent covers only the specific types of image processing recited in the claims, specifically "producing a resultant digital image from said first digital image enhanced with said second digital image" (claim 1), "producing a color image of said imaging target from said four digital images" (claim 6), or "producing a color image from said three scalar digital images processed in conjunction with said gray digital image" (claim 26). None of the '289 Patent claims cover image enhancement that utilizes multiple images taken from the same image sensor, even on cameras that include multiple lenses and multiple sensors. For example, many digital cameras – including those that include multiple lenses and multiple sensors – capture high dynamic range ("HDR") photographs by taking multiple pictures at different exposures in rapid succession using the same image sensor. While this approach to capturing HDR photographs involves enhancing a first digital image with a second digital image, it is not covered by the '289 Patent claims because the images are not captured by first and second image sensors. Nor do any of the '289 Patent claims cover combining, side-by-side, images captured from multiple image sensors to create a single panoramic image, since that form of image processing does not involve enhancing one digital image with a second digital image. Thus, the breadth of the '289 Patent claims is limited to very specific camera architectures, and to very specific forms of image processing that are performed using those architectures.

14. The problems described in the '289 Patent specification as being solved by the claimed invention make clear that the focus of the claims is on improving the functionality of

digital cameras, and not merely on using a digital camera as a conduit for performing image processing in the abstract. A first problem identified in the specification was that digital cameras that existed at the time had limited resolutions compared with film cameras:

> Nevertheless, there are many cases in which digital cameras simply could not be used due to the limited resolutions from today's digital cameras. Film-based photographs have immeasurably higher resolutions than digital cameras. The comparison magnitude may be somewhere millions of pixels versus tens thousands of pixels in the digital cameras.

('289 Patent at 1:40-45). The specification also explains that simply using image sensors having a larger number of pixels was not, at that time, a viable solution to the problem of low image resolution because the costs would be prohibitive:

> Although, it is theoretically possible to design a photosensitive chip with multimillion of pixels, the cost of such chip would be a forbidden number and may consequently drag the digital cameras out of the consumer market.

('289 Patent at 1:46-49). The specification further explains that:

> To have color images with higher resolutions, the number of photocells in a sensor must be increased. The actual design and manufacturing cost for a higher resolution sensor, however, would be evaluated at many magnitudes of the lower resolution sensors.

('289 Patent at 1:66-2:3). Consequently, the specification concludes that "there is a great need for a generic solution that makes digital cameras capable of producing high resolution images without enormously incurring the cost of photosensitive chips with multimillion photocells." This is a first problem that was solved by the invention of the '289 Patent.

15. A second problem described in the '289 Patent specification as being solved by the claimed invention was the low dynamic range of images captured by digital cameras compared with film cameras:

> A second noticeable quality between digital cameras and film-based cameras is the dynamic range. Films have the necessary chemical pigments to make colors much more vivid and more adaptive to light conditions than current digital cameras can do. This is largely due to the limited pixel depth the current digital cameras could produce and the limited sensitivity of the photocells in the image sensor.

('289 Patent at 2:8-14). Consequently, "[t]here is thus a further need for digital cameras that produce better colors and details in a greater range." ('289 Patent at 2:15-16). The invention of the '289 Patent also solved this second problem associated with prior digital cameras.

16. Additionally, the '289 patent noted that it is always desirable to improve image quality in digital cameras, stating that:

> There are many other quality factors that limit the popularity of digital cameras although it is well understood that the digital cameras are the much preferred image acquisition means. Solutions that fundamentally improve the image qualities without incurring substantial cost are always welcome and being seriously and continuously sought.

('289 Patent at 2:17-22). The '289 Patent also addressed this broader issue by providing a camera architecture that can produce digital images having improved qualities. These problems that are described in the specification, and that were addressed by the '289 Patent, demonstrate that the focus of the claimed invention is an improvement in the functionality of digital cameras.

17. The '289 Patent specification explains that it solved these technological problems associated with prior digital cameras by providing a technological solution, specifically an improved digital camera architecture:

> The present invention has been made in consideration of the above described problems and needs and has particular applications to digital cameras that are demanded to produce digital images of high qualities. According to one aspect of the present invention, an improved digital camera uses four image sensors, each having its own lens, of which three image sensors are made responsive to the three primary colors and the fourth one made responsive to all intensity information.

('289 Patent at 2:36-44). The '289 Patent explains that the improved digital architecture of this embodiment can produce digital images having improved quality:

> Using a set of digital image processes embedded in a digital signal processing chip, images from the three color image sensors are processed with reference to the image from the black-and-white image sensor and subsequently produce high quality and film-like true color digital images.

('289 Patent at 2:44-49). The '289 Patent also describes additional benefits associated with the improved digital camera architecture of this embodiment:

> With the unique configuration, there are many obvious benefits and advantages. First, the resolutions of the image sensors are fully used. Second each of the image sensors is only responsible for one color; thereby the expensive process of coating a mosaic of selectively

> transmissive filters superimposed in pixel-based registration on one image sensor is eliminated and subsequently no micro-lenses process is needed. Third, the image from the black-and-white image sensor captures all information including details that the three color image sensors may have missed. Further, because the resolutions of the image sensors are fully used, for the same resolution of color images, the image sensors would relatively have smaller number of pixels, which typically leads to high yield, higher sensitivity, less cross-talking, and lower clocking rate. Besides, the size of the image sensors could be smaller, resulting in smaller optical lenses.

('289 Patent at 2:50-65). More benefits associated with various embodiments of the improved digital camera architecture of the '289 Patent are described in the specification:

> As will be appreciated below, there are many other features in the present invention including high sensitivities, high dynamic ranges, achievement of true colors and increased SNR (signal-to-noise ratio). ('289 Patent at 7:3-7).
>
> Further, with images of the same imaging target from the multiple sensors, it is possible to enhance images, such as noise removal and color correction at 820. More importantly, a true color image with true resolutions is derived from the enhanced images at 830. ('289 Patent at 10:13-16).

In other words, the '289 Patent solved the problems of low image resolution, low dynamic range, low signal-to-noise ratio ("SNR"), inaccurate color reproduction, and low image quality associated with prior digital cameras by providing an improved camera architecture that could produce high quality images while using both smaller image sensors (having higher yield, higher sensitivity, less cross-talking, and lower clocking rate) and smaller optical lenses.

18. The description of the invention in the '289 Patent specification also makes clear that the focus of the claims is on improving the functionality of digital cameras by providing a camera architecture employing a specific configuration and type of image sensors. The specification discloses several different embodiments of the claimed camera architecture, some using four image sensors and others using two image sensors. For example, one embodiment, which is depicted in Fig. 3, is described as including four image sensors of a specific type:

> FIG. 3 shows a block diagram of an improved digital camera 300 employing multiple lens and sensors according to one embodiment of the present invention. Fundamentally and distinctly different from existing digital cameras, improved digital camera 300 uses four identical image sensors 302, 404, 306, and 308. ('289 Patent at 4:62-67).

> Each of image sensors 302, 304, 306, and 308 is integrated respectively with a uniform transmissive filter, not shown explicitly in the figure, referred to as a color filter herein. To be more specific, if output 318 of image sensor 302 is designated for a red signal, the color filter is basically a red filter only transmitting red portion of target 326. Similarly the color filters for image sensors 304 and 306 are a green filter and a blue filter, respectively. It should be pointed out that red, green and blue filters in the present example are preferable, but may be integrated into a lens. That means that lenses 310, 312 and 314 are colored accordingly according to another embodiment. Further other choices of three primary colors will work the same as more explained below. ('289 Patent at 5:14-27).
>
> The fourth image sensor 308 is not specifically coated with a color filter. According to one embodiment, fourth image sensor 308 is integrated with filter 316 that is full transparent, allowing all components of visible light to pass through. In other words, there may not need any filter in front of image sensor 208 according to one aspect of the present invention. Because some image sensors like CCD types tend to have high sensitivity in red portion or beyond in the light spectrum, potentially decreasing image quality. It is preferable to have a proper light (band) filter that obstructs anything beyond the visible light spectrum (430 nm˜680 nm). ('289 Patent at 4:28-40).

The '289 Patent specification also describes other embodiments using specific configurations and types of image sensors. For example, another embodiment employing four image sensors is described as follows:

> In the above description of FIG. 3, it is inherently implied that image sensors 302, 304, 306 and 308 are identical. It is true when the primary colors are red, green and blue. However, those skilled in the art will understand that image sensors 302, 304, 306 and 308 being identical is not the requirement to practice the present invention. For example, image sensors 302, 304 and 306 are integrated with filters that may cause the image sensors to produce images signals similar to YIQ signals used in NTSC television system. In other words, if one of the three images from image sensors 302, 304 and 306 produces a luminance signal representing the light intensity of a color target 326 and the two images are the chrominance images, the resolutions of the chrominance images can be only one half of the luminance image, hence two of image sensors 302, 304 and 306 need to have one half of the resolutions of the third one. This is taking the advantage of the color sensitivity in human color visions. ('289 Patent at 7:19-35).

Again, the focus of this four image sensor embodiment is on the types of image sensors used. And, the '289 Patent also describes an embodiment employing two image sensors, again focusing on the types of image sensors used:

> Further it is also understood to those skilled in the art that the unique configuration of multiple sensors and multi lenses disclosed herein may be applied to black-and-white digital cameras in which there is only one monochromatic image sensor sensing only the intensity of an imaging

> target. Using an additional image sensor, such as image sensor 308 in FIG. 3 can help to modify image qualities of the original image from the monochromatic image sensor. The following description is based on the embodiment illustrated in FIG. 3, those skilled in the art can appreciate that the description is equally applied to the black-and-white digital cameras. ('289 Patent at 7:36-46).

Details of these embodiments described in the '289 Patent specification are incorporated into various claims. For example, claim 1 recites first and second image sensors that must be "closely positioned with respect to a common plane," and the second image sensor must be "sensitive to a full region of visible color spectrum." Claim 2, which depends from claim 1, specifies that the first image sensor must also be "sensitive to said full region of visible color spectrum." Claim 6 recites four image sensors that are "closely positioned with respect to a common plane," the first three being "sensitive to three different regions of visible color spectrum," and the fourth being "sensitive to a full region of said visible color spectrum." And, claim 26 similarly recites four image sensors that are "closely positioned in a common plane with reference to an image target," and that are each "monochromatic and identical in resolution." Thus, the description in the '289 Patent specification of the image sensors used in various embodiments of the invention, and the incorporation of those details into the claims, demonstrate that the focus of the invention claimed in the '289 Patent is a camera architecture having specific configurations and types of image sensors.

19. The prosecution history of the '289 Patent makes clear that the United States Patent and Trademark Office ("USPTO") considered the claimed invention to include an unconventional camera architecture. A copy of the '289 Patent file history is attached hereto as Exhibit B. In particular, the patent examiner cited several prior art patents disclosing digital cameras having multiple lenses and multiple image sensors against the '289 Patent. (1999-01-15 Detailed Action, pp. 2-4). Those prior art patents include U.S. Patent No. 4,506,294 ("Nagumo Patent"), U.S. Patent No. 5,414,465 ("Kodama Patent"), and U.S. Patent No. 5,436,661 ("Yamamoto Patent"). (1999-01-15 Detailed Action, pp. 2-4). With respect to the Nagumo Patent, the patent examiner stated:

> Nagumo discloses a digital camera (solid state camera) with three image sensors (1, 2, and 3) closely positioned with respect to a common plane

> with reference to an image target, with lenses mounted in front of all sensors. (See figure 7). The sensors are respectively responsive to three prima[r]y colors and are thus coated with the three respective primary color filters.

(1999-01-15 Detailed Action, pp. 2-3). Regarding the Kodama Patent, the examiner stated:

> Kodama discloses a digital camera with three image sensors sensitive to the three primary colors (red 3, green 4 and blue 5) closely positioned with reference to an image target. (See figure 1.) Kodama also discloses analog to digital circuitry (6, 7, 8) that digitizes the images produced by the sensors of different intensities. Kodama furthermore discloses image memory (frame memory 9, 10, 11) that stores the images in addition to digital image processing circuitry (interpolation circuits 12, 13, 14).

(1999-01-15 Detailed Action, pp. 3-4). And, regarding the Yamamoto Patent, the examiner stated:

> Yamamoto, however, teaches the use of a fourth sensor that outputs a green color image for use as a luminance signal. The examiner takes Official Notice that it is well known in the art to substitute green color images for gray intensity images with regards to obtaining luminance signals. Thus, it would have been obvious to incorporate the fourth image sensor of Yamamoto in the apparatus of Nagumo in order to produce a gray (green) intensity image in order to improve the resolution and dynamic range of a full color image signal.

> Yamamoto, however, teaches the use of a fourth sensor that outputs a second green color image sensor that is used to produce a luminance image. The image produced from the fourth Sensor is used to enhance the dynamic range of the mixed signal. (See column 10, lines 63-66.) Thus, it would have been obvious to incorporate the fourth image sensor of Yamamoto in the apparatus of Kodama in order to produce an additional intensity image that combined with the other three intensity images improves the resolution and dynamic range of a resulting full color image signal.

(1999-01-15 Detailed Action, pp. 3-4). Nonetheless, despite the fact that digital cameras having multiple lenses and multiple image sensors existed prior to the filing date of the ’289 Patent, the patent examiner found all of the asserted claims allowable over the prior art in the first Office Action because of the types of sensors used. Specifically, the patent examiner stated that:

> Claims 1,2 and 4-25 are allowed. The following is a statement of reasons for the indication of allowable subject matter: Prior art discloses image pickup devices comprised of up to four image sensors, but is silent on the issue of one of said two or four image sensors being sensitive to a full

> visible color spectrum in combination with other limitations within claims 1 and 6.

(1999-01-15 Detailed Action, p. 4). In other words, the asserted claims of the '289 Patent were found allowable because they use different image sensors than those used in prior digital cameras having multiple lenses and multiple image sensors. Thus, the prosecution history of the '289 Patent demonstrates that the USPTO considered its claimed camera architecture to be unconventional.

SAMSUNG'S DUAL-LENS CAMERA PRODUCTS

20. Samsung makes, uses, sells, offers for sale, and/or imports into the United States and this District products that incorporate the multi-lens camera technology claimed in the '289 Patent. These products include Samsung's Galaxy Note 8, Galaxy S9+, and Galaxy Note 9 smartphones (collectively "Samsung Accused Products").

21. On information and belief, Samsung released its first smartphone, the Galaxy S, on June 2, 2010.[1] The Galaxy S included a single-lens fixed-focus 5.0 megapixel rear-facing camera for taking digital photos.[2] The camera in the original Galaxy S suffered from limitations arising from design constraints that are common to virtually all smartphone cameras, particularly their small lens and image sensor size, as well as the proximity of the lens to the sensor. These limitations resulted in inferior image quality and less creative control over the appearance of a captured image compared to what could be achieved using larger-format digital cameras of the time such as digital single-lens reflex (DSLR) cameras. On information and belief, Samsung has invested significant resources in addressing the limitations in its smartphone cameras ever since the release of the Galaxy S.[3]

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[1] *See* https://www.phonearena.com/phones/Samsung-Galaxy-S_id4522.

[2] *See* https://www.phonearena.com/phones/Samsung-Galaxy-S_id4522.

[3] *See* https://news.samsung.com/global/in-depth-look-1-how-the-galaxy-s9-reimagines-the-smartphone-camera.

(continued...)

22. One shortcoming of the original Galaxy S camera design that Samsung took considerable steps to address was the inability to create a bokeh effect in a captured image due to the large depth-of-field ("DOF") of the camera.[4] DOF refers to the region in front of, and behind, the plane of focus ("POF") of a lens that looks sufficiently sharp to appear in-focus, despite technically being out-of-focus. Being able to control the depth of field provides photographers with a great deal of creative control over their compositions because it allows them to control which portions of the photograph are in-focus, and which portions are out-of-focus. In some instances, such as landscape photography, it can be desirable for an entire captured image to appear in-focus. However, in other instances, such as portrait photography, it might instead be desirable for only the subject to appear in-focus while the background is out-of-focus, thereby emphasizing the sharply-focused subject against a blurred background. Bokeh refers to the blurring of the out-of-focus portions of a photographic image that lie outside of the DOF.

23. Bokeh is achieved in traditional larger-format cameras such as DLSR cameras by using a lens having a large focal length ("*f*"). The *f* of a lens is the distance between the lens and its point of focus, which in the case of a digital camera is an image sensor, and it is both directly proportional to magnification and inversely proportional to field-of-view ("FOV"). A larger *f* will result in greater magnification and a narrower FOV; conversely, a smaller *f* will result in lower magnification and a wider FOV. The *f* of typical DLSR camera can be adjusted by either adjusting the magnification of an attached zoom lens or using a fixed prime lens having a *f* that will produce the desired DOF. The *f* of a typical smartphone camera, however, cannot be adjusted, but rather is fixed at a value that is too small to produce the shallow DOF required under most circumstances to create a bokeh effect. The small *f* of virtually all smartphone cameras, and consequently their large DOF, is a natural consequence of their geometry, particularly the small size of the lenses and sensors, and their proximity to one another. This is a

[4] *See* https://www.techradar.com/news/heres-why-the-galaxy-note-8-is-samsungs-first-handset-with-a-dual-camera-setup.

(continued...)

problem that Samsung and other smartphone manufacturers have been attempting to address for years.[5]

24. One approach Samsung adopted to provide a bokeh effect in its smartphone cameras is a feature it calls Selective Focus.[6] This feature first appeared in the Samsung Galaxy S5,[7] which was introduced on February 24, 2014[8] and became generally available on April 11, 2014.[9] Selective Focus is a mode that takes a burst of shots with a single camera but at different focus points and allows users the ability to change the focus area in a post-processing action that stitches the images together.[10] This approach, however, requires the user to turn on Selective Focus mode, capture the image, view the image in the picture gallery, select the image to which the effect is to be applied, choose the type of focus desired (with the available options being Near Focus, Far Focus, and Pan Focus), and hit "Done" to save the modified image to the picture gallery.[11] This introduced a significant number of steps, requires additional time, and cannot be done in the camera app itself.

25. Samsung also attempted to provide a bokeh feature in its smartphones by utilizing its Dual Pixel Sensor,[12] first used in the Galaxy S7,[13] which was introduced on February 21,

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[5] *See* https://www.techradar.com/news/heres-why-the-galaxy-note-8-is-samsungs-first-handset-with-a-dual-camera-setup.

[6] *See* https://gs5.gadgethacks.com/how-to/take-selective-focus-pics-shoot-4k-videos-your-galaxy-s5-0154589/.

[7] *See* https://gs5.gadgethacks.com/how-to/take-selective-focus-pics-shoot-4k-videos-your-galaxy-s5-0154589/.

[8] *See* https://www.phonearena.com/phones/Samsung-Galaxy-S5_id8202.

[9] *See* https://www.engadget.com/2014/02/24/samsung-galaxy-s5-launching-on-april-11-in-150-countries/.

[10] *See* https://www.androidheadlines.com/2018/03/samsung-galaxy-s9-plus-has-live-focus-mode-unlike-galaxy-s9.html.

[11] *See* https://www.tomsguide.com/us/samsung-galaxy-s5-guide,review-2821-13.html.

[12] *See* https://news.samsung.com/us/samsungs-new-image-sensors-bring-fast-slim-attributes-mobile-iot-applications/.

[13] *See* https://www.samsung.com/global/galaxy/galaxy-s7/camera/.

(continued...)

2016 and became generally available on March 11, 2016.[14] The Dual Pixel Sensor in the Galaxy S7 is used with a single-camera arrangement.[15] According to Samsung, "Dual Pixel technology employs two photodiodes in each and every pixel of the sensor instead of only one."[16] Samsung has stated that "[d]ual Pixel technology especially allows depth-of-field effect for taking *bokeh*, or aesthetically out-of-focused photographs, through a traditional single lens camera."[17] One online publication explained how Samsung's Dual Pixel Sensor can estimate depth-of-field, stating that "Dual-lens cameras can compare the view from their slightly different positions to determine what's the subject and what's in the background, allowing the software to simulate the background blur or bokeh traditionally associated with cameras that pack larger sensors. A Dual Pixel sensor, on the other hand, instead measures the difference from one side of the pixel and the other rather than two lenses. The feature allows dual-camera effects like the portrait mode for background blur to work in single lens cameras."[18] Despite Samsung's hope that their Dual Pixel Sensor camera could enable a single-camera smartphone to provide the same bokeh effect as its competitors' dual-camera smartphones, the Dual Pixel Sensor was too "noisy" to provide consistent results.[19] Moreover, Samsung has stated with respect to single-lens arrangement using the Dual Pixel Sensor that "these techniques only provide partial information of what we need and are more noisy than the dual-camera technology. They do not provide enough information to create the bokeh effect."[20] Moreover, "even in the future, it will be difficult to create the bokeh

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[14] *See* https://www.phonearena.com/phones/Samsung-Galaxy-S7_id9817.

[15] *See* https://www.samsung.com/global/galaxy/galaxy-s7/camera/.

[16] *See* https://news.samsung.com/us/samsungs-new-image-sensors-bring-fast-slim-attributes-mobile-iot-applications/.

[17] *See* https://news.samsung.com/us/samsungs-new-image-sensors-bring-fast-slim-attributes-mobile-iot-applications/.

[18] *See* https://www.digitaltrends.com/photography/samsung-launches-dual-pixel-sensor/.

[19] *See* https://www.techradar.com/news/heres-why-the-galaxy-note-8-is-samsungs-first-handset-with-a-dual-camera-setup.

[20] *See* https://www.techradar.com/news/heres-why-the-galaxy-note-8-is-samsungs-first-handset-with-a-dual-camera-setup.

(continued...)

effect using a single lens dual pixel technology."[21] Therefore, according to Samsung, "[t]he purpose of the dual pixel camera that we've had since the S7 is not to create the bokeh effect, but to accelerate the autofocus."[22]

26. While Samsung's attempts to provide a bokeh effect with a single-camera configuration through its Selective Focus mode and its Dual Pixel Sensor fell short of the dual-camera approaches being employed by competitors such as Apple, Samsung had also begun researching dual-sensor and lens cameras sometime around 2012 or 2013.[23] According to Samsung, "[we] started to research the dual camera because we believed it had the potential to offer features that were difficult or impossible to provide through single lens cameras."[24] In particular, Samsung explained how a dual-camera can be used to create a bokeh effect by stating that "[i]n order to create the bokeh effect, you need to measure the distance between the camera and the object that you are shooting. Using the dual cameras you get two perspectives and, based on the differences between the two images, you can extract the depth information and create the bokeh effect."[25]

27. On August 23, 2017, Samsung introduced the Galaxy Note 8, its first smartphone incorporating a dual-lens camera.[26] The Galaxy Note 8 became generally available in the United States on September 15, 2017.[27] According to Samsung's website, the Galaxy Note 8 includes a

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[21] *See* https://www.techradar.com/news/heres-why-the-galaxy-note-8-is-samsungs-first-handset-with-a-dual-camera-setup.

[22] *See* https://www.techradar.com/news/heres-why-the-galaxy-note-8-is-samsungs-first-handset-with-a-dual-camera-setup.

[23] *See* https://www.techradar.com/news/heres-why-the-galaxy-note-8-is-samsungs-first-handset-with-a-dual-camera-setup.

[24] *See* https://www.techradar.com/news/heres-why-the-galaxy-note-8-is-samsungs-first-handset-with-a-dual-camera-setup.

[25] *See* https://www.techradar.com/news/heres-why-the-galaxy-note-8-is-samsungs-first-handset-with-a-dual-camera-setup.

[26] *See* https://www.phonearena.com/phones/Samsung-Galaxy-Note-8_id10478.

[27] *See* https://www.phonearena.com/phones/Samsung-Galaxy-Note-8_id10478.

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rear-facing "Dual camera" that includes a "Wide-angle camera" having a f/1.7 aperture, and a "Telephoto camera" having a f/2.4 aperture.[28] The rear-facing dual camera of the Galaxy Note 8 supports a feature called Live Focus.[29] According to Samsung, "Thanks to the dual rear cameras on Galaxy S9+ and Galaxy Note 8, you can use Live focus, a feature that allows you to adjust the level of background blur so you can create a variety of moods within one shot. Even after taking the photo, you can readjust the blur until you find the ideal setting."[30] In order to enable the Galaxy Note 8 to perform the complex computations necessary to take advantage of the dual-lens camera introduced on the Galaxy Note 8, Samsung uses a powerful 64-bit ARM-based system on a chip (SoC) from Qualcomm Inc. called the Snapdragon 835.[31] The Snapdragon 835 includes an advanced image signal processor ("ISP") from Qualcomm called the Spectra 180 ISP, which Qualcomm describes as an ISP that "supports capture of up to 32 megapixels with zero shutter lag, and offers smooth zoom, fast autofocus and true-to-life colors for improved image quality."[32] On information and belief, the Spectra ISP in the Qualcomm Snapdragon 835 SoC used in the Galaxy Note 8 performs the processing for implementing the new Live Focus mode that was introduced with the Galaxy Note 8.

28. On February 25, 2018, Samsung introduced another smartphone, the Galaxy S9+, which became generally available in the United States on March 16, 2018.[33] The Galaxy S9+ retains the rear-facing dual-lens camera of the Galaxy Note 8, with the modification that it incorporates Samsung's improved Dual Aperture wide-angle camera instead of the Galaxy Note 8's standard f/1.7 wide angle camera,[34] and the Galaxy S9+ is capable of performing the Live

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[28] *See* https://www.samsung.com/global/galaxy/galaxy-note8/specs/.

[29] *See* https://www.samsung.com/global/galaxy/galaxy-note8/specs/.

[30] *See* https://www.samsung.com/global/galaxy/what-is/live-focus/.

[31] *See* https://www.phonearena.com/phones/Samsung-Galaxy-Note-8_id10478.

[32] *See* https://www.qualcomm.com/products/snapdragon/processors/835.

[33] *See* https://www.phonearena.com/phones/Samsung-Galaxy-S9_id10717.

[34] *See* https://www.samsung.com/global/galaxy/galaxy-s9/specs/.

(continued...)

Focus feature introduced with the Galaxy Note 8, but it also improves upon that feature by providing bokeh filters that allow the user "to then go into the Gallery and select from a range of background blur shapes to add characters and shapes to the photo."[35] To implement the improved Live Focus feature, the Galaxy S9+ incorporates an even more powerful 64-bit ARM-based SoC from Qualcomm than the one found in the Galaxy Note 8.[36] This more powerful SoC, called the Snapdragon 845, incorporates a more powerful ISP, called the Spectra 280 ISP, that "features a completely new architecture" and "is engineered to support immersive, cutting-edge mobile photography and video capture, even in challenging lighting conditions with lots of movement."[37] Furthermore, "Snapdragon 845 was also designed to capture the depth of three-dimensional images for new XR experiences. Additionally, it supports emerging consumer use cases that require cameras to accurately capture faces for unlocking devices and security-rich e-commerce transactions."[38]

29. On August 9, 2018, Samsung introduced the successor to the Galaxy Note 8, the Galaxy Note 9, which became generally available in the United States on August 24, 2018.[39] The Galaxy Note 9 utilizes the rear-facing dual-lens camera of the Galaxy S9+, with the improved Dual Aperture wide-angle camera, and it is capable of performing the improved Live Focus feature of the S9+ that provides bokeh filters.[40] The Galaxy Note 9 also uses the same Qualcomm Snapdragon 845, with the Spectra 280 ISP, that is used in the Galaxy S9+.[41]

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[35] *See* https://www.samsung.com/global/galaxy/what-is/live-focus/.

[36] *See* https://www.phonearena.com/phones/Samsung-Galaxy-S9_id10717.

[37] *See* https://www.qualcomm.com/news/onq/2018/02/15/how-does-snapdragon-845-capture-more-lifelike-experiences.

[38] *See* https://www.qualcomm.com/news/onq/2018/02/15/how-does-snapdragon-845-capture-more-lifelike-experiences.

[39] *See* https://www.phonearena.com/phones/Samsung-Galaxy-Note-9_id10857.

[40] *See* https://www.samsung.com/us/mobile/galaxy-note9/specs/.

[41] *See* https://www.phonearena.com/phones/Samsung-Galaxy-Note-9_id10857.

(continued...)

30. On information and belief, in response to the popularity and success of its dual-camera systems in its Galaxy Note 8, Galaxy S9+, and Galaxy Note 9 smartphones, Samsung has developed turnkey dual-camera solutions intended for use in mid- to entry-level smartphones developed by other manufacturers.[42] According to Samsung:

> Dual camera smartphones have two image sensors that capture different light information, enabling new features like refocusing and LLS. With these benefits, dual cameras are a growing trend in premium mobile devices. However, integrating dual cameras can be a difficult process for original equipment manufacturers (OEM), as it requires time-consuming optimization between the OEMs and different vendors developing the sensors and algorithm software. Samsung's total dual camera solution will simplify that process and enable mid- to entry-level mobile devices to take advantage of certain camera features mainly available in premium devices equipped with an extra image signal processor.
>
> To accelerate development and reduce optimization difficulties with dual camera smartphones, Samsung now offers the industry's first total dual camera solution, with both ISOCELL Dual sensor hardware and sensor-optimized algorithm software. This enables even mid- to entry-level mobile devices to utilize popular dual camera features like refocusing and LLS. Samsung is coupling its refocusing algorithm with a 13 megapixel (Mp) and 5Mp set of image sensors, and its LLS algorithm with a set of two 8Mp sensors, to simplify implementation by OEMs.[43]

These dual-camera kits, called ISOCELL Dual, include dual Samsung ISOCELL sensors that "can be mixed and matched in various combinations on consumer devices to bring about features demanded in the latest dual camera trend."[44] Samsung describes its "mix and match dual camera" by stating that "ISOCELL Dual provides unique versatility for dual cameras, including optical zoom, low-light shooting (LLS) and depth sensing for out-focusing effects. ISOCELL Dual enables DSLR-like photo experiences such as greater light sensitivity, depth effects and sharper brightness in all conditions."[45] Samsung further states that its ISOCELL Dual solution

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[42] *See* https://news.samsung.com/global/samsungs-isocell-dual-software-solution-enables-dual-camera-features-in-a-wider-range-of-smartphones.

[43] *See* https://news.samsung.com/global/samsungs-isocell-dual-software-solution-enables-dual-camera-features-in-a-wider-range-of-smartphones.

[44] *See* https://news.samsung.com/global/samsung-introduces-image-sensor-brand-isocell-at-2017-mwc-shanghai.

[45] *See* https://www.samsung.com/semiconductor/image-sensor/mobile-image-sensor/.

(continued...)

includes "[d]ual image sensors and proprietary software for two popular features – refocusing (bokeh) and low-light shooting (LLS). While such dual camera features had generally been exclusive to premium smartphones, Samsung's ISOCELL Dual sensors and its library of proprietary software algorithms enable these features in lower price mobile devices."[46]

31. As detailed above, the Samsung Accused Products, as well as mobile devices that incorporate Samsung's ISOCELL Dual image sensors and proprietary software, all infringe at least Claims 1, 2, and 4 of the '289 Patent:

Claim Element	Samsung Accused Products
1. An improved digital camera comprising:	The Samsung Accused Products are all digital cameras.
1[a] a first and a second image sensor closely positioned with respect to a common plane, said second image sensor sensitive to a full region of visible color spectrum;	The Samsung Galaxy Note 8 includes first and second image sensors closely positioned with respect to a common plane, the first sensor being located behind a wide-angle f/1.7 aperture lens, and the second sensor being located behind a telephoto f/2.4 aperture lens, both lenses being on the rear-side of the device. Both of the first and second image sensors behind the lenses on the rear-side of the device are sensitive to a full region of visible color spectrum. The Samsung Galaxy S9+ and the Galaxy Note 9 include first and second image sensors closely positioned with respect to a common plane, the first sensor being located behind a wide-angle Dual Aperture lens having an f/1.5 mode and an f/2.4 mode, and the second sensor being located behind a telephoto f/2.4 aperture lens, both lenses being on the rear-side of the device. Both of the first and second image sensors behind the lenses on the rear-side of the device are sensitive to a full region of visible color spectrum.
1[b] two lenses, each being mounted in front of one of said two image sensors;	The Samsung Galaxy Note 8 includes a wide-angle f/1.7 aperture lens and a telephoto f/2.4 aperture lens on the rear-side of the device, each lens being mounted in front of an image sensor.

[46] *See* https://news.samsung.com/us/samsungs-isocell-dual-software-solution-dual-camera-smartphones/.

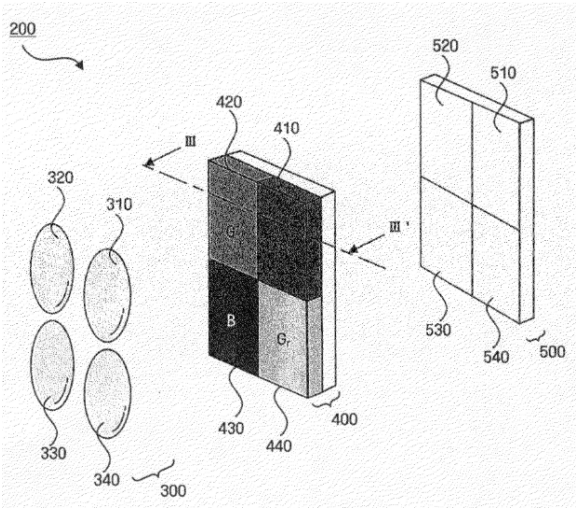
Claim Element	Samsung Accused Products
	The Samsung Galaxy S9+ and Galaxy Note 9 include a wide-angle Dual Aperture lens having an f/1.5 mode and an f/2.4 mode and a telephoto f/2.4 aperture lens on the rear-side of the device, each lens being mounted in front of an image sensor.
1[c] said first image sensor producing a first image and said second image sensor producing a second image;	The first and second image sensors located behind the wide-angle f/1.7 aperture lens and the telephoto f/2.4 aperture lens on the rear-side of the Samsung Galaxy Note 8 create first and second images, respectively. The first and second image sensors located behind the wide-angle Dual Aperture lens having an f/1.5 mode and an f/2.4 mode and the telephoto f/2.4 aperture lens on the rear-side of the Samsung Galaxy S9+ and the Galaxy Note 9 create first and second images, respectively.
1[d] an analog-to-digital converting circuitry coupled to said first and said second image sensor and digitizing said first and said second intensity images to produce correspondingly a first digital image and a second digital image;	The first and second image sensors located behind the wide-angle f/1.7 aperture lens and the telephoto f/2.4 aperture lens on the rear-side of the Samsung Galaxy Note 8 each are coupled to analog-to-digital converting circuitry that digitizes the first and second images to produce first and second digital images, respectively. The first and second image sensors located behind the wide-angle Dual Aperture lens having an f/1.5 mode and an f/2.4 mode and the telephoto f/2.4 aperture lens on the rear-side of the Samsung Galaxy S9+ and the Galaxy Note 9 each are coupled to analog-to-digital converting circuitry that digitizes the first and second images to produce first and second digital images, respectively.
1[e] an image memory, coupled to said analog-to-digital converting circuitry, for storing said first digital image and said second digital image; and	An image memory coupled to the analog-to-digital converting circuitry in the Samsung Accused Products stores the digital images.
1[f] a digital image processor, coupled to said image memory and receiving said first digital image and said second digital image, producing a resultant digital image from said first digital image enhanced with said second digital image.	A digital image processor coupled to the image memory in the Samsung Accused Products receives the first and second digital images, produces a resultant digital image from the first and second digital images, and produced a resultant digital image from the

Claim Element	Samsung Accused Products
	first digital image enhanced with the second digital image. In the Samsung Galaxy Note 8, the digital image processor is a Spectra 180 ISP located in a Qualcomm Snapdragon 835 SoC, and a resultant image is produced from the first digital image enhanced with the second digital image when using the Live Focus feature. In the Samsung Galaxy S9+ and the Galaxy Note 9, the digital image processor is a Spectra 280 ISP located in a Qualcomm Snapdragon 845 SoC, and a resultant image is produced from the first digital image enhanced with the second digital image when using the Live Focus feature, either with or without bokeh filters.
2. The improved digital camera as recited in claim 1, wherein said first image sensor sensitive to said full region of visible color spectrum.	Both of the first and second image sensors behind the wide-angle f/1.7 aperture lens and the telephoto f/2.4 aperture lens on the rear-side of the Samsung Galaxy Note 8 are sensitive to a full region of visible color spectrum. Both of the first and second image sensors behind the wide-angle Dual Aperture lens having an f/1.5 mode and an f/2.4 mode and the telephoto f/2.4 aperture lens on the rear-side of the Samsung Galaxy S9+ and the Galaxy Note 9 are sensitive to a full region of visible color spectrum.
4. The improved digital camera as recited in claim 1, wherein said analog-to-digital converting circuitry comprises two individual analog-to-digital converters, each integrated with one of said first and second image sensors so that said first and second digital images are digitized independently and in parallel to increase signal throughput rate.	The analog-to-digital circuitry coupled to the first image sensor located behind the wide-angle f/1.7 aperture lens on the rear-side of the Samsung Galaxy Note 8 comprises an individual analog-to-digital converter, and the analog-to-digital circuitry coupled to the second image sensor located behind the telephoto f/2.4 aperture lens on the rear-side of the Samsung Galaxy Note 8 comprises another individual analog-to-digital converter. The individual analog-to-digital converters digitize the first and second digital images independently and in parallel to increase signal throughput rate. The analog-to-digital circuitry coupled to the first image sensor located behind the wide-angle Dual Aperture lens having an f/1.5 mode and an f/2.4 mode on the rear-side of the Samsung Galaxy S9+ and Galaxy Note 9 comprises an individual analog-to-digital

Claim Element	Samsung Accused Products
	converter, and the analog-to-digital circuitry coupled to the second image sensor located behind the telephoto f/2.4 aperture lens on the rear-side of the Samsung Galaxy S9+ and Galaxy Note 9 comprise another individual analog-to-digital converter. The individual analog-to-digital converters digitize the first and second digital images independently and in parallel to increase signal throughput rate.

SAMSUNG'S KNOWLEDGE OF THE '289 PATENT

32. On May 24, 2007, Samsung Electro-Mechanics Co., Ltd. ("SEM"), an affiliate of SEC, filed U.S. Patent Application No. 11/802,752 (the "Samsung '752 Application"), entitled "Camera Module." The Samsung '752 Application disclosed and sought to claim many of the features claimed in the '289 Patent. In particular, the Samsung '752 Application taught "an improved digital camera uses four image sensors, each having its own lens, of which three image sensors are made responsive to the three primary colors and the fourth one made responsive to all intensity information." According to the inventors, by "[u]sing a set of digital image processes embedded in a digital signal processing chip, images from the three color image sensors are processed with reference to the image from the black-and-white image sensor and subsequently produce high quality and film-like true color digital images." This disclosed arrangement of lenses and sensors is depicted in Figure 2 of the Samsung '752 Application:



This disclosure in the Samsung '752 Application is nearly identical to some of the embodiments disclosed and claimed in the '289 Patent. Moreover, the Samsung '752 Application explicitly contemplates that the invention relates to "[d]igital devices including high-resolution camera modules, such as digital cameras and camera phones …."

33. On November 30, 2009, during prosecution of the Samsung '752 Application, SEM filed an Information Disclosure Statement ("IDS") citing the '289 Patent to the United States Patent and Trademark Office ("USPTO") as prior art. Thus, Samsung was aware of the claims of the '289 Patent, and Samsung was aware of the significance of the '289 Patent to Samsung's products incorporating dual-lens cameras and their uses, no later than November 30, 2009. Despite this awareness, Samsung made no attempt to contact Plaintiffs or obtain a license for the '289 technology up to and including the filing of this lawsuit.

34. Samsung's conduct was deliberate and willful and subjects it to exemplary damages under the patent laws. *Halo Electronics, Inc. v. Pulse Electronics, Inc., et al.*, 136 S. Ct. 1923, 1935-36 (2016).

COUNT I

(Direct Infringement of the '289 Patent pursuant to 35 U.S.C. § 271(a))

35. Plaintiffs incorporate Paragraphs 1 through 29 herein as set forth in full.

36. Samsung has infringed and continues to infringe at least Claims 1, 2, and 4 of the '289 Patent in violation of 35 U.S.C. § 271(a).

37. Samsung's infringement is based upon literal infringement or infringement under the doctrine of equivalents, or both.

38. Samsung's acts of making, using, importing, selling, and/or offering for sale infringing products and services have been without the permission, consent, authorization, or license of Plaintiffs.

39. Samsung's infringement includes the manufacture, use, sale, importation and/or offer for sale of Samsung's products, including Samsung's Galaxy Note 8, Galaxy S9+, and Galaxy Note 9. The Samsung Accused Products embody the patented invention of the '289 Patent.

40. Samsung's infringement of the '289 Patent has injured and continues to injure Plaintiffs in an amount to be proven at trial.

41. Samsung has been well aware of Plaintiffs' patents, including the '289 Patent, and has continued its infringing activity despite this knowledge.

42. Samsung knew of the '289 Patent at least as early as November 30, 2009, when Samsung cited the '289 Patent to the USPTO in an IDS during prosecution of the Samsung '752 Application.

43. Despite the foregoing knowledge of the '289 Patent and the technology covered by this patent, and despite a high likelihood that its actions constituted infringement of this patent, Samsung proceeded to and continued to infringe the '289 Patent. Samsung made the deliberate decision to acquire and to continue to sell products and services that it knew infringed the '289 Patent.

44. Samsung's infringement of the '289 Patent is egregious.

45. On information and belief, Samsung has undertaken no efforts to design these products or services around the '289 Patent to avoid infringement despite Samsung's knowledge and understanding that its products and services infringe the '289 Patent. Thus, Samsung's infringement of the '289 Patent is willful and egregious, warranting enhancement of damages under 35 U.S.C. § 284, and attorneys' fees and costs incurred under 35 U.S.C. § 285.

COUNT II

(Indirect Infringement of the '289 Patent pursuant to 35 U.S.C. § 271(b))

46. Plaintiffs incorporate Paragraphs 1 through 29 herein as set forth in full.

47. Samsung has induced and continues to induce infringement of at least Claims 1, 2, and 4 of the '289 Patent under 35 U.S.C. § 271(b) by instructing, directing and/or requiring others, including its customers, purchasers, users, and developers, to perform one or more of the limitations of the claims, either literally or under the doctrine of equivalents, of the '289 Patent, where all the limitations of the claims are performed by either Samsung, its customers, purchasers, users or developers, or some combination thereof. Samsung knew or was willfully blind to the fact that it was inducing others, including customers, purchasers, users or developers, to infringe by practicing, either themselves or in conjunction with Samsung, one or more claims of the '289 Patent, including at least Claims 1, 2, and 4.

48. Samsung knowingly and actively aided and abetted the direct infringement of the '289 Patent by instructing and encouraging its customers, purchasers, users and developers to use the Samsung Accused Products. Such instructions and encouragement include, but are not limited to, advising third parties to use the Samsung Accused Products in an infringing manner, providing a mechanism through which third parties may infringe the '289 Patent, specifically through the use of multiple lens cameras and multiple image sensors, and by advertising and promoting the use of the Samsung Accused Products in an infringing manner, and distributing guidelines and instructions to third parties on how to use the Samsung Accused Products in an infringing manner.

49. On information and belief, Samsung has had knowledge and notice of the '289 Patent as early as November 30, 2009, when Samsung cited the '289 Patent to the USPTO in an

IDS during prosecution of the Samsung '752 Application. Samsung's infringement is willful, egregious, deliberate and done in bad faith entitling Plaintiffs to exemplary damages.

50. Plaintiffs have suffered damages because of Samsung's indirect infringement of the '289 Patent.

PRAYER FOR RELIEF

WHEREFORE, Plaintiffs pray for judgment and relief as follows:

A. An entry of judgment holding that Samsung has infringed and is infringing the '289 Patent, and has induced infringement and is inducing infringement of the '289 Patent;

B. An award to Plaintiffs of such damages as it shall prove at trial against Samsung that is adequate to fully compensate Plaintiffs for Samsung's infringement of the '289 Patent, said damages to be no less than a reasonable royalty;

C. A determination that Samsung's infringement has been willful, wanton, deliberate and egregious and that the damages against it be increased up to treble on this basis or for any other basis within the Court's discretion;

D. A finding that this case is "exceptional" and an award to Plaintiffs of their costs and reasonable attorneys' fees, as provided by 35 U.S.C. § 285;

E. An accounting of all infringing sales and revenues, together with post-judgment interest and prejudgment interest from the first date of infringement of the '289 Patent; and

F. Such further and other relief as the Court may deem proper and just.

Respectfully submitted,

DATED: July 22, 2019

By /s/ Daniel Johnson, Jr.

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DEMAND FOR JURY TRIAL

Plaintiffs demand a jury trial on all issues so triable.

Respectfully submitted,

DATED: July 22, 2019

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CERTIFICATE OF SERVICE

I, Robert G. Litts, hereby certify that on July 22, 2019, the foregoing document was filed with the Clerk of the U.S. District Court for the Northern District of California, using the court's electronic filing system ("ECF"), in compliance with Civil L.R. 5-1. The ECF system serves a "Notice of Electronic Filing" to all parties and counsel who have appeared in this action, who have consented under Civil L.R. 5-1 to accept that Notice as service of this document.

/s/ Robert G. Litts
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