

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

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

Petitioners,

v.

CELLECT, LLC,

Patent Owner.

Case IPR2020-00512

U.S. Patent No. 9,186,052

**DECLARATION OF DEAN P. NEIKIRK, PH.D. IN SUPPORT OF
PETITIONER'S REPLY TO PATENT OWNER RESPONSE**

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I, Dean P. Neikirk, Ph.D., have previously been asked to testify as an expert witness in this action. As part of my work in this action, I have been asked by Petitioner to respond to certain assertions and opinions from Dr. Lebby regarding obviousness, including secondary considerations. I hereby declare under penalty of perjury under the laws of the United States as follows:¹

I. INTRODUCTION

1. I am the same Dean P. Neikirk who provided a declaration for this matter executed on February 17, 2020 (Ex. 1004 (“Neikirk Decl.,” “Declaration”)).

2. My experience, qualifications, and compensation are provided in my February 17, 2020 Declaration and my curriculum vitae. Neikirk Decl., ¶¶5-23, Appendix A. In this Declaration, I have been asked to respond to certain assertions raised by Patent Owner in its Patent Owner’s Response (“POR”) (Paper 18) and by Dr. Michael Lebby in his supporting declaration (Ex. 2088 (“Lebby”)).

3. I understand that, in this proceeding, the Board has instituted *Inter Partes* Review proceedings of claim 2 of the ’052 patent (“Challenged Claim”) as obvious based on Swift in view of Ricquier and Suzuki, or alternatively Larson in view of Swift and further in view of Ricquier and Suzuki, as set forth in my Declaration. Neikirk Decl., ¶¶57-295.

¹ Throughout this Declaration, all emphasis and annotations are added unless noted.

4. In reaching the conclusions described in this Declaration, I have relied on the documents and materials cited herein as well as those cited within and identified in my prior Declaration (*see* Neikirk Decl., Appendix B). I have also considered the documents and materials cited in the POR and the documents cited by Dr. Lebby. A complete listing of all materials upon which I have relied upon in formulating my opinion are included in Appendix A attached hereto.

5. As further discussed below, Dr. Lebby's opinions generally repeat the arguments made by Patent Owner in the POR and vice-versa. I disagree with Dr. Lebby's opinions for the same reasons that I disagree with the corresponding assertions in the POR and vice-versa.

6. My opinions are also based upon my education, training, research, knowledge, and personal and professional experience.

7. I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further 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 18 U.S.C. §1001. If called to testify as to the truth of the matters stated herein, I could and would testify competently.

II. LEVEL OF ORDINARY SKILL IN THE ART

8. In my February 17, 2020 Declaration, I opined that on or before October 6, 1997, “a person of ordinary skill in the art relating to the technology of the ’052 patent would have had a minimum of a Bachelor’s degree in Electrical Engineering, Physics, or a related field, and approximately two years of professional experience in the field of imaging devices. Additional graduate education could substitute for professional experience, or significant experience in the field could substitute for formal education.” Neikirk Decl., ¶36. I have reviewed Dr. Lebby’s opinion regarding the level of ordinary skill in the art with respect to the ’052 patent (requiring: “a bachelor’s degree in Electrical Engineering, Physics, or related field of study and at least 3 years of experience in the field of solid-state image sensors. Additional graduate education could substitute for some professional experience, but solid-state image sensors were rapidly developing and at least 1-2 years of experience in the field of solid-state image sensors would be necessary.”). Lebby, ¶36. Under either my definition or Dr. Lebby’s definition I met or exceeded the level of skill required as of October 6, 1997, and my opinions are the same. *See, e.g.,* Neikirk Decl., ¶¶5-23, Appendix A; Ex. 2076 (9/30/20 Neikirk Dep. Tr.), 9:16-47:5.

III. CLAIM CONSTRUCTION

9. As in my February 17, 2020 Declaration, I have interpreted the claims according to their plain and ordinary meaning consistent with the specification.

IV. MOTIVATION TO COMBINE SWIFT, RICQUIER, AND SUZUKI

A. Patent Owner's Assertions and Dr. Lebby's Opinions Regarding Swift's CMOS/APS Type Image Sensor are Incorrect

10. Patent Owner asserts that “Swift discloses a camera that uses the CMOS APS-type sensors disclosed in the Laser Focus World article referenced therein”—that is, the “camera on a chip” discussed in the '052 patent's background. POR 25, 14-17, 24-28, 30, 33, 35-37. Similarly, Dr. Lebby opines that “Swift describes...an APS CMOS image sensor described by Dr. Fossum with a camera-on-a-chip architecture.” Lebby, ¶¶6-7, 12-13, 98, 106, 108-112, 120, 123-124. I disagree.

11. Swift broadly teaches that “image sensor 51” is preferably a “CMOS...Active Pixel Sensor.” Swift, 10:1-6. Swift does not expressly disclose its pixel arrangement nor how timing of its “image sensor 51” is controlled and leaves it to a person of ordinary skill in the art to apply known imaging technologies. Neikirk Decl., ¶¶254, 261. Further, Swift teaches that certain image sensor circuitry, including processing circuitry, resides off-chip on circuit board 53. Swift, 9:7-13 (“Various circuitry components are mounted on the circuit board 53 ... [to] *process image signals* received [from image sensor 51]”), 3:32-4:4; Neikirk Decl., ¶¶228-236. Therefore, Swift discloses using a CMOS APS-type sensor that, contrary to

Patent Owner's assertions and Dr. Lebby's opinions, is expressly not a "camera on a chip." Patent Owner concedes that "conventional CMOS image sensors" did not have "camera timing, control and signal processing circuitry" integrated onto the same die—this was merely a possibility for which CMOS allowed. POR 10 (citing Ex. 2069 (Ohta), 20 (CMOS makes it "*possible* to integrate functional circuits"); Ex. 2050 (ISSCC96 "Camera on a Chip" paper), 24 (CMOS provides "ability" to integrate)). Further, Swift expressly states its teachings are not limited to any specific embodiment. Swift, 19:8-21.

12. Swift's generic disclosure of "CMOS/APS (Active Pixel Sensor) *type*" is not specifying the use of any particular sensor or product. Swift, 10:1-6. While Swift mentions that "[f]urther information on APS-type sensors may be found in the publication '*Laser Focus World*', June 1993, Page 83," an article by Mr. Fossum, Swift does not suggest that, among the several CMOS APS sensors described, its image sensor must be the "camera-on-chip" concept "pursued by...JPL." Swift, 10:2-6; Ex. 1048 (*Laser Focus World* article), 85. Moreover, the prior art confirms that it was well-known to use CMOS imagers that were not camera-on-a-chip. For example, Ricquier discloses using a dedicated imager for a camera with a CMOS photodiode array addressable using a timing controller that is implemented on an off-chip driving unit. Ricquier 2-4; Neikirk Decl., ¶¶161-165. Monroe also teaches using a CMOS imager that has "video processing circuitry" remotely located "within

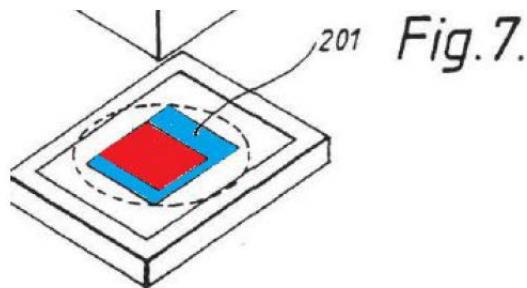
the combined power supply and lighting unit.” Ex. 1007 (Monroe), 3:36-62, 8:8-11, Fig. 3; Neikirk Decl., ¶299. Additionally, Stam discloses an “image sensor 106 [which] may be CMOS active pixel image sensor array” with a “Timing and Control” 203 as a separate unit. Ex. 1043 (“Stam”), Fig. 5, 4:66-5:2, 6:25-28; Neikirk Decl., ¶39. And, Zarnowski, which Dr. Lebby quotes for its teaching of “on-chip electronics” (Lebby, ¶13), also explains that “CMOS imagers” can “include[] *partial* or complete integration of electronics.” Ex. 2007 (Zarnowski), 129-130; Neikirk Decl., ¶77.

13. Dr. Lebby opines that “a POSITA would not have separated the timing and control from the pixel array because the it [sic] would have required significant numbers of connection using C4, FC or bump packaging, and would have resulted in a significantly more complex design with increased costs and lower yields, rather than a lower-cost option proposed by Swift.” Lebby, ¶107. I disagree. Swift does not disclose the location of its timing-and-control circuitry and leaves it to a person of ordinary skill in the art to apply known technologies. Neikirk Decl., ¶¶254, 261. Further, Dr. Lebby’s statement that off-chip timing and control circuitry would “have resulted in a significantly more complex design” directly contradicts his earlier admission that in Ricquier, “the driving unit and clock signals are placed offchip to limit the complexity of the timing controller.” Lebby, ¶103. Moreover, Dr. Lebby fails to explain why off-chip “timing and control” for a CMOS imagers

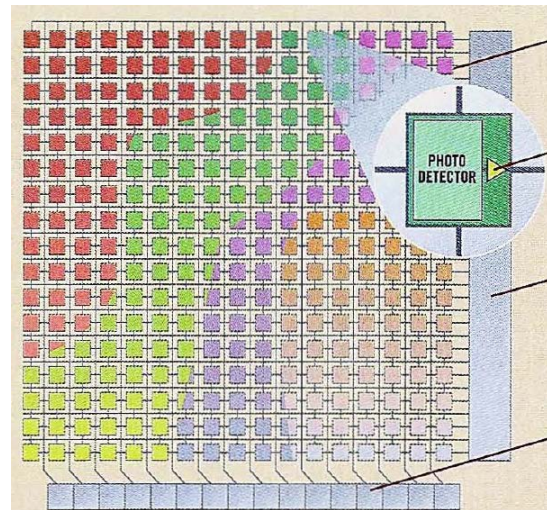
“required significant numbers of connection using C4, FC or bump packaging” yet “a POSITA in the late 1990s considering at packaging a CCD image sensor ... would have not [used] C4 or FC” and “would have chosen wire bonding ... techniques.” Lebbby, ¶80. As demonstrated by Ricquier, and admitted by Dr. Lebbby, locating timing and control circuitry off-chip from the CMOS pixel array was known in the art. *See* Lebbby, ¶103.

14. Patent Owner asserts that “Swift’s CMOS imager, with an asymmetrically positioned ‘light-sensitive area,’ is directly analogous to Dr. Fossum’s CMOS camera on a chip, which has integrated timing and control circuitry and an analog-to-digital converter and an asymmetrically located pixel array.” POR 26-27 (citing Swift, Fig. 7; Ex. 1060 (Armstrong), 2). Similarly, Dr. Lebbby opines that Swift’s “Figure 7 (CMOS embodiment) shows circuit board 201, including a section of the circuit board containing the pixel array” and “[a] POSITA would know that board 201 includes both the light collecting portion (*i.e.*, CMOS pixels) and additional space for circuitry needed for signal processing and timing and control as described in Dr. Fossum’s camera-on-a-chip design.” Lebbby, ¶¶6, 106, 117. I disagree. Swift provides no description of the regions of the sensor 201 that Patent Owner and Dr. Lebbby highlight. Swift, 18:13-23, Fig. 7 (reproduced with Patent Owner’s annotations below). There is no disclosure in Swift that describes what circuitry is included within 201. As I previously explained, Swift explains that

circuitry to “process image signals” are “mounted on the circuit board 53.” Swift, 9:7-13. And, a side-by-side comparison of Patent Owner’s annotated Swift’s Figure 7 and “Fossum’s CMOS camera on a chip” shows that there are no similarities in these generic drawings to suggest limiting Swift’s image sensor to Fossum’s disclosures:



POR 26 (Swift, Fig. 7 (annotated by PO))



Ex. 2039 (Ex. 1060, Armstrong), 55
(depicting Fossum’s “active pixel sensor”)

15. Furthermore, even if Swift intended to limit its image sensor to having on-chip timing and control circuitry (which it did not), as I explained in my February 17, 2020 Declaration (and in Section IV.C, below), a person of ordinary skill in the art would nonetheless have been motivated to apply Ricquier’s off-chip timing and control circuitry teachings in implementing Swift. Neikirk Decl., ¶¶237-240.

B. Patent Owner's Assertions and Dr. Lebby's Opinions Limiting Swift's Disclosed System Architecture to Require a CCD Image Sensor are Incorrect

16. Patent Owner argues that “Swift’s multi-circuit-board system architecture is consistent with CCD imager architecture, not CMOS imagers” (POR 14-16) and Dr. Lebby opines that “Swift describes [an] alternate embodiment[] ... with CCD image sensor and off-chip architecture” (Lebby, ¶¶97-98, 6-7). I disagree. Swift expressly discloses its camera employs a CMOS/APS sensor, and not once does Swift suggest using a CCD image sensor. Swift, Abstract, 4:11-15, 10:1-6, 12:30-32, claim 19; Neikirk Decl., ¶¶230, 254, 258.

17. Patent Owner argues that the “size of Swift’s circuit boards also establishes that the circuitry on its circuit boards is circuitry for supporting a CCD image sensor” and cites Swift’s disclosures of the size of Swift’s overall housing for the camera. POR 14-15 (citing Swift, 5, 9). I disagree. Nothing about the size of the camera housing suggests that Swift is limited to a CCD, nor does it contradict Swift’s express disclosure of a CMOS image sensor. Swift’s housing is “designed to accommodate ... a battery, and/or a transmitter, and/or a converter in order to convert a video signal or combined video/audio signals into a UHF signal” in addition to one or more circuit boards, a “cable clamp,” “a miniature microphone,” and a “miniature loudspeaker.” Swift, 9:30-10:20.

18. Patent Owner asserts that “[t]he 12V power supply used in Swift is in the range of voltages used for CCD imagers, not CMOS imagers.” POR 15-16. Similarly, Dr. Lebbby opines that “a POSITA would have understood that other embodiment such as the one shown in Figure 6, using 12 volt power supply (typical of CCD rather than 5 volt for CMOS) and off-chip circuitry, describe a camera that uses a CCD sensor.” Lebbby, ¶98. I disagree. The passage in Swift that Patent Owner and Dr. Lebbby rely upon expressly states that “12 volt[s]” is an exemplary example of a “low ... operating voltage for the camera,” including all components of the camera. Swift, 15:28-31 (“The power supply device 170 may comprise, for example, a low-voltage transformer in order to receive mains power and provide, as an output, a low (eg 12 volt) operating voltage for the camera 152.”) (emphasis added). An exemplary voltage for the entire camera does not limit operating voltages of individual components such that the explicitly disclosed CMOS sensor can be somehow transformed into a CCD imager that was nowhere described. Swift, 15:28-31. Indeed, in the “preferred imager” in the ’052 patent, “the power to the imaging device is simply a direct current which can be a 1.5 to a **12 volt** source.” ’052

patent, 9:44-47. Thus, CMOS image sensors are not incompatible with 12 volt power sources.²

19. Patent Owner argues that “a POSITA understands that Swift’s multi-circuit board system architecture is consistent with CCD imager architecture, not CMOS imagers.” POR 16. Dr. Lebby also states that Swift’s “off-chip circuitry[] describe[s] a camera that uses a CCD sensor.” Lebby, ¶98. I disagree. Swift’s disclosure of circuitry on a separate circuit board from the image sensor does not indicate Swift is a “CCD imager architecture.” As discussed in Section IV.A, Swift discloses a CMOS APS sensor and nowhere refers to a CCD image sensor. Contrary to Patent Owner’s assertions and Dr. Lebby’s opinions, Swift’s disclosures of a “multi-circuit board system architecture” and “CMOS/APS ... type” image sensor confirms, as discussed above in Section IV.A, that CMOS sensors with off-chip circuitry were well-known. Neikirk Decl., ¶¶77, 161-165, 238, 259-263.

C. Patent Owner’s Assertions and Dr. Lebby’s Opinions Regarding Ricquier’s Teachings are Incorrect

20. Patent Owner argues that a person of ordinary skill in the art “would not have modified Swift with Ricquier’s off-chip driving unit if the goal was to

² I note that the ’052 patent does not suggest that a 12 volt power supply to a CMOS imager sensor is a novel feature of the patent.

‘minimize the device’s size or profile area.’” POR 28-30. Similarly, Dr. Lebby opines that “a POSITA would not have relied on [the separation of the clock drivers in Ricquier] as a design feature” and “[t]o the contrary, a POSITA at the time would have believed that the best way to reduce the size of a CMOS imager would have been to move toward a ‘camera-on-a-chip.’” Lebby, ¶118. I disagree. Patent Owner and Dr. Lebby ignore the prior art which, as I explained in my February 17, 2020 Declaration, demonstrate it was well-known to configure a CMOS imaging device, including its image sensor and related circuitry, in order to minimize the overall device size.

21. Swift, for example, discloses organizing a CMOS imaging device where the image sensor including a first circuit board is located on a first plane, and the circuitry for converting the pre-video signal to a post-video signal is located on a second circuit board defining a second plane. Swift, 8:31-9:21, 10:12-16, 18:25-33, Fig. 2; Neikirk Decl., ¶¶229-236, 268-271.

22. As another example, Ricquier teaches that it was known to locate the timing controller on a different chip (on an “off-chip,” “external driving unit”) from the CMOS image sensor and its pixel array. Ricquier, 3-4. Ricquier thus confirms the timing controller is a component that can be placed on various layers, including stackwise, to allow for a more compact camera head. Neikirk Decl., ¶¶238-239. As I explained in my deposition, “Ricquier ... discusses timing and control circuitry,

and specifically discloses that that can be [] off-chip.... This teaching makes it quite clear that you can place it on another part, and Swift discloses two circuit boards, so place it on another circuit board.” Ex. 2095 (Neikirk 10/09/20 Dep. Tr.), 38:4-39:13. As I explained in my Declaration, the PCB Design textbook confirms that a common design consideration known for designing compact devices was to “fit[] ... the components into the available space” “[b]y making a series of individual PCBs and then joining them, stackwise, one on top of the other, [resulting in] a multi-layer board.” PCB Design Textbook (Ex. 1045), 15, 20; Neikirk Decl., ¶239. I also explained in my Declaration that “a person of ordinary skill in the art would have been motivated to apply Ricquier’s teachings of an off-chip timing and control circuitry in implementing Swift’s image sensor by locating the timing and control circuitry on, for example, on the opposite side of Swift’s “circuit board 52” to “image sensor 51” in order to minimize the camera’s overall size.” Neikirk Decl., ¶239. Tanuma (Ex. 1016), for example, demonstrates that it was known that mounting an image sensor chip on one side of a circuit board and other circuit components on the circuit board’s underside would advantageously reduce the number of required “lead wires, so there is a high degree of reliability, and excellent matching characteristics...[and would] allow for a more compact camera head.” Tanuma (Ex. 1016), 4-5; Neikirk Decl., ¶239.

23. Patent Owner asserts that during my deposition “it became apparent that [my] analysis relied on hindsight reconstruction of the claimed invention based on the theory that the location of the timing and control circuitry is simply a ‘design choice.’” POR 30-31 (citing Ex. 2098 (10/9/2020 Neikirk Dep. Tr.), 38:4–39:13; 44:15–23). I disagree. As I testified, “[t]he details of the circuitry, actual schematic circuit diagram, the selection of electrical components to build that circuit, those are all design choices that are left to one of skill reading these references.” Ex. 2095 (10/9/2020 Neikirk Dep. Tr.), 73:15-74:11. Specifically, I explained “I don’t believe Swift says you have to put [timing and control circuitry] in any specific location. It’s a question of a design choice of [a person of ordinary skill in the art].” Ex 2095 (10/9/2020 Neikirk Dep. Tr.), 44:11-23, 38:4-39:13.

24. Patent Owner asserts “the choice of where to locate the timing and control circuitry is not a matter of ‘design choice’ as a matter of law because the claimed arrangement solved a particular problem and gave rise to unexpected results.” POR 31. Specifically, Patent Owner asserts that “[t]he claimed imaging device of the ’052 Patent both solves the particular problem of further miniaturizing the CMOS ‘camera on a chip’ and produced the unexpected result of obviating the need for RFI shielding, which previously required ‘great efforts.’” POR 31. Similarly, Dr. Lebbly opines that “[f]ollowing the path of the ’052 Patent yielded smaller cameras than a POSITA would have expected given the accepted wisdom that ‘on-

chip integration is key to achieving future camera miniaturization” and “the system design claimed in the ’052 Patent yielded unexpected benefits, including ‘that remoting processing circuitry from the CMOS imager and timing and control circuits eliminated the need for shielding.” Lebbby, ¶¶110, 5. I disagree.

25. Patent Owner and Dr. Lebbby’s alleged problem of reducing the size of a CMOS image sensors that had all of the components on the same chip is flawed, as Swift teaches its processing circuitry is on separate board 52 and Ricquier teaches its timing and control circuitry is also off-chip, as discussed above in Section IV.A. Patent Owner’s alleged solution of placing circuitry in different locations was already taught by Swift and Ricquier and was also well-known as taught by the PCB Design textbook, as also discussed above. Also, as I previously discussed in Section IV.A, Patent Owner concedes that “conventional CMOS image sensors” did not integrate all components on the same chip (POR 10), and this is confirmed by Patent Owner’s own evidence indicating that integration was merely optional (Ex. 2069 (Ohta), 20; Ex. 2050 (ISSCC96 “Camera on a Chip” paper), 24; Ex. 2007 (Zarnowski), 129-130).

26. There is also no nexus between Patent Owner’s and Dr. Lebbby’s purported “unexpected result of obviating the need for RFI shielding” and claim 2. Specifically, Mr. Adair explains in his 10/20/98 declaration that the alleged “unexpected result” was that “remoting the processing circuitry from the CMOS

imager and timing and control circuits eliminated the need for shielding” from “radio frequency interference (RFI) *which is emitted by electrosurgical generators used during surgery.*” Ex. 1003 (Adair Decl.), 85-86. Claim 2, however, does not recite limitations directed to “electrosurgical generators used during surgery.” And, regardless, Swift already teaches including the processing circuitry remote from the imager, as discussed above in Section IV.A. Further, as discussed in Section VIII below, I have reviewed each of Patent Owner’s secondary considerations arguments and they do not change my opinions expressed in my February 17, 2020 Declaration nor those expressed herein.

27. Patent Owner and Dr. Lebby argue that Ricquier’s express advantages of “selective addressability” and “multiple resolutions...[and] data rates upto 10 MHz” would not have motivated a person of ordinary skill in the art to implement Ricquier’s teachings of an off-chip driving unit in implementing Swift’s CMOS sensor “[b]ecause Swift discloses a camera based on Dr. Fossum’s CMOS imager, its pixel array **already enjoys** that advantage.” POR 32-33 (emphasis in original); Lebby, ¶¶120-121. I disagree. As discussed above in Section IV.A, Swift’s CMOS/APS type image sensor is not limited to Fossum’s camera-on-a-chip CMOS imager. Swift does not specify the timing and control scheme for its CMOS sensor, but rather leaves it to a person of ordinary skill in the art to determine a suitable timing and control scheme. Ricquier teaches one timing and control circuitry

scheme that employs “selective addressability” and advantageously provides “multiple resolutions...[and] data rates upto 10 MHz,” which would have motivated a person of ordinary skill in the art to apply its teachings in implementing Swift’s miniature camera. Neikirk Decl., ¶¶237-240.

28. Patent Owner asserts that none of Ricquier’s express advantages of “‘selective addressability,’ and ‘multiple resolutions...[and] data rates up to 10 MHz’ ... are associated with Ricquier’s timing controller being realized ‘off chip.’” POR 32. Dr. Lebby opines that “Ricquier’s disclosure of ‘data rates up to 10 MHz’ also does not provide motivation for Petitioner’s proposed combination as this performance characteristic does not result from implementing the timing controller ‘off chip.’” Lebby, ¶121. I disagree. Regardless of whether Ricquier’s express advantages are “associated with Ricquier’s timing controller being realized ‘off-chip,’” a person of ordinary skill in the art would have been motivated to apply an array of CMOS pixels and off-chip timing controller, as taught by Ricquier, in implementing Swift’s teachings. Neikirk Decl., ¶¶237-240. These express advantages are attributable to Ricquier’s implementation of a timing and control scheme that Ricquier describes as an “X-Y addressable architecture,” which is realized using off-chip driving unit (*i.e.*, “generated by an external driving unit”). Ricquier, 3 (“To realise the acquisition of image data only in specific regions of interest, an X-Y addressable architecture was selected. Based on X-Y addresses and

control pulses generated by an external driving unit, two decoders drive one particular row selection and column selection signal.”), 2-4; Neikirk Decl., ¶¶238-239. Notably, Dr. Lebby admits that by having “the driving unit and clock signals [] placed off-chip” Ricquier is advantageously able to “limit the complexity of the timing controller” (Lebby, ¶103)—which would have further motivated a person of ordinary skill in the art to apply Ricquier’s teachings.

29. Patent Owner and Dr. Lebby argue that “a POSITA would not have modified Swift with Ricquier’s off-chip driver because it would limit ‘the rate at which the on-chip amplifier can handle charge packets.’” POR 33-34 (citing Ex. 2034 (Fossum’s ’515 patent), 1:45-52). Dr. Lebby opines that “Ricquier’s off-chip driver placement **limits** the imager’s data rate because, like a traditional CCD imager, such an architecture requires that ‘signals are coupled to a single output amplifier.’” Lebby, ¶¶121 (citing Ex. 2034 (Fossum’s ’515 patent)) (emphasis in original), 102. I disagree. Patent Owner’s and Dr. Lebby’s argument is based on a statement regarding CCD architectures in a reference (Ex. 2034 (Fossum’s ’515 patent)) that is unrelated and irrelevant to Ricquier and the proposed combination. POR 34; Lebby, ¶121. Ricquier expressly teaches that its output amplifier “can operate at speeds upto 10 MHz” and offers a “maximal frame rate...[of] about 125 full images per second.” Ricquier, 5, 8, 2 (“[t]he sensor described here, makes it possible to acquire information of the scene in a flexible way and at a relatively high speed”);

Neikirk Decl., ¶¶238-239. The statement in Ex. 2034 (Fossum’s ’515 patent) upon which Patent Owner and Dr. Lebby base their statements references the “serial output” of a CCD architecture, but Ricquier expressly teaches its CMOS architecture avoids the “drawback caused by the inherently serial data flow in CCD architectures” and their “fixed frame rate.” Ricquier, 2.

30. Patent Owner argues that Ricquier “provides a proof-of-concept for using a CMOS imager for machine vision applications” (POR 32) and “explicitly teaches away from the off-chip driver utilized in its tests” (POR 34-35). Dr. Lebby opines that “Ricquier describes a bench-test setup used for machine vision” and that “[a] POSITA would understand that separating timing and control from the pixel was only done for convenience in developing the pixel array and negatively impacts performance, which is why Ricquier expressly states that the goal is for cointegration of the clock driving unit onto the image sensor.” Lebby, ¶¶11, 99, 118. I disagree. While Ricquier mentions the “*possibility* of further cointegration of processing electronics on the same chip” and “development of a multi-purpose flexible sensor architecture that *can be used* as a module in further sensor systems on a single chip,” these statements are directed toward possible future developments and do not suggest that using “off-chip” architecture is discouraged. Ricquier 2-3; Neikirk Decl., ¶¶163-165. Moreover, these statements do not suggest that further cointegration of Ricquier is mandatory nor that such cointegration would necessarily

include Ricquier's off-circuit driving unit. Ricquier, 5-8; DI 25. Additionally, contrary to Patent Owner's assertion, Ricquier never characterizes its imager device as "a test setup," or a "proof of concept," nor does it characterize its imager device as "a bench-test setup" as Dr. Lebby opined. Regardless, even if Ricquier's teachings were intended as a proof-of-concept or a bench-test setup Ricquier's demonstration that off-chip timing and control works would have only provided further motivation for a person of ordinary skill in the art to apply the teachings as taught by Ricquier—allowing for flexibility in the selection of the placement of circuitry as discussed further below.

31. Patent Owner argues that it "is not true" that Ricquier is "relevant to the problem of 'reduc[ing] image noise in a CMOS sensor'" because "Ricquier is silent with respect to noise reduction." POR 31. Dr. Lebby opines that his "review of Ricquier did not uncover any discussion of noise reduction or techniques for achieving a reduction in image noise." Lebby, ¶119. I disagree. Ricquier provides two subsections ("4.4. Fixed pattern noise" and "4.5. Temporal noise") that discuss in detail the measurement of noise in Ricquier's system. Ricquier, 6-8. And, as I pointed out in my Declaration, Ricquier discloses improved noise reduction on page 8. Neikirk Decl., ¶170. Specifically, Ricquier explains that "the RMS value of the temporal noise of the image can be derived in real operating conditions" and that "[t]he best results were obtained for the 2*2 resolution." Ricquier, 8. Ricquier then

explains “the reason for this lies in the availability of an optimal capacitance value at the output amplifier” and then expressly states that to reduce noise “the parasitic capacitance always present at the output amplifier should be further reduced.” Ricquier, 8. Evaluating the amount and sources of noise, and how to reduce that noise, as Ricquier teaches is reasonably pertinent to the alleged problem(s) identified in the ’052 patent, including arranging the circuitry of a CMOS image sensor and noise reduction.

32. Dr. Lebby asserts that “a POSITA would not have looked to the passive CMOS image sensor in Ricquier [because] ... a passive CMOS image sensor would not have met the design and application criteria required in Swift’s security camera architecture because at the relevant time period, passive CMOS image sensors were not acceptable for the application due to poor image quality.” Lebby, ¶10. I disagree. This argument misconstrues the ground, which relies on Swift’s teachings of its CMOS/APS (Active Pixel Sensor) image sensor and applies Ricquier’s teachings of arranging CMOS pixels in an array and an off-chip timing controller in implementing Swift’s image sensor. Neikirk, ¶¶240, 252-263. Further, as I explained in my February 17, 2020 Declaration and above, a person of ordinary skill in the art would have been motivated to apply Ricquier’s known teachings of an array of CMOS pixels and off-chip timing and control circuitry in implementing Swift’s image sensor because Ricquier’s off-chip timing controller adds flexibility

in the selection of the placement of circuitry to allow for a more compact camera head. Ricquier, 3, 4; PCB Design Textbook (Ex. 1045), 15, 20; Tanuma (Ex. 1016), 4-5; Neikirk, ¶¶237-240. In addition, Ricquier provides further express advantages of “selective addressability” and “multiple resolutions...[and] data rates upto 10 MHz.” Ricquier, 2; Neikirk, ¶239.

D. Patent Owner’s Assertions and Dr. Lebby’s Opinions Regarding Suzuki are Incorrect

33. Patent Owner argues that “because Suzuki teaches a CCD camera, a POSITA would not have looked to Suzuki for ideas of how to implement the system architecture for a CMOS imager.” POR 18, 35. Dr. Lebby opines that “a POSITA would not have looked to Suzuki for ideas of how to implement the system architecture for a CMOS imager.” Lebby, ¶122. I disagree. Patent Owner and Dr. Lebby base their argument on the false notion that Suzuki is limited to CCD technology. But, as I explained in my Declaration, Suzuki broadly teaches the use of a “solid-state image pickup chip” and does not provide any specific disclosure that would limit the type solid state imaging pickup chip to a CCD. Suzuki, 4:6-11; Neikirk Decl., ¶¶152, 245; DI 22.

34. Patent Owner and Dr. Lebby argue “[t]he fact that Suzuki’s circuit board 227 includes ‘a circuit for driving the solid-state image pickup chip 221 and a circuit for amplifying the video signal from the solid-state image pickup chip 221’

separate from the image pickup chip tells a POSITA that Suzuki describes a CCD imaging sensor.” POR 18; Lebby, ¶104. Suzuki’s off-chip driving and amplification circuits do not limit Suzuki to a CCD. As I explained in my October 8, 2020 deposition, Suzuki provides a “broad-based statement about putting driving circuitry on circuit board 227,” but is not “providing any specific requirement.” Ex. 2075 (10/8/20 Neikirk Dep. Tr.), 23:3-25:25. As I explained, the term “[d]riving circuitry” is very broad and can refer to a number of different types of circuitry including an “external driving circuit for power” (i.e., “power supply”) which “[e]very solid-state imaging device I know requires,” including CMOS image sensors. Ex. 2075 (10/8/2020 Neikirk Dep. Tr.), 23:3-25:25, 31:21-32:12; Neikirk Decl., ¶¶151-153. Additionally, Suzuki’s off-chip “circuit for amplifying the video signal” does not limit the type of image sensor that Suzuki can use since it amplifies the signal after it is output from the solid-state image pickup chip. And, as I previously discussed in Section IV.A, it was well-known to use CMOS imagers with off-chip circuitry.

35. Patent Owner asserts and Dr. Lebby opines that “Suzuki claims priority to an application filed in 1990, prior to the introduction of CMOS imagers” and that “[t]his is further evidence that a POSITA would recognize that Suzuki’s ‘solid-state image pickup device’ uses CCD technology, not CMOS.” Lebby, ¶116; POR 23 (citing Ex. 2092 (“Kozlowski”), 8). I disagree. Contrary to Patent Owner’s assertion that Kozlowski “demonstra[es] the year of introduction of CMOS imagers” (POR

19-20), CMOS image sensors were disclosed prior to the filing date of Suzuki. For example, Renshaw, which I understand was publicly available by May 3, 1990, also disclosed a “CMOS sensor chip” with “CMOS sensor pixel[s].” Ex. 1090 (“Renshaw”), 3038, Fig. 1. And, U.S. Patent 4,841,348, granted June 20, 1989 to Shizukuishi, disclosed a “solid state optical pickup device ... built according to CMOS IC technology”—that is, a CMOS image sensor. Ex. 1089 (“Shizukuishi”), Abstract, 2:47-68 (“[T]he present invention uses a CMOS IC manufacturing process to provide a solid state pickup device, comprising a photosensitive section....”). Therefore, by the time Suzuki was filed, CMOS image sensors were well-known examples of solid-state imagers. Moreover, a person of ordinary skill in the art reading Suzuki, which never mentions CCD, would have understood its reference to solid state imagers to refer simply to solid state imagers, without limiting the disclosure to a certain type. Thus, a person of ordinary skill in the art would have been motivated to apply Suzuki’s teachings to Swift, as I testified in my February 17, 2020 Declaration. Neikirk Decl., ¶¶241-246.

V. PATENT OWNER’S ASSERTIONS AND DR. LEBBY’S OPINIONS REGARDING THE DIMENSIONS LIMITATION

36. As discussed in Section IV.D above, Suzuki was not filed “prior to the introduction of CMOS imagers” as Patent Owner and Dr. Lebbly incorrectly assert. POR 23; Lebbly, ¶116. Further, even if Suzuki was filed “prior to the introduction

of CMOS imagers” (which is not true), Suzuki’s intentional reference to solid state imagers generally (*see* Section IV.D) would have motivated a person of ordinary skill in the art to apply its teachings to a CMOS imager.

37. Patent Owner argues that “Petitioner has not...attempted to demonstrate that it would have been obvious to de-integrate on-chip components of Swift’s CMOS sensor in order to place them on separate circuit boards, as required in Suzuki given its CCD design.” POR 24-25. I disagree. As discussed in Section IV.A, Swift does not teach a camera-on-a-chip with all circuitry integrated on a single sensor chip, and thus would not require “de-integrat[ion].” As discussed in Section IV.A, Patent Owner’s argument is directly contrary to Swift’s express teachings and belied by the prior art, which is replete with examples of CMOS image sensors using off-chip circuitry. Further, as discussed in Section IV.D, there is no basis to limit Suzuki’s “solid-state pickup chip” to a CCD.

38. Patent Owner and Dr. Lebby argue that “Swift discloses a camera having far larger dimensions than either the imaging device recited in the ’052 Patent or Suzuki.” POR 21-23; Lebby, ¶¶114, 9. I disagree. Swift’s discloses an “example” of the “maximum” dimension of the camera’s outer housing of 38 mm, but the maximum outer dimension of a camera does not determine the minimum size for the housing and, more specifically, does it suggest the size of the image sensor along said first plane within the housing (defined by the first circuit board as required by

claim 2). Swift, 9:30-34. Indeed, a “maximum” size of 38mm as disclosed by Swift only further confirms that Suzuki’s teaching of a “chip-connecting board 226” having a diagonal length between 8.5 and 10mm would be a practical choice that would fit when implementing Swift’s miniature camera (as modified by Ricquier)—satisfying claim 2’s size limitation. Neikirk Decl., ¶¶285-289. Notably, neither Patent Owner nor Dr. Lebby attempt to explain why Swift’s disclosed outer diameter would dissuade a person of ordinary skill in the art from the proposed combination.

39. Dr. Lebby argues that “a POSITA would not have combined Swift’s in-door security camera with the housing and imager design in Suzuki because it provides no technical benefits or cost savings advantages” and “a POSITA would not have had any reason to look to Suzuki to limit the size of the image sensor, which reduces resolution and imposes unnecessary performance constraints.” Lebby, ¶9. I disagree. As I explained in my February 17, 2020 Declaration, a person of ordinary skill in the art would have been motivated to apply Suzuki’s teachings of stacking circuit boards and a “chip-connecting board 226” having a diagonal length between 8.5 and 10mm in implementing Swift’s miniature camera (as modified by Ricquier) to reduce the camera’s size and improve its “stability and reliability” as taught by Suzuki. Suzuki, 1:53-56, 3:1-49, 3:61-4:12, 4:30-65; Neikirk, ¶¶241-246. Dr. Lebby’s assertions regarding no “cost savings” (Lebby, ¶¶9, 108-109, 111) and that Suzuki’s teachings would “reduce[] resolution and impose unnecessary performance

constraints” (Lebby, ¶¶9, 116) are unsupported. Furthermore, neither Claim 2 nor Swift specifies a requisite level of resolution, level of noise, or image quality, but Swift does expressly state its “desir[e] for a camera to be as small as possible, so that it may be located discretely in such a way that it is not readily observed.” Swift, 1:10-13. Therefore, a POSITA would have been motivated to apply Suzuki’s teaching to Swift to further one of Swift’s express objectives, even if it resulted in performance or cost trade-offs.

40. Patent Owner and Dr. Lebby argue that “even granting Petitioner’s assertion that a POSITA would modify Swift such that ‘circuit board 53 is oriented parallel to circuit board 52,’ that modification would not change the dimensions of circuit board 52, which is far larger than 12mm.” POR 22-23; Lebby, ¶115. I disagree. As I explained in my February 17, 2020 Declaration, a person of ordinary skill in the art would have been motivated to orient circuit boards 52 and 53 parallel to one another to “reduce the camera’s overall size.” Swift, 10:12-16; Neikirk Decl., ¶243. As Swift points out, its use of “absolute orientation are used conveniently to denote the usual orientation of items in normal use and/or as shown in the accompanying drawings. However, such items could be disposed in other orientations.” Swift, 18:25-33. And, a person of ordinary skill in the art would have recognized that by reorienting the circuit boards in a parallel configuration, the camera’s depth could be reduced by having “the rear housing portion 30 ... replaced

by another portion of different configuration, designed to accommodate ... components of [a] different configuration[.]” Swift, 10:12-16. And, as I explained in my February 17, 2020 Declaration, by applying Suzuki’s teachings of its chip-connecting board having a diagonal length between 8.5 and 10mm in implementing Swift’s circuit board 52 would have advantageously reduced the overall size of the camera. Neikirk Decl., ¶243.

VI. SWIFT EXPRESSLY DISCLOSES THE CLAIMED CIRCUITRY ON A SECOND CIRCUIT BOARD TO CONVERT THE PRE-VIDEO SIGNAL TO A POST-VIDEO SIGNAL

41. Patent Owner argues that “[i]n Swift, the pre- to post-video conversion is done on-chip,” and that Swift “never states that circuit board 53 includes ‘circuitry...to convert said pre-video signal to a post-video signal.’” POR 36-37 (citing Ex. 1060 (*Business Week* article about Fossum)). Similarly, Dr. Lebby opines “[i]n Swift’s CMOS sensor embodiments, a POSITA understands that the pre- to post-video conversion is done on-chip.” Lebby, ¶¶125 (citing Ex. 1060 (*Business Week* article about Fossum)), 124. Dr. Lebby further argues “a POSITA would understand that circuit board 53 in Figure 2 describes processing of post-video signal because a camera-on-a-chip image sensor would be a more efficient way to convert a pre-video signal to post-video signal.” Lebby, ¶125. I disagree.

42. As discussed above in Section IV.A, Swift’s teachings are not limited to the camera-on-a-chip discussed in Fossum. In citing the *Laser Focus World*

article (Ex. 1048), Swift simply stated that “information on APS-type sensors may be found” in the article, not that Swift uses Fossum’s camera-on-a-chip design. Further, the *Laser Focus World* article (Ex. 1048) never describes pre- to post-video conversion being performed on-chip; in fact, the only on-chip circuitry mentioned was “analog-to-digital conversion to explore cameras-on-a-chip for *future microspacecraft applications*.” Ex. 1048 (*Laser Focus World* article), 85. Patent Owner’s citations to Exhibit 1060 (*Business Week* article about Fossum) again only confirms that co-integration of circuitry is a possibility, not a requirement. In any case, Exhibit 1060 (*Business Week* article about Fossum) is irrelevant as that article was published a year after Swift was filed. And, neither Exhibit 1048 (*Laser Focus World* article cited by Swift) nor Exhibit 1060 (*Business Week* article about Fossum) can rewrite Swift’s express teachings.

43. Swift expressly discloses the arrangement of the processing circuitry on board 53. Swift explains that its camera includes a “video processor,” and that the location this video processor is on circuit board 53 by explaining that “[v]arious circuitry components are mounted on the circuit board 53, to provide power to the image sensor 51, *process image signals received therefrom*....” Swift, 3:32-35, 9:7-13. As this passage explains, “image signals” (pre-video signals—not post-video signals) are received at circuit board 53 from image sensor 51. Swift, 9:7-13; Neikirk, ¶¶236, 268-273. The processing circuitry (“video processor”) on circuit

board 53 converts the image signals received from image sensor 51 (pre-video signal) to a “video signal[]” (post-video signal), which is output from the device via a cable for “display” on a “video monitor.” Swift, 15:7-8, 15:13-14, 17:34-18:3, 18:8-11; Neikirk, ¶269.

44. Patent Owner and Dr. Lebby argue that “as shown in Fig. 4b of the ’052 Patent, the term video processing does not mean or even imply converting a ‘pre-video signal to a post-video signal.’” POR 37; Lebby, ¶125. I disagree. These arguments are directly contrary to the express disclosures of the ’052 patent. For example, the ’052 patent expressly states video processing circuitry performs the video conversion: “FIG. 4b is an enlarged schematic diagram of a video processing board having placed thereon the processing circuitry which processes the pre-video signal generated by the array of pixels and which converts the pre-video signal to a post-video signal which may be accepted by a standard video device.” ’052 patent, 7:9-14, 4:24-28, Fig. 4b. And, regardless, as discussed above, Swift expressly discloses that the circuitry for converting the image signal (pre-video signal) to a video signal (post-video signal) is on circuit board 53.

VII. PATENT OWNER’S ASSERTIONS AND DR. LEBBY’S OPINIONS REGARDING MOTIVATIONS TO COMBINE LARSON AND SWIFT (AS MODIFIED BY RICQUIER AND SUZUKI) (GROUND 2)

45. Patent Owner and Dr. Lebby argue that “to the extent a POSITA modified Larson in view of Swift, a POSITA would have used Larson’s CCD image

sensor, which provided superior performance and was a mature technology especially for security and surveillance applications such as in Swift.” POR 38; Lebby, ¶126. Patent Owner and Dr. Lebby further argue that “[a] POSITA would not have replaced the CCD image sensor in Larson with...a passive pixel sensor (in Ricquier).” POR 38; Lebby, ¶¶126, 8. I disagree.

46. These arguments mischaracterize the ground and ignore the motivations I presented in my February 17, 2020 Declaration. I explained in my Declaration that “a person of ordinary skill in the art would have been motivated and found it advantageous to apply the teachings of Swift’s miniature camera (as modified by Ricquier’s and Suzuki’s teachings...) in implementing Larson’s ‘camera’ in the ‘videophone’ with ‘compact housing.’” Neikirk Decl., ¶¶290-295; Larson, 7:14-27. The ground does not “replace” Larson’s CCD image sensor with Ricquier’s passive pixel sensor, but rather the ground relies on Swift’s CMOS “Active Pixel Sensor,” which includes an amplifier for each “active pixel.” Neikirk, ¶295. As I explained in my Declaration, Larson discloses that using a single “tilt and swivel housing” can be used “for ease of positioning the video camera and viewing screen,” “enables the videophone of the invention to be housed in a compact housing,” and “require[s] less power.” Neikirk Decl., ¶293; Larson, 7:6-27. Moreover, as I explained in my Declaration, the ’052 patent itself acknowledges that CMOS active pixel sensors had several well-known advantages over CCDs

(including: lower noise, ability to be mass produced, ability to incorporate a number of different electronic controls on smaller circuit boards, and less power consumption). Each of these well-known advantages would have motivated a person of ordinary skill in the art. Neikirk Decl., ¶294; '052 patent, 1:66-2:19.

47. Patent Owner and Dr. Lebby suggest that Swift's teachings are limited to "security and surveillance applications" and conclude that "a POSITA would have used Larson's CCD image sensor." POR 38; Lebby, ¶¶6, 127. I disagree. Swift broadly refers to "miniature cameras." Swift, 1:7-13; Neikirk Decl., ¶294. Specifically, Swift explains that "*[m]iniature cameras are finding increasing application in* surveillance and security systems, and also in automated inspection apparatus, and for *incorporation in other devices*." Swift, 1:7-13. Swift further states that "*[p]referred embodiments of the present invention* aim to provide miniature cameras which can be so constructed as to be particularly small and compact, and *may find application in fields as mentioned above*." This confirms that a person of ordinary skill in the art would have been motivated to apply Swift's teachings in implementing Larson's videophone. Swift, 1:7-13; Neikirk Decl., ¶294.

VIII. PATENT OWNER’S ALLEGED EVIDENCE OF SECONDARY CONSIDERATIONS

48. Regarding Patent Owner’s purported objective evidence of non-obviousness, I have reviewed Patent Owner’s evidence and it does not change my opinions expressed in my February 17, 2020 Declaration nor those expressed herein.

49. With respect to Patent Owner’s allegations of commercial success and licensing, Patent Owner’s evidence (Ex. 2074 (Micro Imaging Solutions’ website)) simply contains generic statements that it has licensed its “technology.” *See* POR 41. Patent Owner has presented no evidence on what product(s) or patents were allegedly licensed or that such product(s) practiced the Challenged Claim.

50. With respect to Patent Owner’s allegations of recognition of a problem and long felt but unresolved need (POR 41-43 (quoting Ex. 2089 (Orthopaedic Product News), 2-3)) and industry praise (POR 45-46 (quoting Ex. 2090 (Orthopedics This Week), 14-15)), these articles do not specify any particular product, but describe the general development of disposable arthroscopes and endoscopes that use a CMOS sensor located at the distal tip of the scope. The praise for this “disposable scope system” is directed primarily to the unclaimed feature of disposability. As Exhibit 2089 explains, using the disposable scope would “*significantly* reduce ... [the] turnover time” of the surgical room because “you would be using a NEW, sterile and remarkably clear scope/video system on every

patient.” Ex. 2089 (Orthopaedic Product News), 2. Additionally, the article explains that a disposable scope avoids the need of costly repairs and downtime. Ex. 2089 (Orthopaedic Product News), 2-3. The claims of the ’052 patent do not require a disposable scope with a “high resolution, sturdy and inexpensive CMOS sensor[] ... built into the distal tip of arthroscopes [and] ... endoscopes.” There is no nexus between these statements and the Challenged Claim. Further, the cited articles credit the development of CMOS sensors generally. For example, Exhibit 2089 explains that “[t]he development of the CMOS sensor has addressed the needs of the surgeon, surgical facility and the patient while addressing the important issues of video image, thoughtful design and cost-effectiveness.” Ex. 2089 (Orthopaedic Product News), 2-3. However, as the ’052 patent itself admits, CMOS sensors were not novel. ’052 patent, 1:57-3:23. The evidence provided by Patent Owner does not demonstrate that the claimed invention recognized a problem and long felt but unresolved need or received industry praise.

51. Likewise, I have reviewed Mr. Adair’s declaration (Ex. 1003 (’839 File History), 83-89) on which Patent Owner bases its allegations of industry skepticism and unexpected results. POR 43-45. Again, there is no nexus between Patent Owner’s purported industry skepticism and unexpected results and the Challenged Claim. With respect to industry skepticism, the declaration specifies that “[t]here has been great skepticism in the industry as to the capability to use CMOS

technology in medical imaging applications” because “CMOS imagers have been characterized as not being capable of producing high quality images.” Ex. 1003 (’839 File History), 84. The Challenged Claim, however, does not have any limitations specific to “medical applications” or the improvement CMOS image quality. And, as Patent Owner has admitted, “conventional CMOS image sensors” did not have “camera timing, control and signal processing circuitry” integrated onto the same chip; CMOS image sensors merely provided the possibility. POR 10-11 (citing Ex. 2069 (Ohta), 20 (CMOS makes it “*possible* to integrate functional circuits”); Ex. 2050 (ISSCC96 “Camera on a Chip” paper), 3 (CMOS provides “ability” to integrate)).

52. As previously discussed in Section IV.C, there is also no nexus between Patent Owner’s and Dr. Lebby’s purported “unexpected result of obviating the need for RFI shielding” and claim 2. *See* Ex. 1003 (Adair Decl.), 85-86; ’052 patent, Claim 2.

53. With respect to unexpected results and Patent Owner’s allegations of proceeding contrary to accepted wisdom (POR 46-47; Lebby, ¶¶5, 110), as I explained in my February 17, 2020 Declaration, it was well-known to locate processing circuitry separate from a CMOS image sensor as explained in Swift, Monroe, and Ackland, and that radio frequency interference would be reduced by doing so. *See, e.g.*, Swift, 8:33-9:21, Fig. 2; Monroe, 3:57-62, 8:8-11, Fig. 3;

Ackland, Fig. 6, 8:48-52; Neikirk Decl., ¶¶76-77, 297-301. Thus, as confirmed by the prior art, as discussed in my February 17, 2020 Declaration and above in Section IV.A, the claims were not contrary to accepted wisdom, but rather were simply a recitation of one of many known and obvious arrangements of components in a CMOS image sensor. Neikirk Decl., ¶¶76-77, 299-301.

IX. CONCLUSION

54. In summary, and as outlined in my Declaration and set forth above, I have concluded that claim 2 of U.S. Patent No. 9,186,052 is rendered obvious under §103 over Swift in view of Ricquier and Suzuki and over Larson in view of Swift, Ricquier, and Suzuki. As discussed above, Dr. Lebby's and Patent Owner's arguments are incorrect, and none of their arguments alters my opinions expressed in my previous Declaration.

55. I hereby declare under penalty of perjury under the laws of the United States of America that the foregoing is true and correct, and that all statements made of my own knowledge are true and that all statements made on information and belief are believed to be true.

Sworn to this 1st day of February 2021 in Dripping Springs, Texas.



Dean P. Neikirk, Ph.D.

APPENDIX A (LIST OF MATERIALS CONSIDERED)

Ex. 1001	U.S. Patent No. 9,186,052 (“’052 patent”)
Ex. 1002	U.S. Patent No. 9,186,052 File History (“’052 Patent File History”)
Ex. 1003	File History of U.S. Patent No. 6,043,839
Ex. 1005	WO Application Publication No. 95/34988 (“Swift”)
Ex. 1006	U.S. Patent No. 5,835,141 (“Ackland”)
Ex. 1007	U.S. Patent No. 5,919,130 (“Monroe”)
Ex. 1009	U.S. Patent No. 4,700,219 (“Tanaka”)
Ex. 1015	U.S. Patent No. 5,233,426 (“Suzuki”)
Ex. 1016	JP Unexamined Patent Publication No. S62-104075 (“Tanuma”)
Ex. 1017	Plaintiff Collect LLC’s Amended and Supplemental Objections and Responses to Defendants Samsung Electronics Co., Ltd., and Samsung Electronics America, Inc.’s Interrogatory No. 2
Ex. 1027	U.S. Patent No. 5,903,706 (“Wakabayashi”)
Ex. 1028	File History of U.S. Patent No. 9,667,896
Ex. 1029	U.S. Patent No. 5,541,640 (“Larson”)
Ex. 1030	U.S. Patent No. 5,756,981 (“Roustaei”)
Ex. 1031	U.S. Patent No. 4,630,110 (“Cotton”)
Ex. 1032	European Patent Application Publication EP0610938 (“Crosetto”)
Ex. 1033	Ricquier, N., <i>et al.</i> “CIVIS sensor: a flexible smart imager with programmable resolution,” Charge-Coupled Devices and Solid State Optical Sensors IV. Vol. 2172. International Society for Optics and Photonics, 1994. (“Ricquier SPIE”)
Ex. 1035	Butler Affidavit (VISION VM5402 Camera Module Product Datasheet)

Ex. 1036	Mendis, S.K., <i>et al.</i> “Progress in CMOS active pixel image sensors,” in M.M. Blouke (Ed.), <i>Charge-Coupled Devices and Solid State Optical Sensors IV</i> , pp. 19-29, 1994 (“Mendis”)
Ex. 1037	Dickinson, A., <i>et al.</i> , “Standard CMOS Active Pixel Image Sensors for Multimedia Applications,” <i>Proceedings Sixteenth Conference on Advanced Research in VLSI</i> . IEEE, 1995.
Ex. 1038	Ricquier, N., <i>et al.</i> “CIVIS sensor: a flexible smart imager with programmable resolution,” <i>Charge-Coupled Devices and Solid State Optical Sensors IV</i> . Vol. 2172. International Society for Optics and Photonics, 1994. (“Ricquier”)
Ex. 1041	U.S. Patent Publication No. 2001/0010551 (“Dierickx”)
Ex. 1042	Hurwitz, et al., “An 800K-Pixel Color CMOS Sensor For Consumer Still Cameras” (“Hurwitz”)
Ex. 1043	U.S. Patent No. 5,837,994 (“Stam”)
Ex. 1044	U.S. Patent No. 5,221,964 (“Chamberlain”)
Ex. 1045	Charles Hamilton, <i>A Guide to Printed Circuit Board Design</i> (1984)
Ex. 1046	Hurwitz, <i>et al.</i> , “An 800K-Pixel Color CMOS Sensor For Consumer Still Cameras” (“Hurwitz Cornell”)
Ex. 1047	Hurwitz, <i>et al.</i> , “An 800K-Pixel Color CMOS Sensor For Consumer Still Cameras” (“Hurwitz SPIE”)
Ex. 1048	Fossum, E.R., “Active-pixel sensor challenge CDDs,” <i>Laser Focus World</i> 29(6), p. 83-87, June 1993 (“ <i>Laser Focus World</i> article”)
Ex. 1060	“NASA’s Tiny Camera Has A Wide-Angle Future,” <i>Business Week</i> (March 6, 1995)
Ex. 1085	U.S. Patent No. 5,859,878 (“Phillips”)
Ex. 1089	U.S. Patent No. 4,841,348 (“Shizukuishi”)
Ex. 1090	Renshaw, et al., “ASIC Image Sensors”; and G.P. Grenier’s declaration (“Renshaw”)
	IPR2020-00475, Paper 2 (“Petition,” “Pet.”)

	IPR2020-00475, Paper 15 (“Decision on Institution”)
	IPR2020-00475 Paper 18 (“Patent Owner’s Response,” “POR”) (and materials cited therein)

* I also considered any additional materials referenced in this declaration, my February 17, 2020 declaration, and in Dr. Lebby’s declaration.