

**UNITED STATES INTERNATIONAL TRADE COMMISSION
WASHINGTON, D.C.**

**Before The Honorable Bryan F. Moore
Administrative Law Judge**

In the Matter of

**CERTAIN SENSORS WITH PIXELS
AND PRODUCTS CONTAINING THE
SAME**

Investigation No. 337-TA-1403

**DECLARATION OF DR. ADAM FONTECCHIO IN RESPONSE TO
DECLARATION OF DR. DANIEL FOTY CONCERNING
CLAIM CONSTRUCTION FOR CERTAIN TERMS IN
U.S. PATENT NOS. 9,064,764, 9,905,599, 10,224,359, 11,069,737, AND 11,721,714**

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I, Adam Fontecchio, declare under penalty of perjury as follows:

I. INTRODUCTION

1. I submit this Declaration to provide relevant background information regarding the technology at issue in U.S. Patent Nos. 9,064,764 (the “764 patent”), 9,905,599 (the “599 patent”), 10,224,359 (the “359 patent”), 11,721,714 (the “714 patent”), and 11,069,737 (the “737 patent”) (collectively, the “Asserted Patents”), and to set forth my opinions about the meaning of certain disputed claim terms in these patents from the perspective of a person of ordinary skill in the art (“POSITA”).

2. I have been retained by Respondents Samsung Electronics Co., Ltd., Samsung Electronics America, Inc., and Samsung Semiconductor, Inc. (collectively “Samsung”) to offer opinions related to my experience and expertise in the matter titled *In the Matter of Certain Sensors With Pixels and Products Containing the Same*, ITC. Inv. No. 337-TA-1403. My opinions are based on my skills, knowledge, training, education, and experience, including in matters of this nature, and my examination of the materials used in preparing this Declaration. In addition, I have considered the materials cited herein.

3. This declaration represents only those opinions that I have formed to date. I reserve the right to revise, supplement, or amend my opinions below based on new information or documents that may be provided to me, and based on my continuing analysis of the materials already provided in light of any such new information or documents.

4. I have personal knowledge of the matters set forth in this Declaration, and if I am called upon, I could testify competently about them.

5. I am being compensated for my time spent on this matter at my usual and customary rate of \$525 per hour, plus reasonable expenses. My compensation is not contingent on the outcome of this action, and I have no financial interest in this case.

II. QUALIFICATIONS

6. I am a professor of electrical engineering specializing in electro-optic devices. I have studied and researched the function and use of numerous types of imaging systems and imaging hardware, including multispectral imagers, hyperspectral imagers, and Ultra Wideband imaging systems. I have conducted extensive research on imaging systems; detection systems; the hardware necessary for these systems including color filtering, optical system design and fabrication, semiconductor design and fabrication, and optical pathway fabrication; and the fundamental interactions of light and matter. I have published numerous articles and delivered many lectures and research talks on these subjects.

7. I am a tenured Full Professor at Drexel University. I have been employed as a faculty member at Drexel University since 2002. I served as the Vice-Dean of the Graduate College at Drexel University from 2015–2017, and as an Associate Dean of the College of Engineering at Drexel University from 2010–2015. Prior to my work at Drexel, I was a graduate student at Brown University, working under the direction of Prof. Gregory Crawford, where I conducted doctoral research on new technologies to be used in display and imaging systems. I received a Bachelor's degree in Physics from Brown University in 1996, a Master's degree in Physics from Brown University in 1998, and a Doctorate degree in Physics from Brown University in 2002.

8. During my career as a doctoral student, researcher, and faculty member at Drexel University, I have conducted and directed research relevant to the electro-optics and imaging communities. I have presented my research and findings at professional organizations and conferences including the Society for Information Display, the Optical Society of America, the American Physical Society, the Materials Research Society, and the International Liquid Crystal Society.

9. My research into electro-optic phenomena and devices, including imaging system hardware design and fabrication, has been sponsored by both government agencies and private industry. My government sponsors have included the National Science Foundation, NASA, the Department of Energy, the National Institute of Standards and Technology (NIST), the US Army CERDEC, and the Pennsylvania Department of Health.

10. I am a Senior Member of the IEEE, have served as Vice-Chair of the IEEE Philadelphia Branch, and am a member of the American Society for Engineering Education (ASEE).

11. I have worked as a consultant on technical issues, including electro-optic devices and displays, for private clients primarily offering technical guidance, contracted research services, or expert testimony. In the course of my work as a faculty member and as a consultant, I have visited microfabrication and fabrication facilities around the world and witnessed industrial fabrication processing first-hand.

12. While a doctoral student at Brown University, I studied the morphology and structure of liquid crystal based devices for imaging systems. Nanoscale microscopy and imaging was a significant part of my thesis work, and I have significant experience with microscopy, including scanning electron microscopy (“SEM”), atomic force microscopy (“AFM”), and surface structure profilometry. For my final two years of graduate school, I served as the in-house expert on SEM, performing the majority of SEM imaging and analysis of semiconductor and imaging devices and components for the entire research group. I also worked on projects for fabricating and assembling complete prototype imaging systems that were delivered to industrial sponsors.

13. At Drexel University, my research has included microfabrication of both semiconductor and optical devices, display and optical system projects, and associated characterization methods. From 2004 through 2013 I led the design and outfitting of a class 1000 cleanroom with a class 100 wet lab clean room included, which became the shared Micro Fabrication Facility (“MFF”). From 2005-2013 I served as Director of Micro/Nano Fabrication, A. J. Drexel Nanotechnology Institute, Drexel University, where I oversaw the acquisition, installation, and operation of microfabrication instrumentation for semiconductor processing into the MFF facility. This facility was utilized by over 100 academic and industrial users each year during my tenure as the Director.

14. I have extensive familiarity with fields involving imaging and imaging hardware. Based on my experience, as well as my review of the literature, I am familiar with the state of this field was at the relevant time up to the times that the ‘764, ‘599, ‘359, ‘737, and ‘714 patents were filed.

15. In recognition of my work experience and contributions to engineering, I was selected by the Engineers Club of Philadelphia, the professional association of the >100 professional engineering and technical societies in Pennsylvania, New Jersey, and Delaware, as the 2015 Delaware Valley Engineer of the Year. I was selected for the highly prestigious NASA Young Investigator Award in 2004. I was also elected to serve as Acting Director of the Center for the Integration of Research, Teaching, and Learning (CIRTL) in July 2020, and I was subsequently elected to a 3 year term as the national Director of CIRTL in 2022. In 2001, I was awarded the American Society for Engineering Education Benjamin Garver Lamme Award for contributions to the art of teaching, contributions to research and technical literature, and achievements that contribute to the advancement of the profession of engineering college

administration. I was also awarded the Christian R. and Mary F. Lindback Award for Distinguished Teaching in 2022. A complete list of my work experience, awards, honors, and publications that may be relevant to the opinions are set forth in my CV. My curriculum vitae is attached as **Exhibit A**.

III. SCOPE OF OPINION

16. I have been asked to provide my opinions regarding the claim constructions and arguments for certain issues discussed in the DECLARATION OF DR. DANIEL FOTY CONCERNING CLAIM CONSTRUCTION FOR CERTAIN TERMS IN U.S. PATENT NOS. 9,064,764, 9,905,599, 10,224,359, 11,069,737, AND 11,721,714.

17. This Declaration, including the appendices hereto, sets forth my opinions on this topic. I understand, however, that the parties may submit additional arguments and evidence related to claim construction, and I hereby reserve the right to provide additional opinions after I have had a chance to review any such arguments and evidence.

IV. MATERIALS REVIEWED AND CONSIDERED

18. In connection with my work on this matter, I have reviewed and considered the materials cited herein.

V. LEGAL PRINCIPLES

19. I am not a lawyer and have no formal training or education in patent law. In order to conduct my analyses and form my opinions, I have been informed by counsel of certain legal principles with respect to patent law and claim construction. All of the legal principles set forth in this declaration were provided to me by counsel for Samsung. I applied these legal principles while reviewing materials and forming the opinions expressed in this declaration, and my opinions are informed by my understanding of the relevant law, which is as follows:

20. A purpose of claim construction is to determine the meaning and scope of patent claims that have been asserted as allegedly infringed. Patent claim terms are generally given the meaning that the terms would have to a POSITA, as of the earliest claimed priority date, after reviewing the patent specification, figures, claims, and prosecution history.

21. In rendering opinions, an expert must consider the patent claims from the perspective of a POSITA. To determine the appropriate level of skill of a POSITA, the following factors may be considered: (a) the types of problems encountered by those working in the field and prior art solutions thereto; (b) the sophistication of the technology in question and the rapidity with which inventions occur in the field; (c) the educational level of active workers in the field; and (d) the educational level of the inventor.

22. The POSITA is deemed to read the claim term not only in the context of the particular claim in which the disputed term appears, but in the context of the entire patent, including the specification, and the patent's prosecution history. When construing the claims of a patent, the principal considerations are the plain language of the claim (including the surrounding claim language and context), the patent specification, and the prosecution history (if in evidence) – which are collectively called the “intrinsic evidence.” While a claim is to be read in light of the specification, one must generally avoid importing limitations into the claim from the specification. The prosecution history can often inform the meaning of the claim by demonstrating how the inventor understood the invention and whether the inventor limited the invention in the course of prosecution, thus making the claim scope narrower than it might otherwise appear to be. Representations that the patent holder makes to the Patent Trial & Appeals Board (“PTAB”) in the context of inter partes review (“IPR”) of a patent may also be

relevant to the interpretation of a patent's claims, and such representations are also considered to be part of the intrinsic record.

23. When considering whether a patent claim is indefinite, a court determines whether a POSITA would understand the bounds of the claim when it is read in light of the specification and prosecution history. If the answer is yes, the claim satisfies the definiteness requirement; conversely, a claim is indefinite if, when read in light of the specification and prosecution history, it fails to inform a POSITA with reasonable certainty about the scope of the invention.

VI. LEVEL OF ORDINARY SKILL IN THE ART

24. Dr. Foty argues that a person of ordinary skill in the art of the Asserted Patents should be defined as:

a person having at least a bachelor's degree in electrical engineering, materials science, or physics, (or an equivalent technical degree), at least two years of experience in optoelectronics, and at least three years of work experience in semiconductor manufacturing. Further, a master's degree or Ph.D. in a relevant field may substitute for some work experience or vice versa.

Foty Decl. ¶ 15.

25. In my opinion, Dr. Foty's requirement of "at least three years of work experience in semiconductor manufacturing," when taken with the other requirements he proposes, exceeds the level of ordinary skill in this field at the time of the patents. In my experience, many engineers who design optoelectronics devices do not have three years of manufacturing experience. For example, engineers who work at fabless semiconductor companies, which rely on a third-party to manufacture the company's chip designs, typically have little to no manufacturing experience. Thus, this requirement as part of the definition of a POSITA is not correct.

26. I would define a POSITA as a person having a Bachelor's degree in engineering, physics, or a related or equivalent field, and two or more years of experience researching,

developing, designing, and/or evaluating image sensors using photonics. A person with less or different education but more relevant practical experience, or vice versa, may also meet this standard. I believe the two proposed definitions are roughly equivalent except for Dr. Foty's inclusion of three years of manufacturing experience.

27. As of March 2012, which is near the earliest priority date on the face of the Asserted Patents, I was at least a person of skill under both proposed definitions.

VII. PRIORITY DATES

28. For the purpose of this Declaration, I have been asked to assume that the earliest possible priority date for the '764 patent, the '599 patent, the '359 patent, and the '714 patent is March 22, 2012. I have therefore analyzed the claim constructions and knowledge of one of ordinary skill in the art for these patents as of that date or somewhat before that date. Should there be a determination that any of these patents has a different priority date, I reserve the right to consider my opinions in view of that different date.

VIII. THE '764, '599, '359, AND '714 PATENTS ("LIGHT-TRAPPING PATENTS")

A. Background

29. The background section of the Light-Trapping Patents describes the problem of cross-talk between adjacent sensor pixels. *See* '764 Patent, 1:20–32.¹ In the context of image sensors, cross-talk refers to the phenomenon where neighboring pixels interfere with each other. This can occur when light that reaches one pixel is reflected and strays into a neighboring pixel. As a result, the image sensor may incorrectly detect light in one pixel that it actually should have been detected in a neighboring pixel, resulting in reduced image quality.

¹ The Light-Trapping Patents have a common specification. All citations to the specification will be in reference to the '764 Patent, but the patents have the same disclosures.

30. The Light-Trapping Patents explain, for example, that in “[b]ackside illuminated pixel sensors ... significant cross-talk can be generated due to reflection off the often planar back surface of the device.” ’764 Patent, 1:28–32. To address this issue of light that reaches one pixel being reflected into another pixel, the disclosure of the Light-Trapping Patents “provides for light trapping pixels” that include “light trapping materials” at the boundaries of the pixels – including the “backside surface” and the “peripheral sidewall” – so that “[t]he light contacting the backside light trapping material or the peripheral light trapping material is thus reflected back toward the pixel.” ’764 Patent, 1:36-49; 10:65–11:5. Thus, the light-trapping pixel structure is intended to reduce or eliminate crosstalk by keeping light that reaches one pixel “trapped” within that pixel, and preventing that light from straying into a neighboring pixel. ’764 Patent, 6:10–19.

B. “light sensitive pixel” / “light sensitive image sensor pixels” terms (’764, ’359, and ’714 patents)

Claim Term	SiOnyx’s Proposed Construction	Samsung’s Proposed Construction
“light sensitive pixel” / “light sensitive image sensor pixels”	Plain and ordinary meaning. To the extent construction is required: element(s) of an image sensor that converts light into an electrical signal.	photodiode capable of detecting light

31. Each of the independent claims of the ’764 patent (claims 1, 8, 17, and 21), ’359 patent (claims 1 and 18), and ’714 patent (claim 1) include a limitation requiring a “light sensitive pixel” or “light sensitive image sensor pixels.” Dr. Foty argues that this term need not be construed because it “is so well-known in the art.” Foty Decl. ¶ 26. He also states that if the term is construed, SiOnyx’s proposed construction should be adopted. Foty Decl. ¶ 26. I disagree with Dr. Foty’s conclusions.

32. This term needs to be construed so that the parties have a clear definition to apply when evaluating the validity and alleged infringement of the asserted claims. For example, claim 1 of the '714 patent requires “at least one light sensitive pixel having a light incident surface, a backside surface opposite the light incident surface, and a peripheral sidewall disposed into at least a portion of the pixel and extending at least substantially around the pixel periphery.” This limitation requires that the pixel has a “light incident surface,” a “backside surface,” and a “peripheral sidewall” that must be “disposed into at least a portion of the pixel” and “extend[] at least substantially around the pixel periphery.” Evaluating claim 1 thus requires a clear understanding of the definition and boundaries of the pixel, so that one can determine whether the other requirements of the claim are satisfied.

33. The two proposed constructions appear to share the same premise, which is that a pixel has the function of detecting light by converting light into electrical signals. SiOnyx’s proposed construction expressly includes language about converting light into electrical signals, and Dr. Foty agrees that this is what a “photodiode” does as well. *See* Foty Decl. ¶ 30. Similarly, Dr. Foty explains that “pixels are used to detect light” and that “pixels provide the basic light-detecting unit of an image sensor,” Foty Decl. ¶ 28 – consistent with the “capable of detecting light” language found in Samsung’s proposed construction. Therefore, it appears that the only dispute between the parties relates to *the structures* that should be considered to be a part of the pixel.

34. SiOnyx’s construction, with which Dr. Foty agrees, Foty Decl. ¶ 26, states that pixels are comprised of “element(s)”. Foty Decl. ¶ 27. In my opinion, this proposed construction is ambiguous in that it does not specify the “element(s)” that should be considered to be a part of the pixel, which makes it impossible to evaluate the claim.

35. While I agree with Dr. Foty’s explanation of the origin of the word “pixel,” Foty Decl. ¶ 27, using this contraction in the context of the Light-Trapping Patents does not make sense. The term “pixel” is a contraction of “picture element,” but this originally referred to the smallest addressable portion of a *displayed image* – i.e., the red, green, and blue dots, or “elements,” that make up a picture. The Light-Trapping Patents, however, are about a *structure on a semiconductor chip for converting incoming light waves into electrical signals* – not about displaying small dots on a screen to make up a picture. I therefore disagree that the original inspiration for the word “pixel” – i.e., a “picture element” – can or should be used as the definition of a pixel in the context of an image sensor. The term “element” in the original phrase “picture element” referred to dots on a display, and it has no applicability or meaning in the context of identifying the specific structure(s) that comprise a “pixel” for converting light waves into electrical signals in an image sensor.

36. In the context of the claims, specification, and prosecution histories of the Light-Trapping Patents, a POSITA would understand that the “pixel” terms require a photodiode capable of detecting light. For example, Figure 2 of the Light-Trapping Patents, shown below, depicts “an imager having at least two pixels or photodiodes (202 and 204) and at least one isolation element 214.” ’764 Patent 8:7–9. A POSITA would understand that this passage is using “pixels” interchangeably with “photodiodes.”

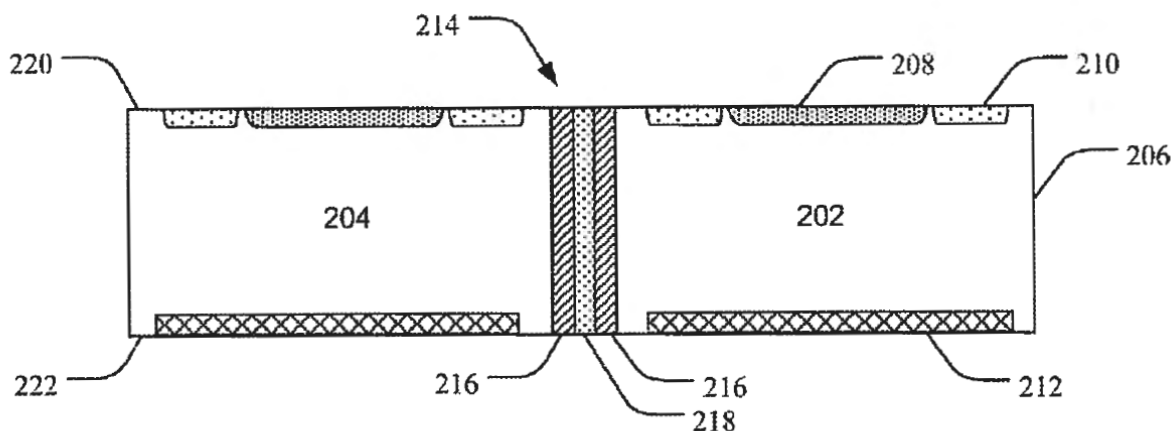


FIG. 2

37. Dr. Foty quoted a portion of the '764 patent, at 6:32–34, to argue that the Light-trapping Patents use “pixel” and “photodiode” to refer to different things. Foty Decl. ¶ 30. And later in the same paragraph, Dr. Foy quoted the end of the sentence at 6:36 as additional support for his conclusion. But the full sentence from 6:32–36 is:

In one aspect, a variety of optoelectronic devices are provided such as, without limitation, photosensitive diodes, pixels, and imagers capable of detecting visible and infrared light while exhibiting reduced optical and electrical cross-talk between neighboring pixels or diodes.

A POSITA understand the end of this sentence to be using pixel and photodiode interchangeably. This is consistent with the passage from the specification discussing Figure 2, as explained above.

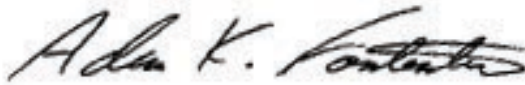
38. Samsung’s proposed construction would allow a POSITA to evaluate the other claim limitations, to the extent they are not indefinite. For example, a POSITA would understand that the portion of the semiconductor substrate 206 from first side 220 to the second side 222 and from the left side of the isolation element 214 to the left edge of the substrate is the photodiode 204. '764 Patent 8:5–15. The construction proposed by SiOnyx and Dr. Foty does not provide the same clarity, because the term “element(s)” – in the context of a patent directed to

structure(s) in an image sensor – has no meaning and does not serve to identify the boundaries of the pixel.

39. For example, Dr. Foty explained that a photodiode “is a type of (semiconductor based) electronic device **element** that can absorb light (i.e., a photon) and convert that light energy into electrical energy (i.e., an electron/hole pair)...” Foty Decl. ¶ 30 (emphasis added). But comparing this description of a photodiode against the construction of “pixel” offered by SiOnyx and Dr. Foty, it is entirely unclear what other “element(s)” – if any – Dr. Foty believes should be deemed to be a part of the “pixel.” This illustrates the ambiguity inherent in the proposed construction put forth by SiOnyx and Dr. Foty.

40. I declare under penalty of perjury that the foregoing is true and correct. Executed on September 20, 2024, in New Orleans, Louisiana.

By:

A handwritten signature in black ink, appearing to read "Adam K. Fontecchio", is written over a horizontal line.

Adam Fontecchio, Ph.D.

CERTIFICATE OF SERVICE

I, Marissa Golub, certify that on September 20, 2024, copies of the foregoing
**DECLARATION OF DR. ADAM FONTECCHIO IN RESPONSE TO
DECLARATION OF DR. DANIEL FOTY CONCERNING
CLAIM CONSTRUCTION FOR CERTAIN TERMS IN
U.S. PATENT NOS. 9,064,764, 9,905,599, 10,224,359, 11,069,737, AND 11,721,714**

was delivered, pursuant to Commission regulations, upon the following interested parties as indicated:

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