UNITED STATES DISTRICT COURT
FOR THE DISTRICT OF DELAWARE

BECKMAN COULTER, INC.,

Plaintiff,

v.

CYTEK BIOSCIENCES, INC.,

Defendant.

C.A. No. 24-0945-CFC-EGT

DECLARATION OF DR. DAVID SCHAAFSMA, PH.D. IN SUPPORT OF

BECKMAN COULTER'S OPENING CLAIM CONSTRUCTION BRIEF

Dated: June 5, 2025______________________________

Dr. David Schaafsma

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I, David Schaafsma, declare as follows:

I. INTRODUCTION

1. My name is David Schaafsma. I am the President of California Optical Engineering, Inc.

2. I have been retained as an expert in this proceeding by counsel for Plaintiff Beckman Coulter, Inc. ("Plaintiff" or "Beckman Coulter"). I understand that the defendant in this case is Cytek Biosciences, Inc. ("Defendant" or "Cytek").

3. I understand that Beckman Coulter alleges that Defendant Cytek infringes certain claims of U.S. Patent Nos. 10,305,582 (the "'582 Patent"); 11,703,443 (the "'443 Patent"); 12,174,106 (the "'106 Patent"); and 12,174,107 (the "'107 Patent") (collectively, the "Asserted Patents"). In particular, Beckman Coulter alleges that Defendant infringes claims 1, 3, 6, 15, 17, 18, 20, 21, 23, 25, 26 of the '582 patent, claims 1, 2, 3, 4, 6, 7, 10, 11, 15, 17, 18 of the '443 patent, claims 2, 11, 14, 17 of the '106 patent, and claims 1, 3, 5, 7, 9, 10, 11, 12, 14, 16, 17, 18, 26, 27, 29, 30 of the '107 patent (collectively the "Asserted Claims").

4. This declaration sets forth my opinions and the bases for my conclusions concerning some of the background technology at issue in the Asserted Patents and technical issues relating to the meaning of certain disputed terms in the claims of the Asserted Patents.

5. I reserve the right to supplement the opinions expressed in this declaration and/or to provide a rebuttal declaration in light of any discovery conducted, opinions by any Cytek expert, any claim construction briefs filed by Cytek, or any additional briefing by the parties.

II. QUALIFICATIONS AND PROFESSIONAL EXPERIENCE

6. My qualifications are stated more fully in my curriculum vitae, which is attached as Exhibit A. Below is a summary of my education, work experience, and other qualifications.

7. I have over thirty years of industry experience in optics. I am currently President and Principal at California Optical Engineering, Inc. which provides technology and product development consulting services primarily in the medical and industrial fields. The company specializes in software and hardware development for medical devices, communications systems, and sensing. Over the last 35 years, I have built a wide range of optical systems for research and product development, including free-space, fiber optic, and integrated optic systems for sensing and diagnostics. In the early 1990s, I built a confocal fluorescence microscope with very low noise and high spatial resolution which I used to study quantum effects in semiconductor structures. In the mid-1990s, I built the optical train for a near-field scanning optical microscope, used in conjunction with a free-electron laser to study the surface morphology of diamond films. I have designed,

built, and tested numerous microscope and endoscope systems, for a wide array of applications.

8. I was an adjunct professor of applied physics at California State University, San Marcos from 2006 to 2022. I taught physics, electronics and optics courses, which I developed as new curriculum. I also mentored several undergraduate projects in the areas of lasers and optics. I taught courses and mentored projects in the area of embedded systems, including courses dealing with programming microcontrollers at a low level (e.g. in C or Assembly) and logic design in VHDL and schematic mode for field-programmable gate arrays (FPGAs). I have also used these embedded systems skills in numerous product development efforts.

9. I have a bachelor of arts in physics from Whitman College, a master of science in physics from Brown University, and a doctorate in physics from the University of Colorado, Boulder.

10. I am a named inventor on two patents and have been a listed author on over thirty papers. I was for many years also an Executive Editor of Fiber & Integrated Optics, a peer-reviewed bi-monthly technical journal.

11. I am being compensated for my time at my ordinary hourly rate of $675, which includes a fee paid to WIT Legal LLC for administrative services provided in connection with my retention in this matter. My compensation is not dependent on

the outcome of these proceedings or the content of my opinions. To the best of my knowledge, I have no financial interest in either party or in the outcome of this proceeding.

III. MATERIALS CONSIDERED

12. In preparing this declaration, I have reviewed the claims, specification, and file history of the Asserted Patents. I understand that the ’582 patent issued on June 25, 2019, from U.S. Application No. 15/638,461 (the “’461 application”). The ’426 patent states that it claims priority to U.S. Application No. 14/555,102 (the “’102 application”), filed Nov. 26, 2014, which was a continuation-in-part of PCT Application No. PCT/US2013/043453 (the “’453 PCT”), filed on May 30, 2013. I understand that the ’106 patent issued from U.S. Application No. 17/645,727 on December 24, 2024 and is a continuation of U.S. Application No. 15/638,477, which is a continuation of the ’102 application. I understand that the ’443 patent issued from U.S. Application No. 17/980,669 on July 18, 2023 and is a continuation of the ’106 patent. I understand that the ’107 patent issued from U.S. Application No. 18/823,596 on December 24, 2024 and is a continuation of the ’106 patent.

13. I understand that the ’102 application claims priority to U.S. Provisional Application Nos. 61/653,245 (the “’245 application”), filed on May 30, 2012; 61/653,328 (the “’328 application”), filed on May 30, 2012; 61/715,819 (the “’5819 application”), filed on Oct. 18, 2012; 61/715,836 (the “’836 application”),

filed on Oct. 19, 2012; 61/816,819 (the "'819 application"), filed on Apr. 29, 2013; and 61/911,859 (the "'859 application"), filed on Dec. 4, 2013.

14. I have also reviewed and understand the references cited in this Declaration, as well as the materials cited by the parties in the Joint Claim Construction Chart ("JCCC"), including the following:

Description
Joint Claim Construction Statement & Chart (D.I. 89-1)
U.S. Patent No. 10,305,582 (the "'582 Patent")
'582 Patent Prosecution History
U.S. Patent No. 11,703,443 (the "'443 Patent")
'443 Patent Prosecution History
U.S. Patent No. 12,174,106 (the "'106 Patent")
'106 Patent Prosecution History
U.S. Patent No. 12,174,107 (the "'107 Patent")
'107 Patent Prosecution History
U.S. Application No. 15/638,477
U.S. Application No. 14/555,102 (the "'102 application")
PCT Application No. PCT/US2013/043453 (the "'453 PCT")
Provisional Pat. App. 61/653,245 (the "'245 application")
Provisional Pat. App. 61/653,328 (the "'328 application")
Provisional Pat. App. 61/715,819 (the "'5819 application")
Provisional Pat. App. 61/715,836 (the "'836 application")
Provisional Pat. App. 61/816,819 (the "'6819 application")
Provisional Pat. App. 61/911,859 (the "'859 application")
McGraw-Hill Dictionary of Scientific & Technical Terms (6th ed. 2003) (Ex. 2)
Portion, Dictionary.com (2025) (Ex. 3)
F. PEDROTTI ET AL., INTRODUCTION TO OPTICS (3d ed. 2007) (Ex. 4)
Fiber Optics Standard Dictionary (3rd ed. 1997) (Ex. 5)
'106 Patent File History, Applicant Arguments/Remarks Made in Amendment (July 18, 2024) (Ex. 6)
'106 Patent File History, Applicant Arguments/Remarks Made in Amendment (June 4, 2024) (Ex. 7)

Edmund Optics, CONSIDERATIONS IN COLLIMATION, *available at* https://www.edmundoptics.com/knowledge-center/application-notes/optics/considerations-in-collimation/ (Ex. 8)
Dayy Photonics, What is a Collimated Beam, https://dayyphotonics.com/knowledgebase/what-is-a-collimated-beam (Ex. 9)
’582 Patent FH, Notice of Allowance and Fees Due (Feb. 7, 2019) (Ex. 10)
WILEY ELECTRICAL AND ELECTRONIC ENGINEERING DICTIONARY (Ex. 11)
U.S. Patent No. 11,913,868 (Ex. 12)
Oxford Dictionary of Physics (Alan Isaacs ed., 2005) (Ex. 13)
Merriam-Webster's Collegiate Dictionary (11th ed. 2003) (Ex. 14)
Brittanica Academic, Encyclopedia Britannica (1998) (Ex. 15)
’174 Patent FH, Applicant Arguments/Remarks Made in an Amendment (July 23, 2018) (Ex. 16)
’106 Patent File History, Notice of Allowance (Sept. 11, 2024) (Ex. 17)
USPTO Classification, Class 359 Optical: Systems and Elements (2012) (Ex. 18)
U.S. Patent No. 12,209,948 (Ex. 19)
Fiber Collimation Procedure for APD Assembly (Ex. 20)
G. Vasileiadis, Raman LIDARs and atmospheric calibration for the Cherenkov Telescope Array (Ex. 21)
Eugene Hect, Optics (4th ed. 2002) (Ex. 22)
McClelland & Scheinfein, “Laser focusing of atoms: a particle-optics approach,” J. Opt. Soc. Am. B 8, 1974-1986 (1991)) (Ex. 23)
Voss, J., Kunz, C. (1992). Principle and Limitations of the Hamburg Focusing Mirror Microscope. In: Michette, A.G., Morrison, G.R., Buckley, C.J. (eds) X-Ray Microscopy III. Springer Series in Optical Sciences, vol 67. Springer, Berlin, Heidelberg (Ex. 24)
Rüdiger Paschotta (RP), *Focus*, RP Photonics Encyclopedia, https://www.rp-photonics.com/focus.html (Ex. 25)
Saleh & Teich, FUNDAMENTALS OF PHOTONICS (2d ed. 2007) (Ex. 26)
H. Sun, LASER DIODE BEAM BASICS: MANIPULATIONS AND CHARACTERIZATIONS (2012) (Ex. 27)

IV. LEGAL PRINCIPLES

15. I am not an attorney. For the purposes of this declaration, I have been informed about certain aspects of the law that are relevant to my opinions expressed herein. My understanding of the law is as follows.

16. I understand that patent claim terms are generally given the meaning they would have to a person of ordinary skill in the art ("POSA") at the time of the invention of the patent. I understand that this meaning can be referred to as the plain and ordinary meaning.

17. I understand that the meaning of patent claims is determined based on the language of the claims, the patent specification, and the prosecution history of the patent, as well as other sources from the time of the invention of the patent, all of which can provide evidence of the meaning of a claim term as it would have been understood by a person of ordinary skill in the art the art at the time of the invention of the patent.

18. I understand that a patent must provide claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention. I understand that a patent is invalid for indefiniteness only if the patent challenger proves by clear and convincing evidence that the patent claims, when read in light of the specification and prosecution history, fail to inform, with reasonable certainty, those skilled in the art about the scope of the invention.

19. I understand that a "means-plus-function" claim term is a claim term that recites a particular function but does not recite sufficient structure for performing that function. I understand that means-plus-function terms are limited to the function recited in the claim(s) and the structures disclosed in the patent's specification for performing that function, as well as any structures equivalent to the disclosed structures.

20. I understand a claim limitation is presumed to be a means-plus-function limitation if it explicitly uses the term "means for" and includes functional language. I further understand that, when a claim limitation lacks the word "means," there is a presumption that it is not means-plus-function. I understand that the presumption that a term is not means-plus-function can be overcome if the claim term fails to recite sufficient structure for performing that function.

21. I understand that if a term is construed as means-plus-function, the construction follows a two-step approach. The first step is to identify the claimed function, staying true to the claim language and the limitations expressly recited by the claims. The second step is to determine the corresponding structure(s) identified in the specification that perform those function(s). A disclosed structure corresponds to a function only if a POSA would understand that the specification links or associates that structure to the function recited in the claim. I understand a mean-

plus-function claim is indefinite if there is no structure identified in the specification that perform the function recited in the claim.

V. LEVEL OF ORDINARY SKILL IN THE ART

22. I have considered the Asserted Patents from the perspective of a person of ordinary skill in the art at the time of the invention ("POSA"). A person of ordinary skill in the art for the Asserted Patents would have had at least the equivalent of a master's degree or a Ph.D. in electrical engineering, optics, physics, or physical chemistry and three to five years of experience in the field of optics, particularly as those systems relate to optical sensing for biological or diagnostic applications. As of December 2011, I would have qualified at least as a person of ordinary skill in the art under this standard.

VI. OVERVIEW OF THE RELEVANT TECHNOLOGY AND THE ASSERTED PATENTS

23. The Asserted Patents relate to novel flow cytometers and, in particular, those using compact wavelength division multiplexers (WDMs). "Flow cytometry is a biophysical technique employed in cell counting, sorting, biomarker detection and protein engineering … where cells suspended in a stream of liquid pass through an … detection apparatus." '582 patent[1] at 1:38-45. A flow cytometer "aligns cells

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[1] Because the Asserted Patents share the same specification, for each instance where I have cited to the '582 patent's specification, the same cited disclosures are also present in the other Asserted Patents' specifications.

or particles so that they pass single file through the flow cell" where "[a] measuring subsystem system coupled to the flow cell … detects [the] cells or particles." *Id*. at 26:60-67. A flow cytometer can measure many different characteristics of the cells or particles, including what colors of light each cell or particle emits when illuminated by a laser. *Id*. at 1:42-45, 27:2-3, 27:9-50. The light emitted "permits deriving various types of information about the physical and chemical structure of each individual particle" such as the presence of proteins. *Id*. at 27:29-50. Different proteins or structures in cells emit fluorescent light at different colors (i.e., wavelengths), and cells or particles may be tagged with fluorescent dyes that emit different colors (i.e., wavelengths). *Id*. at 27:9-50; 47:32-48. Thus, detecting which different colors cells or particles emit can provide valuable information about the sample and can be used to sort cells by type.

24. The wavelength division multiplexer (WDM) described in the Asserted Patents includes a novel combination of elements that separate light from particles in a flow cell into colored bands that can then be detected. '582 patent at 4:53-60. Since the signal level in the flow cytometer is very low (the fluorescence can come from, e.g., a single molecule), the noise must be kept low so that the signal can be detected. *Id*. at 43:31-67. The Asserted Patents' novel flow cytometer enables the simultaneous detection of multiple wavelength bands (i.e., color bands) of light with low noise in a compact design. *Id*. at 4:34-60, 8:32-34, 46:3-5.

25. Prior art flow cytometers did not use the novel flow cytometry WDM technology disclosed in the Asserted Patents. They also relied on bulky sensors such as photomultiplier tubes (PMTs) to detect fluorescent light. *Id*. at 43:31-44:34. PMTs are large and expensive, which limited the number of PMTs that could be used in any one instrument. *Id.* Further, PMTs did not work well "in the biologically important red to near infrared spectral region." *Id*. As a result, prior art flow cytometers could only detect a limited range of colors (i.e., wavelengths) and could only detect a few colors (i.e., wavelengths) at one time. *Id*.

26. The Asserted Patents' novel flow cytometry WDM techniques is tailored to the challenges of processing and detecting fluorescent light from cells or particles in a flow cell, which emit light with low signal strength that spreads out in every direction, making it difficult to focus the beam of light onto semiconductor detectors. '582 patent at 44:1-57.

27. The novel flow cytometry WDM techniques described in the Asserted Patents use a combination of components to control the size of the light beam and focus it onto semiconductor detectors. In particular, the Asserted Patents describe WDMs that include using a row of optical filters to separate a beam of light into separate wavelength (i.e., color) bands one by one. This is illustrated, for example, in a preferred embodiment shown in Figure 25:

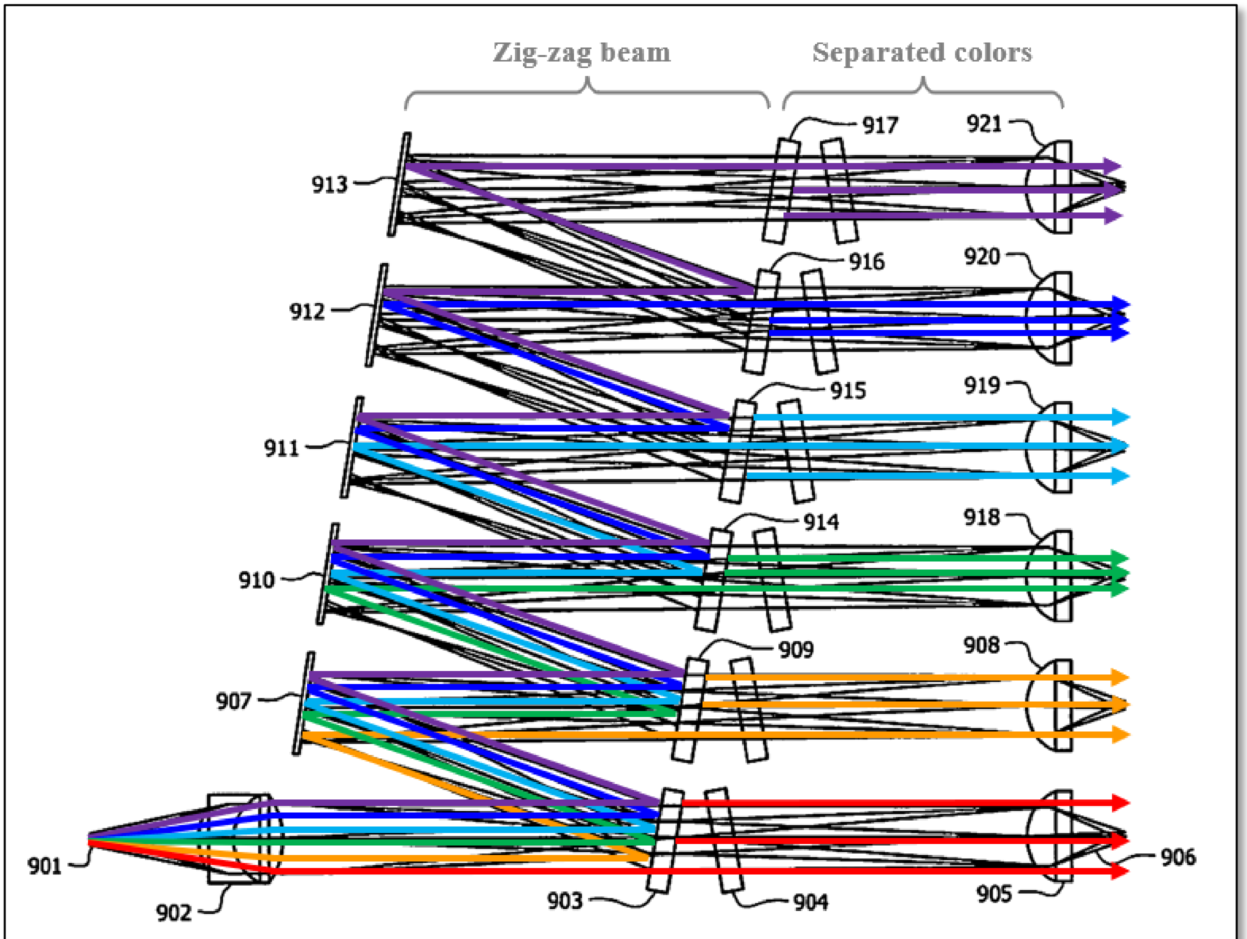

FIG. 25

’582 Patent at Fig. 25 (annotations added). As illustrated in the above figure, “the optical input of the WDM” system receives light from a flow cell via “the facet of a multimode optical fiber … [which] forms an extended … source at location 901.” *Id*. at 44:35-40. The light received from the optical fiber has many wavelengths (i.e., colors), which I have illustrated in the above figure by adding annotations in six different colors. *See id*. at 43:31-42, 46:22-29. My annotations are drawn side by side for visibility, but in the actual system all the colors exit the fiber mixed together in the same beam, not side by side. As discussed above, these wavelength bands (i.e., colors) correspond to different fluorescent molecules such a dyes that are attached to different cells in the flow channel of the cytometer, so each "color" separated by the WDM corresponds to a characteristic of the cells being analyzed. *Id*. at 27:9-50, 47:32-48.

28. As illustrated in the above figure, part of the beam of light in this preferred embodiment is reflected back and forth in a zig zag between curved mirrors on the left (e.g., 907, 910, 911, 912, 913) and optical filters on the right (e.g., 903, 909, 914, 915, 916). '582 Patent at Fig. 25, 45:7-54. The curved mirrors reflect all the light they receive, and their curvature controls the diameter of the beam. *Id*. The optical filters each allow a specific wavelength band (i.e., color band) corresponding to a dye or feature to pass through while reflecting the remaining wavelengths (i.e., colors). *Id*. The light passed by each filter (propagating to the right in Figure 25) is focused by a lens onto a semiconductor detector, which detects the light. *Id*. Each optical filter allows a specific wavelength band (i.e., color band) to pass through so the remaining wavelengths (i.e., colors) propagate further through the system until, one by one, each wavelength (i.e., color) band of interest is "peeled off" from the beam on the left of the system and detected by its own detector. *Id*. Thus, the novel WDM technique efficiently separates the beam into separate wavelength (i.e., color) bands and detects each one distinctly and simultaneously.

29. In addition to the preferred embodiment described above, the specification of the Asserted Patents describes many variations and other embodiments.

30. I understand that in this case, Beckman Coulter asserts that Defendant infringes the following claims:

Patent	Asserted Claims
’582 patent	1, 3, 6, 15, 17, 18, 20, 21, 23, 25, 26
’443 patent	1, 2, 3, 4, 6, 7, 10, 11, 15, 17, 18
’106 patent	2, 11, 14, 17
’107 patent	1, 3, 5, 7, 9, 10, 11, 12, 14, 16, 17, 18, 26, 27, 29, 30

31. Exemplary independent claims are listed below. As discussed in more detail below, I have analyzed each of the asserted claims to understand the context and relevance of the disputed claim terms.

32. Claim 1 of the ’582 patent is reproduced below:

> 1. An optical subsystem for a flow cytometer, the optical subsystem comprising:
>
> a collimating optical element arranged to receive light from a light source, the collimating optical element configured to project a collimated beam;
>
> an optical relay element arranged to receive at least a portion of the collimated beam from the collimating optical element, the optical relay element comprising a curved mirror configured to reflect the portion of the collimated beam received from the collimating optical element to produce a first image;
>
> a first focusing optical element arranged to receive at least a portion of the collimated beam reflected by the optical relay element; and

a first semiconductor detector,

wherein the first focusing optical element is configured to focus the portion of the collimated beam received from the optical relay element onto the first semiconductor detector.

33. Claim 1 of the ’443 patent is reproduced below:

1. A wavelength division multiplexer (WDM) for a flow cytometer comprising:

a set of filters, each filter of the set of filters configured to pass a corresponding portion of multiple portions of light;

at least one mirror including at least one curved mirror, the at least one mirror configured to:

receive one or more portions of the light from the set of filters; and

reflect the one or more portions of the light to the set of filters; and

a set of detectors, each detector of the set of detectors corresponding to a filter of the set of filters and configured to receive a portion of the light at the detector that passed through the filter corresponding to the detector.

34. Claim 1 of the ’106 patent is reproduced below:

1. A flow cytometer, comprising:

a light source arranged to illuminate a stream of particles in a viewing zone of a flow cell in the flow cytometer;

a collecting optical element configured to collect and focus fluorescent light emitted by a particle illuminated by the light source such that the fluorescent light leaving the collecting optical element converges; and

a wavelength division multiplexer (WDM) configured to separate into color bands the fluorescent light collected by the collecting optical element, the WDM including, a collimating optical element that is separate from the collecting optical element and is arranged to receive the fluorescent light collected by the collecting optical element, the collimating optical element configured to collimate the fluorescent light,

a first semiconductor detector configured to detect and quantitate a first color band in the fluorescent light,

a first curved mirror arranged to receive at least a portion of the fluorescent light after the fluorescent light has passed through the collimating optical element, the first curved mirror configured to reflect the portion of the fluorescent light towards the first semiconductor detector, and

a first dichroic filter optically disposed between the first curved mirror and the first semiconductor detector, the dichroic filter configured to allow the first color band in the fluorescent light to pass through the first dichroic filter onto the first semiconductor detector, and to reflect a second color band in the fluorescent light away from the first semiconductor detector.

35. Claim 1 of the ’107 patent is reproduced below:

1. A flow cytometer comprising:

an optical fiber; and

a wavelength division multiplexer (WDM) configured to receive light from the optical fiber, wherein the WDM comprises:

an array of mirrors;

an array of filters; and

an array of avalanche photodiodes (APDs) configured to receive light that passed through one or more filters in the array of filters;

wherein each of the filters in the array of filters is configured to receive light such that:

a portion of the light passes through the filter; and another portion of the light is reflected; and

wherein each of the mirrors in the array of mirrors is configured to:

receive light reflected by a filter in the array of filters; and

reflect light to another filter in the array of filters.

VII. FIRST / SECOND

36. I understand that the parties dispute the meaning of the terms "first" and "second."

Claim Term	Beckman Coulter's Construction	Cytek's Construction
"first" / "second" '582 Patent, cls. 1, 3, 6, 14, 15, 17, 18, 20, 21, 22, 25, 26; '106 Patent, cl. 1; '443 Patent, cls. 9, 10	No construction necessary; plain and ordinary meaning.	**First**: "initial [curved mirror / focusing optical element / filter/ optical filter / dichroic filter / semiconductor detector / image] in the optical path through the WDM," otherwise indefinite. **Second**: "second sequential [filter / focusing optical element / semiconductor detector] after an initial [filter / focusing optical element / semiconductor detector / image] in the optical path through the WDM," otherwise indefinite.

37. For the reasons explained below, it is my opinion that the terms "first" and "second" would have been understood by a person of ordinary skill in the art in the field of optics as having their plain and ordinary meanings. It is my opinion that

the plain and ordinary meanings of “first” and “second” reflect that the terms are used to differentiate between instances of the same term, which is consistent with Beckman Coulter’s proposed construction.

38. The usage of these terms in the Asserted Patents confirms that they are not used to indicate a sequence of the claimed components. For example, claim 6 of the ’582 Patent recites “a first optical filter … to separate the collimated beam into a first branch and a second branch.” The branches are not sequential, since they travel in different directions, and neither branch precedes the other in sequence. *E.g.*, ’582 patent at 57:4-9, Fig. 25. Thus, “first” and “second” cannot indicate a sequence of branches. Further, claim 10 of the ’443 patent requires the “first filter is an ***initial*** filter.” If “first” indicated a sequence of filters, it would be redundant to require this to be “an initial filter.” Thus, a POSA would understand that “first” and “second” do not indicate a sequence in the Asserted Patents.

39. Cytek’s proposed construction, on the other hand, is inconsistent with the claims and specification of the Asserted Patents. For example, claim 12 of the ’582 Patent recites that a “first image is a reimage of the second image.” A POSA would have understood that “reimage” means an image that is similar to a prior image and which is further from the light source than that prior image. In other words, a POSA would have known that a “reimage” is further from the light source

than the “image” it is a “reimage of,” meaning that the “image” must come before the “reimage” in the optical path.

40. Cytek’s proposed construction is inconsistent with claim 12 of the ’582 patent. Cytek’s construction of “first” and “second” would require the “first image” to be the “initial image in the optical path.” In other words, Cytek’s construction requires the “first image” to be closer to the light source than the “second image,” such that the “reimage” would come before the “image” in the optical path. This is a contradiction because it would require the “first image” to be simultaneously closer to the light source than the “second image” and farther from the light source than the “first image.” Thus, a POSA would have recognized that Cytek’s proposed construction is inconsistent with claims including claim 12 of the ’582 patent.

VIII. COLLIMATION TERMS

41. I understand that the parties dispute the meaning of the terms “collimate,” “collimating,” “collimated beam,” and “collimating optical element”:

Claim Term	Beckman Coulter’s Construction	Cytek’s Construction
“collimating”/ ”collimate” ’582 Patent, cls. 1, 14, 20; ’106 Patent, cls. 1, 13, 17	No construction necessary; plain and ordinary meaning. That is: [rendering / render] rays of light more nearly parallel	Indefinite. If not indefinite, should be construed as “make rays of light within a beam that originate from a point source parallel to each other and not converging (i.e., focused) or diverging”

Claim Term	Beckman Coulter's Construction	Cytek's Construction
"collimated beam" '582 Patent, cls. 1, 3, 6, 14, 17, 18; '443 Patent, cl. 10	No construction necessary; plain and ordinary meaning. That is: a beam with nearly parallel rays	Indefinite. If not indefinite, should be construed as "a beam wherein all rays of light originating from a point source are projected parallel with each other and the rays within the beam are neither converging (i.e., a focused beam) or diverging"
"collimating optical element" '582 Patent, cls. 1, 6, 14, 20, 18, 21; '106 Patent, cls. 1, 13	No construction necessary; plain and ordinary meaning. That is: an optical element, such as a lens, mirror, or grating, to render rays of light more nearly parallel; a collimator *Alternatively, if means-plus-function*: '582 Patent, cl. 1: **Function**: (1) receive light from a light source; (2) project a collimated beam **Structure**: a lens, such as an achromatic doublet lens, and structural equivalents thereof	35 U.S.C. § 112, ¶ 6 / 35 U.S.C. § 112(f). '582 Patent, cl. 1: **Function**: (1) receive light from a light source; and (2) project a "collimated beam" onto an optical relay element. **Structure**: Indefinite. '582 Patent, cl. 14: **Function**: (1) receive light from a light source; and (2) project a "collimated beam" including a first image onto an optical relay element. **Structure**: Indefinite. '582 Patent, cl. 20:

Claim Term	Beckman Coulter's Construction	Cytek's Construction
	'582 Patent, cl. 14: **Function**: (1) receive light from a light source; (2) project a collimated beam including a first image **Structure**: a lens, such as an achromatic doublet lens, and structural equivalents thereof '582 Patent, cl. 20: **Function**: (1) receive light from a light source; (2) project a first image **Structure**: a lens, such as an achromatic doublet lens, and structural equivalents Thereof '106 Patent, cls. 1, 13: **Function**: (1) receive the fluorescent light collected by the collecting optical element; (2) collimate the fluorescent light **Structure**: a lens, such as an achromatic doublet	**Function**: (1) receive light from a light source; and (2) project a first image onto an optical relay element. **Structure**: Indefinite. '106 Patent, cls. 1, 13: **Function**: (1) receive fluorescent light collected by the collecting optical element; and (2) collimate the fluorescent light that is projected onto a first dichroic filter. **Structure**: Indefinite. *Alternatively, if not construed as means-plus-function*: "an optical component at a focal distance from a light source that projects a 'collimated beam' centered on the optical axis such that a 'portion of the collimated beam' is projected onto a first focusing optical element," and another 'portion of the collimated beam' is projected onto a first optical relay element," otherwise

Claim Term	Beckman Coulter's Construction	Cytek's Construction
	lens, and structural equivalents thereof	indefinite.

42. For the reasons explained below, it is my opinion that the terms "collimating," "collimate," "collimated beam," and "collimating optical element" would each have been understood by a person of ordinary skill in the art in the field of optics as having their plain and ordinary meanings. It is my opinion that the plain and ordinary meaning of "collimat[e/ing]," is "render[ing] rays of light more nearly parallel," which is consistent with Beckman Coulter's proposed construction. It is my opinion that the plain and ordinary meaning of "collimated beam," is "a beam with nearly parallel rays," which is consistent with Beckman Coulter's proposed construction.

43. It is my opinion that the plain and ordinary meaning of "collimating optical element" is "an optical element, such as a lens, mirror, or grating, to render rays of light more nearly parallel," which is consistent with Beckman Coulter's proposed construction.

44. Cytek's proposed constructions, on the other hand, are inconsistent with how a POSA would understand these terms.[2]

A. A POSA would understand a collimated beam is a beam with nearly parallel rays.

45. The term "collimated" is a commonly used term in optical engineering. In optical engineering, "collimated" means having nearly parallel rays. *E.g.*, McGraw-Hill Dictionary of Scientific & Technical Terms, at 430 (6th ed. 2003) (Ex. 2); Wiley Electrical and Electronic Engineering Dictionary, at 122 (2004) (Ex. 11) ("collimated beam: A parallel, or ***nearly parallel***, beam of radiation or particles. Such a beam has minimal convergence or divergence." (emphasis added)). Alternatively, rather than describing it in terms of rays, a collimated beam can be described as a beam whose diameter does not increase or decrease significantly as it travels through an optical system. Wiley Electrical and Electronic Engineering Dictionary (ex. 11) at 122 ("A parallel, or nearly parallel, beam of radiation or particles … has minimal convergence or divergence."))); Edmund Optics (Ex. 8) at 1 ("A collimated beam of light … would still [have] some divergence."); Dayy Photonics (Ex. 9) at 1 ("A collimated beam is ***light with weak divergence***."

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[2] I use the present tense "would understand" and "would recognize" to indicate what a POSA would have understood or recognized at the priority date of the Asserted Patents. Use of the present tense throughout my declaration should be understood to include the past tense (i.e., at the time of the invention).

(emphasis added)). When the rays of light remain nearly parallel, there will be little convergence or divergence of the rays as they travel, and so the diameter of the beam will stay nearly the same.

46. The following figure shows a cross section of a collimated beam along its path of travel, up to a lens, which then focuses it:

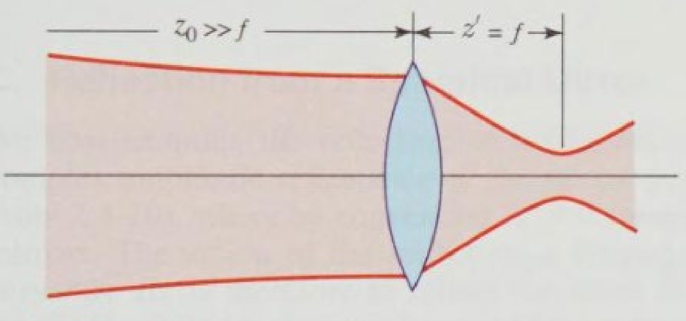
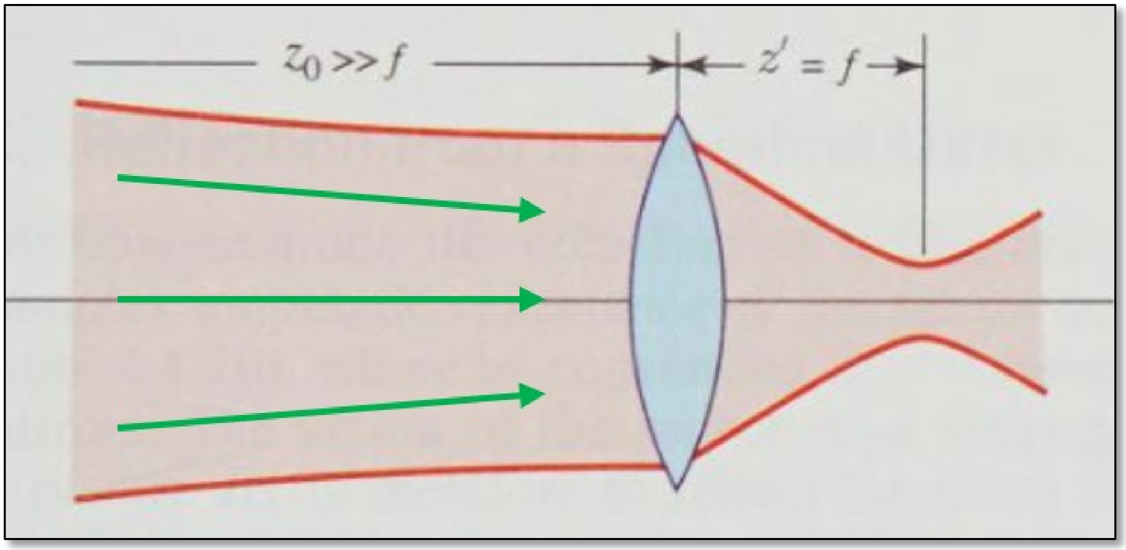


Figure 3.2-4 Focusing a collimated beam.

Saleh & Teich, FUNDAMENTALS OF PHOTONICS, at 89 (2d ed. 2007) (Ex. 26); *see also* H. Sun, LASER DIODE BEAM BASICS: MANIPULATIONS AND CHARACTERIZATIONS, at 39-40 (2012) (Ex. 27) (same). In this image, the beam (shaded red) to the left of the lens (shaded blue) is collimated, while the beam to the right of the lens is not. Saleh & Teich (Ex. 26) at 89. As illustrated, although the collimated beam is perceptibly wider at the left edge of the image than it is nearer to the lens, the diameter of the beam remains nearly the same, and the rays remain nearly parallel, and so the beam is collimated. This is an essential property of collimated beams, for reasons I discuss below.

47. Light rays are a mathematical construct (with a mathematical definition), representing the direction of propagation of light waves. This construct allows computation of how the light waves will behave in different systems. Saleh & Teich (Ex. 27) at 3. In the annotated figure below, I have added three green arrows that represent "rays" of the beam:



Saleh & Teich (Ex. 26) at 89 (annotations added). As illustrated, although the rays of this beam converge slightly, they remain nearly parallel.

48. Several technical dictionaries confirm that a POSA would understand "collimate" or "collimated" to mean "nearly parallel":

- "Collimate" - "To render parallel to a certain line or direction; paths of electrons in a flooding beam, or paths of various arrays of a scanning beam are collimated to cause them to ***become more nearly parallel*** as they approach the storage assembly of a storage tube." MCGRAW-HILL DICTIONARY OF SCIENTIFIC AND

TECHNICAL TERMS, at 430 (6th ed. 2003) (Ex. 2) (emphasis added).

- "collimated beam: A parallel, or ***nearly parallel***, beam of radiation or particles. Such a beam has minimal convergence or divergence." WILEY ELECTRICAL AND ELECTRONIC ENGINEERING DICTIONARY, at 122 (2004) (Ex. 11) (emphasis added).

- "A collimated beam of light … ***would still [have] some divergence***." Edmund Optics, Considerations in Collimation, available at https://www.edmundoptics.com/knowledge-center/application-notes/optics/considerations-in-collimation/ (Ex. 8).

- "A collimated beam is ***light with weak divergence***." Dayy Photonics, What is a Collimated Beam, https://dayyphotonics.com/knowledgebase/what-is-a-collimated-beam (Ex. 9).

- "collimation: 1. In a beam with divergent or convergent rays, the conversion of the rays into a beam with the ***minimum possible ray divergence or convergence***." FIBER OPTICS STANDARD DICTIONARY , at 132 (1997) (Ex. 5) (emphasis added).

49. A POSA's understanding that "collimated" means having nearly parallel rays is also confirmed by how the term "collimated" is used in the specification. The specification repeatedly describes a collimated beam as travelling "over an extended distance without ***significantly*** expanding the beam diameter." '582 Patent at 2:26-29 (emphasis added), 4:34-5:22, 9:51-65, 20:18-33, 44:58-45:7. A POSA would have understood that this is describing a beam expanding and contracting slightly in diameter, while still maintaining the overall nearly parallel

nature of the beam. Moreover, a POSA would have recognized that it would be unnecessary to say a beam does not ***significantly*** expand in diameter if that beam had exactly the same diameter at all times. A POSA would understand that the specification, as a whole, is describing a beam that changes slightly in diameter. In other words, the specification is describing a "collimated beam" that maintains ***nearly*** the same diameter.

50. Because a POSA would understand that "collimated" (and its related terms) means having "nearly parallel rays," Beckman Coulter's proposed constructions are most consistent with the understanding of a POSA.

B. Ideal collimation is physically impossible.

51. Cytek's proposed construction for the collimation terms requires that "rays within the beam are neither converging (i.e., a focused beam) or diverging." I thus understand Cytek's proposed construction to require ideal collimation, that is, a perfectly parallel beam with rays that do not converge or diverge at all. Perfect collimation does not exist in the real world, and thus Cytek's proposed construction recites an impossibility.

52. Academic textbooks sometimes describe a concept of "ideal collimation," that is a beam whose rays are perfectly parallel and whose diameter stays exactly the same. In other words, an ideally collimated beam has absolutely no convergence or divergence, just as is recited in Cytek's proposed construction.

A POSA would know that, in practice and as a matter of physics, ideal collimation is impossible. A parallel beam is a mathematical construct that does not exist in practice. Pedrotti, INTRODUCTION TO OPTICS, at 17 (3d. ed. 2007) (Ex. 4) ("[A] light beam, in practice, cannot be narrowed down indefinitely to approach a straight line."); Edmund Optics (Ex. 8) at 1 ("A collimated beam of light … ***would still [have] some divergence***."); '582 patent at 44:51-57 ("[L]ight from such an extended source, similar to that from a flash light, can only be kept collimated for a very limited distance."), 44:14-50.

53. The reason for this is that light rays, as noted above, are a mathematical construct that represent the direction light waves travel. Light waves emitted from real-world light sources, which are finite in size, spread out (diverge) and thus fill more space. Eugene Hecht, OPTICS, at 149 (4th ed. 2002) (Ex. 22) ("[T]here will always be an apparent deviation from rectilinear propagation even in homogeneous media—the waves will be ***diffracted***." (emphasis in original)); Saleh & Teich (Ex. 26) at 75 ("[T]he wave nature of light precludes the possibility of … idealized transport" of "light … spatially confined and transported in free space without angular spread."); Edmund Optics (Ex. 8) at 1 ("In the real world, neither of these scenarios are possible. In addition, diffraction theory tells us that even if one of these scenarios were met, there would still be some divergence."). This spreading

behavior is due to a process called "diffraction." Hecht (Ex. 22) at 149; Edmund Optics (Ex. 8) at 1.

54. Many widely used optics texts confirm that it is impossible to ideally collimate light. Pedrotti (Ex. 4) at 17 ("a light beam, in practice, cannot be narrowed down indefinitely to approach a straight line"); Hecht (Ex. 22) at 149 ("[T]here will always be an apparent deviation from rectilinear propagation even in homogeneous media—the waves will be ***diffracted***." (emphasis in original)).

55. A POSA would know that in the real world, a beam of light cannot be ideally collimated. The Asserted Patents confirm that notion because they expressly state that light cannot be ideally collimated. '582 patent at 44:51-57 ("light from such an extended source, similar to that from a flash light, can only be kept collimated for a very limited distance, particularly when the diameter of the collimated portion needs to be small."); *see also* '582 patent at 44:14-57. Therefore, a POSA would not understand the term "collimated" (and the related terms) to require physically impossible ideal collimation. Instead, a POSA would understand these terms to mean having "nearly parallel rays," as discussed above.

C. A POSA would understand the Asserted Claims do not include a point source.

56. Cytek's proposed construction of the collimation terms also requires "a beam wherein all rays of light originating from a point source." As explained below,

a POSA would not understand collimation to require that light originate from a point source. As a matter of reference, the term "point source" is found nowhere in the Asserted Patents.

57. A POSA would understand that the term "point source" describes a theoretical light source that is infinitely small. This is in contrast to real light sources, which are not infinitely small.

58. Just as light cannot be ideally collimated, light cannot be focused to a perfect point. The concept of a point source is a theoretical concept that, like ideal collimation, is used to illustrate a concept, not something that can be made in a physical system. The same physical wave behaviors that make it impossible to ideally collimate light also make it impossible to focus light to a perfect point. Saleh & Teich (Ex. 26) at 40, 87-89; Sun (Ex. 27) at 43-44 (explaining how to calculate the smallest possible diameter); Pedrotti (Ex. 4) at 17 ("a light beam, in practice, ***cannot be narrowed down indefinitely***…" (emphasis added)); Hecht (Ex. 22) at 149 ("[T]here will always be an apparent deviation from rectilinear propagation even in homogeneous media—the waves will be ***diffracted***." (emphasis in original)); Edmund Optics (Ex. 8) at 1 ("In the real world, neither" is "an infinitesimally small source … possible."). Thus, a POSA would know that a source of light in the real world cannot be infinitely small.

59. Moreover, the language of the Asserted Claims is inconsistent with requiring that light originate from a point source. For example, claim 2 of the ’582 patent requires the light to come “from a facet of a multimode optical fiber.” Similarly, several claims require light to come from a “particle … in a flow channel.” *E.g.*, ’443 patent, cls. 14-15. As explained in more detail below, a POSA would know that a multimode optical fiber is not a point source.

60. A multimode optical fiber, which is a piece of glass (or another transparent material) used to carry light for some distance using “guided waves,” rather than collimation, is a commonly used type of optical fiber. The facet of a multimode optical fiber is the surface of the fiber from which light enters or leaves the fiber. ’582 patent, 46:10-11 (“[a] beam of light … emits from the facet of the optical fiber”). A multimode fiber facet typically has a diameter measured in millimeters or micrometers. *Id.* at 44:43-46 (“the core diameter of the multimode optical fiber is measured in millimeters”). None of the fibers that exist in the real world constitute a point source because, by definition, they are not infinitely small.

61. Moreover, a multimode fiber cannot be approximated as a point source. *See* ’582 patent at 44:16-22. The ’582 describes a “multimode fiber” as an “extended light source.” *E.g., id.* at Abstract, 4:34-38, 21:40-42, 44:16-22, 45:55-57, 48:20-23, cl. 22. A POSA would have known that in the art, an “extended light source” is the opposite of a “point source.” *See* Hecht (Ex. 22) at 176-177 (comparing images

of extended objects to point sources). Thus, a POSA would have understood that the Asserted Patents recite an extended light source, not a point source (nor even an approximation of a point source).

62. Therefore, a POSA would have recognized that Cytek's proposed constructions, which include a "point source," are both physically impossible and contrary to the language of the Asserted Claims. A POSA would have understood that a "collimated" beam and the related terms are not limited to light from a point source.

IX. IMAGE

63. I understand that the parties dispute the meaning of the term "image."

Claim Term	Beckman Coulter's Construction	Cytek's Construction
"image" '582 Patent, cls. 1, 14, 15, 20, 21, 22, 25, 26	No construction necessary; plain and ordinary meaning. That is: representation of an object	"a pictorial representation of an object (e.g., light source) where rays of light from points on the object are focused to a corresponding point by an optical component," otherwise indefinite.

64. For the reasons explained below, it is my opinion that the term "image" would have been understood by a person of ordinary skill in the art in the field of optics as having its plain and ordinary meaning. It is my opinion that the plain and ordinary meaning of "image" is a "representation of an object," which is consistent with Beckman Coulter's proposed construction.

65. I understand the parties agree that an image is a "representation of an object." Cytek's proposed construction, on the other hand, is inconsistent with how a POSA would understand this term because it includes additional limitations that a POSA would understand are inconsistent with the typical use of the term "image" and are physically impossible.

A. A POSA would understand the term "image" refers to any representation of an object.

66. A POSA would have understood that the term "image" is not limited to pictures. The term image is used in optical engineering to refer to a representation of light. This is not limited to the form of a picture or, as Cytek contends, a "pictorial" representation.

67. A POSA would understand that the specification uses the term "image" to refer to more than just pictures. First, the specification distinguishes between "form[ing] images of each cell's fluorescence" and "captur[ing] digital images of the individual cells." '582 Patent at 27:43-58. A POSA reading the '582 Patent would understand that capturing digital images (i.e., pictures or "pictorial representations") is just one type of image that can be created and that the Asserted Patents confirm that the term "image" standing alone is not limited to digital images formed by a camera but instead encompasses "images" in their broadest sense. A POSA would also understand that the WDM in the Asserted Patents was not being

used to create pictures of the fluorescent cells in the flow channel but simply to collect and distinguish the emitted fluorescent light from different cells.

68. Several technical and lay dictionaries confirm that a POSA would understand "image" to mean any "representation of an object":

- "image" - "a representation of an object." FIBER OPTICS STANDARD DICTIONARY, at 440 (3d ed. 1997) (Ex. 5).
- "image: "[a] representation, reproduction, or counterpart … of an object or entity." WILEY ELECTRICAL AND ELECTRONIC ENGINEERING DICTIONARY, at 360 (2004) (Ex. 11).
- "image" – "[a] representation of a physical object." OXFORD DICTIONARY OF PHYSICS, at 225 (Alan Isaacs ed., 2005) (Ex. 13).
- "image" – "optical counterpart of an object." MERRIAM-WEBSTER'S COLLEGIATE DICTIONARY, at 619 (11th ed. 2003) (Ex. 14).
- "image" – "the apparent reproduction of an object." *Brittanica Academic*, ENCYCLOPEDIA BRITANNICA (1998) (Ex. 15).

69. A POSA would further understand that the specification of the Asserted Patents uses the term "image" to mean any representation of an object. For example, the specification of the Asserted Patents uses the term "image" to describe representations of the fluorescent light from the cells formed somewhere by optics. The specification teaches forming a magnified image "near a … focusing lens." *E.g.*, '582 patent at 44:58-67, 45:20-22, 45:44-54. Further, the specification teaches

forming images of optical elements. *E.g., id.* at 6:49-50 ("an image of said first optical element"), 9:61-65 ("an image of said collimating optical element"), 20:31-33 ("an image of said collimating optical element"), 21:9-10 ("an image of said collimating optical element").

70. A POSA would recognize that the specification is describing "images" that represent the light from the cells that may not be "pictorial representations" for at least two reasons. First, as described in the specification, the light is not recorded by any detector or camera at each image. *E.g.*, *id*. at 44:58-67, 45:20-22, 45:44-54. Second, the pattern of light leaving an optical element such as a mirror or lens does not take on the visual appearance of that mirror or lens (or of the cells). Instead, it recreates the pattern that was projected onto the mirror or lens. A POSA would understand that an "image of … [an] optical element" is not a "pictorial representation" of the optical element (or of the cells).

71. Thus, a POSA would recognize that the Asserted Patents use "image" to refer more broadly to a representation of light, not just to "pictorial representations." A POSA would understand the term "image" to mean a "representation of light from an object."

B. It is physically impossible for light to converge to a point.

72. Cytek's construction requires that "points on the object are focused to a corresponding point" on the image. To the extent this implies a perfect many-to-

one or one-to-one relationship between object and image points, this is impossible. For the same reasons that light cannot be ideally collimated or form a point source, which I discuss above in Sections VIII.B and VIII.C, light cannot converge to a point. Light's nature as a wave limits how tightly it can be focused. Saleh & Teich (Ex. 26) at 40, 87-89; Hecht (Ex. 22) at 149 ("[T]here will always be an apparent deviation from rectilinear propagation even in homogeneous media—the waves will be ***diffracted***." (emphasis in original)). Geometric ray optics does not take into account phenomena such as diffraction, and thus does not accurately describe the physical limits of light focusing. In reality, it is physically impossible to focus light to a point because of diffraction. Saleh & Teich (Ex. 26) at 40, 87-89; Pedrotti (Ex. 4) at 17 ("a light beam, in practice, ***cannot be narrowed down indefinitely***…" (emphasis added)); Hecht (Ex. 22) at 149 ("The attainable degree of perfection of a real imaging optical system will be ***diffraction-limited*** (there will always be a blur spot …)." (emphasis in original)). Even further, practical optical elements such as lenses and mirrors always have imperfections that lead to aberrations in the image. While these aberrations can be reduced, they cannot be eliminated in any practically-realizable system. Pedrotti (Ex. 4) at 25-27.

73. The specification of the Asserted Patents confirms that it is not describing "images" focused to a point. The specification describes "project[ing] a magnified image of" an "extended light source … that forms an object." '582 Patent

at Abstract. As I discussed above in Section VIII.C, the multimode fiber that carries the fluorescent light to the WDM is an extended source. *E.g., id*. at 44:16-20 ("the fluorescence light coming through a … multimode optical fiber is an extended light source with an etendue hundreds of times greater than that of a laser beam out of a single mode optical fiber"). A POSA would recognize that an image of an extended light source will not (and cannot) be focused to a point. Indeed, the specification teaches "an image" can be "of substantially the same size as the effective size of said first optical element." *E.g.*, *id.*, 6:39-46, 44:60-63. Thus, a POSA would understand that the specification of the Asserted Patents is describing images that are not focused to a single point.

74. Further, a POSA would recognize the difference between an idealization of an image (i.e., an "ideal image") and an image as it exists in the real world (i.e., a "nonideal image"). An "ideal image" is defined as "a faithful point-by-point re-creation of corresponding object points." Pedtrotti (Ex. 4) at 25-27. However, in practice, images are "nonideal" because focusing light to a perfect point is physically impossible. *Id*. Instead, "[n]onideal images are formed in practice because of (1) light scattering, (2) aberrations, and (3) diffraction." *Id*.; Hecht (Ex. 22) at 149 ("The attainable degree of perfection of a real imaging optical system will be ***diffraction-limited*** (there will always be a blur spot …)." (emphasis in original)).

75. The Asserted Patents do not require ideally focused images. A POSA would understand that "a magnified image of" an "extended light source … that forms an object," as described in the specification (*id.* at Abstract), would be nonideal. Pedrotti (Ex. 4) at 25-27 ("[n]onideal images are formed in practice because of (1) light scattering, (2) aberrations, and (3) diffraction."). Thus, the specification acknowledges that an image may be non-ideal. Thus, Cytek's construction, which requires "light from points on the object are focused to a corresponding point" is inconsistent how a POSA reviewing the patents would understand "image," because it requires that light be "focused to a corresponding point."

76. Thus, a POSA would understand that Cytek's proposed construction is physically impossible and inconsistent with the intrinsic evidence. Instead, a POSA would understand that a representation of light from an object in practice will be non-ideal, i.e. not focused to a point. Consequently, a POSA would understand "image" to mean a "representation an object."

X. OPTICAL ELEMENT TERMS

77. I understand that the parties dispute the meaning of the term "optical element."

Claim Term	**Beckman Coulter's Construction**	**Cytek's Construction**
"optical element" '443 Patent, cls. 13, 17, 18	No construction necessary; plain and ordinary meaning. That is: a component within an optical instrument or system which acts upon light passing through the instrument or system *Alternatively, if means-plus-function*: '443 Patent, cl. 13: **Function**: detect scattered light emitted by the particle in the flow channel and illuminated by a light source **Structure**: an objective and structural equivalents thereof '443 Patent, cl. 17: **Function**: (1) detect scattered light emitted by the particle in the flow channel and illuminated by a light source; (2) output, based on the detected scattered light, the light to the WDM via the optical fiber **Structure**: an objective and structural equivalents	Invokes 35 U.S.C. § 112, ¶ 6 / 35 U.S.C. § 112(f). '443 Patent, cl. 13: **Function**: detect scattered light emitted by the particle in the flow channel and illuminated by a light source. **Structure**: Indefinite. '443 Patent, cl. 17: **Function**: (1) detect scattered light emitted by the particle in the flow channel and illuminated by a light source; and (2) output, based on the detected scattered light, the light to the WDM via the optical fiber. **Structure**: Indefinite. '443 Patent, cl. 18: **Function**: (1) detect scattered

Claim Term	Beckman Coulter's Construction	Cytek's Construction
	thereof '443 Patent, cl. 18: **Function**: detect scattered light emitted by the particle in the flow channel and illuminated by one or more of the light sources **Structure**: an objective and structural equivalents thereof	light emitted by the particle in the flow channel and illuminated by the one or more light sources and (2) output light to the WDM via the optical fiber. **Structure**: Indefinite.
"collimating optical element" '582 Patent, cls. 1, 6, 14, 20, 18, 21; '106 Patent, cls. 1, 13	No construction necessary; plain and ordinary meaning. That is: an optical element, such as a lens, mirror, or grating, to render rays of light more nearly parallel; a collimator *Alternatively, if means-plus-function*: '582 Patent, cl. 1: **Function**: (1) receive light from a light source; (2) project a collimated beam **Structure**: a lens, such as an achromatic doublet lens, and structural equivalents thereof '582 Patent, cl. 14:	35 U.S.C. § 112, ¶ 6 / 35 U.S.C. § 112(f). '582 Patent, cl. 1: **Function**: (1) receive light from a light source; and (2) project a "collimated beam" onto an optical relay element. **Structure**: Indefinite. '582 Patent, cl. 14: **Function**: (1) receive light from a light source; and (2) project a "collimated beam" including a first image onto an optical relay element.

Claim Term	Beckman Coulter's Construction	Cytek's Construction
	Function: (1) receive light from a light source; (2) project a collimated beam including a first image **Structure**: a lens, such as an achromatic doublet lens, and structural equivalents thereof '582 Patent, cl. 20: **Function**: (1) receive light from a light source; (2) project a first image **Structure**: a lens, such as an achromatic doublet lens, and structural equivalents Thereof '106 Patent, cls. 1, 13: **Function**: (1) receive the fluorescent light collected by the collecting optical element; (2) collimate the fluorescent light **Structure**: a lens, such as an achromatic doublet lens, and structural equivalents thereof	**Structure**: Indefinite. '582 Patent, cl. 20: **Function**: (1) receive light from a light source; and (2) project a first image onto an optical relay element. **Structure**: Indefinite. '106 Patent, cls. 1, 13: **Function**: (1) receive fluorescent light collected by the collecting optical element; and (2) collimate the fluorescent light that is projected onto a first dichroic filter. **Structure**: Indefinite. *Alternatively, if not construed as means-plus-function*: "an optical component at a focal distance from a light source that projects a 'collimated beam' centered

Claim Term	Beckman Coulter's Construction	Cytek's Construction
		on the optical axis such that a 'portion of the collimated beam' is projected onto a first focusing optical element," and another 'portion of the collimated beam' is projected onto a first optical relay element," otherwise indefinite.
"collecting optical element" '106 Patent, cls. 1, 2, 13	No construction necessary; plain and ordinary meaning. That is: an optical element, such as a lens, mirror, or grating, to gather light; a collector *Alternatively, if means-plus-function*: **Function**: collect and focus fluorescent light emitted by a particle illuminated by the light source such that the fluorescent light leaving the collecting optical element converges. **Structure**: an objective and structural equivalents thereof	35 U.S.C. § 112, ¶ 6 / 35 U.S.C. § 112(f). **Function**: collect and focus fluorescent light emitted by a particle illuminated by the light source such that the fluorescent light leaving the collecting optical element converges. **Structure**: (1) a concave mirror and an aberration corrector plate attached to the flow cell with the flow cytometer's viewing zone located between the mirror and the plate; or (2) a concave mirror attached to the flow cell and an aberration corrector plate with the flow cytometer's viewing zone located between the mirror and

Claim Term	Beckman Coulter's Construction	Cytek's Construction
		the plate; or (3) a concave mirror and an aberration corrector plate attached to the flow cell with the flow cytometer's viewing zone located between the mirror and the plate and a chromatic compensating doublet lens; or (4) a concave mirror attached to the flow cell and an aberration corrector plate with the flow cytometer's viewing zone located between the mirror and the plate and a chromatic compensating doublet lens. *Alternatively, if not construed as means-plus-function*: "(1) a concave mirror and an aberration corrector plate attached to the flow cell with the flow cytometer's viewing zone located between the mirror and the plate; or (2) a concave mirror attached to the flow cell and an aberration corrector plate with the flow cytometer's viewing zone located between the mirror and the plate; or (3) a concave mirror and an aberration

Claim Term	**Beckman Coulter's Construction**	**Cytek's Construction**
		corrector plate attached to the flow cell with the flow cytometer's viewing zone located between the mirror and the plate and a chromatic compensating doublet lens; or (4) a concave mirror attached to the flow cell and an aberration corrector plate with the flow cytometer's viewing zone located between the mirror and the plate and a chromatic compensating doublet lens," otherwise indefinite.
"focusing optical element" '582 Patent, cls. 1, 3, 17, 18, 26; '106 Patent, cl. 14	No construction necessary; plain and ordinary meaning. That is: an optical element, such as a lens, mirror, or grating, to converge light *Alternatively, if means-plus-function*: '582 Patent, cl. 1: **Function**: (1) receive at least a portion of a collimated beam reflected by the optical relay element; (2) focus the portion of the collimated beam received from the optical relay element onto a semiconductor detector	35 U.S.C. § 112, ¶ 6 / 35 U.S.C. § 112(f). '582 Patent, cl. 1: **Function**: (1) receive at least "a portion of a collimated beam" reflected by the optical relay element; (2) focus the portion of the collimated beam received from the optical relay element onto a semiconductor detector. **Structure**: "focusing lens that is of a size that captures all light rays of the at least a portion of a 'collimated beam.'"

Claim Term	Beckman Coulter's Construction	Cytek's Construction
	Structure: a lens and structural equivalents thereof '582 Patent, cl. 17: **Function**: (1) receive the collimated beam from the optical relay element at the extended collimated distance and (2) focus the collimated beam onto a first semiconductor detector **Structure**: a lens and structural equivalents thereof '582 Patent, cl. 26: **Function**: focus the light from the optical relay element to a size smaller than the object of the light source onto a semiconductor detector **Structure**: a lens and Structural equivalents thereof '106 Patent, cl. 14: **Function**: focus the band of fluorescent light passing through a dichroic filter in the row of dichroic filters onto a corresponding semiconductor detector	'582 Patent, cl. 17: **Function**: (1) receive the "collimated beam" from the optical relay element at the extended collimated distance and (2) focus the collimated beam onto a first semiconductor detector. **Structure**: Indefinite. '582 Patent, cl. 26: **Function**: focus the light from the optical relay element to a size smaller than the object of the light source onto a semiconductor detector. **Structure**: "focusing lens that is of a size that captures all light rays of the at least a portion of a 'collimated beam.'" '106 Patent, cl. 14: **Function**: focus the band of fluorescent light passing through a dichroic filter in the row of dichroic filters onto a corresponding semiconductor detector.

Claim Term	Beckman Coulter's Construction	Cytek's Construction
	Structure: a lens and structural equivalents thereof	**Structure**: "focusing lens that is of a size that captures all light rays of the band of fluorescent light passing through a dichroic filter." *Alternatively, if not construed as means-plus-function*: "lens that is of a size that captures all light rays of the at least a portion of a 'collimated beam' and projects a focused beam," otherwise indefinite.

78. For the reasons explained below, it is my opinion that the terms "optical element," "collecting optical element," "collimating optical element," and "focusing optical element" would each have been understood by a person of ordinary skill in the art in the field of optics as having their plain and ordinary meanings, which each connote structural components known to a POSA. I will address the terms in more detail below, but to summarize my opinions:

- It is my opinion that the plain and ordinary meaning of "optical element" is "a component within an optical instrument or system which acts upon light passing through the instrument or system," which is consistent with Beckman Coulter's proposed construction.

- It is my opinion that the plain and ordinary meaning of "collimating optical element" is "an optical element, such as a lens, mirror, or grating, to render rays of light more nearly parallel; a collimator," which is consistent with Beckman Coulter's proposed construction. I addressed why a POSA would understand the "collimating" in "collimating optical element" to mean "render[ing] rays of light more nearly parallel," above in connection with my analysis of the collimation terms. *See* Section VIII above.
- It is my opinion that the plain and ordinary meaning of "collecting optical element" is "an optical element, such as a lens, mirror, or grating, to gather light; a collector," which is consistent with Beckman Coulter's proposed construction.
- It is my opinion that the plain and ordinary meaning of "focusing optical element" is "an optical element, such as a lens, mirror, or grating, to converge light," which is consistent with Beckman Coulter's proposed construction.

79. It is also my opinion that Cytek's proposed constructions for each of the "optical element" terms are inconsistent with how a POSA would understand these terms.

A. “Optical element” is a common term in optics that connotes structure.

80. A POSA would consider “optical element” to be a common term that describes structural components that interact with light in a system. There are multiple types of such components. Common examples of optical elements include lenses—such as eyeglasses and magnifying glasses—and mirrors. Another example of components that interact with light are objectives, which can gather and focus light. Various other components in optical systems may also interact with light, including, for example, optical fibers, prisms, and diffraction gratings, among many other examples. *See, e.g.*, FIBER OPTICS STANDARD DICTIONARY (Ex. 5) at 679 (“Examples of optical elements are the whole of, parts of, or segments of, borescopes, fiberscopes, fiber optic faceplates, lenses, prisms, mirrors, light-emitting diodes, photodetectors, optical fibers, fiber optic cables, and fiber optic bundles.”); WILEY ELECTRICAL & ELECTRONIC DICTIONARY (Ex. 11) at 534 (“Examples [of optical elements] include lenses, mirrors, and prisms.”). I discuss these examples in more detail below. A POSA would understand the specific structures of each type of optical element.

81. Different optical elements operate in different ways. For example, lenses work by *refracting* light, which means bending it. Mirrors work by *reflecting* light at an angle. Diffraction gratings work by *diffracting* light. Even though each

works differently, all three types of components can interact with light to make light focus or diverge. A POSA would understand that these components can change the shape and/or direction of a light beam. A POSA would refer to the category of components that interact with light as "optical elements." *See, e.g.*, FIBER OPTICS STANDARD DICTIONARY (Ex. 5) at 679 ("optical element: A component or a part of an optical system."); MCGRAW-HILL DICTIONARY OF SCIENTIFIC & TECHNICAL TERMS (Ex. 2) at 1483 ("Optical element" - "A part of an optical instrument which acts upon the light passing through the instrument, such as a lens, prism, or mirror.").

82. The term "optical element" is used widely in optical engineering to describe structural components that interact with light in an optical system. This is shown, for example, by several technical dictionaries and other definitions:

- "optical element: A component or a part of an optical system…. Examples of optical elements are the whole of, parts of, or segments of, borescopes, fiberscopes, fiber optic faceplates, lenses, prisms, mirrors, light-emitting diodes, photodetectors, optical fibers, fiber optic cables, and fiber optic bundles." FIBER OPTICS STANDARD DICTIONARY (Ex. 5) at 679.

- "Optical element" - "A part of an optical instrument which acts upon the light passing through the instrument, such as a lens, prism, or mirror." MCGRAW-HILL DICTIONARY OF SCIENTIFIC & TECHNICAL TERMS (Ex. 2) at 1483.

- "optical element: A component within an optical instrument or system which acts upon any light passing through it. Examples include lenses, mirrors, and prisms."

WILEY ELECTRICAL & ELECTRONIC DICTIONARY (EX. 11) at 534 .

- "optical elements" include "Lenses; Polarizers; Diffraction gratings; Prisms; Reflectors; Filters; Projection screens; Optical Modulators; Optical Demodulators … Compound lens systems; Light reflecting signalling systems (e.g., retroreflectors); … Light control systems (e.g., light valves); … Kaleidoscopes; … certain apertures, closures, … [and] optical elements combined with another type of structure(s) to constitute an optical element." USPTO Classification, Class 359 Optical: Systems and Elements (2012) (Ex. 18).

A POSA would recognize that all the examples included in the above definitions are "optical elements." A POSA would recognize the structure of each type of optical element and the different ways each can interact with light to reshape, redirect, or otherwise change light. And a POSA would be able to readily distinguish components in an optical system that interact with light, such as mirrors, apertures, and lenses, from components that does not interact with light, such as screws, posts, and electronic power supplies.

83. A POSA would further understand that, outside the definitional context, articles and publications in the field of optics commonly use the term "optical element" to refer to components that interact with light. For example:

- A "lens can act as a focusing ***optical element***." McClelland & Scheinfein, *Laser focusing of atoms: a particle-optics approach*, 8 J. OPT. SOC. AM. B. 1974, 1974-1986 (1991) (Ex. 23) (emphasis added).

- A "focusing lens (***or other optical element***) … transforms a collimated beam (for example) into a converging beam." R. Paschotta, *Focus*, RP Photonics Encyclopedia (2025), https://www.rp-photonics.com/focus.html (Ex. 25) (emphasis added).

- Describing a "mirror for grazing incidence" as a "focusing ***optical element***." J. Voss and C. Kunz, (1992). *Principle and Limitations of the Hamburg Focusing Mirror Microscope*, *in* 67 Springer Series in Optical Sciences: X-Ray Microscopy III, at 235 (A.G. Michette et al. eds., 1992) (Ex. 24) (emphasis added).

84. A POSA would further recognize that the specification discloses numerous different types of optical elements. Some examples from the specification include: lenses, mirrors, prisms, objectives, and optical fibers. *See, e.g.*, '582 patent, at Abstract; 2:7-11; 2:41-43; 2:49-51; 3:7-36; 5:47-6:6; 6:26-56; 7:3-9; 7:10-27; 7:28-38; 7:45-56; 7:57-8:65; 9:10-24; 10:24-26; 10:31-36; 10:60-67; 11:4-9; 11:19-24; 14:41-54; 14:55-57; 14:62-67; 15:9-18; 15:31-32; 15:36-41; 15:56-67; 16:8-14; 21:49-57; 23:1-25; 23:46-50; 23:51-55; 23:56-59; 23:60-63; 24:8-14; 24:15-21; 24:22-24; 24:25-28; 24:29-32; 24:33-36; 24:37-43; 24:44-51; 24:52-57; 24:58-61; 27:59-28:13; 29:36-45; 31:18-23; 31:24-44; 31:56-64; 32:48-33:42; 34:4-14; 34:15-42; 34:43-59; 35:18-35; 35:36-59; 35:60-36:32; 43:31-42; 44:53-67; 48:53-67; 49:8-46; 49:47-52; 51:32-44; 51:45-57; 51:58-52:4; 52:5-14; 53:42-50; 53:51-54:2; 54:12-56:56; 57:1-7; Figs. 1, 8, 8A, 8B, 9A, 10, 11, 12, 13, 36.

B. A POSA would understand which optical elements collect light and are thus "collecting optical elements" or collectors.

85. A POSA would understand how the physical structure of different types of optical elements impact how they interact with light. Therefore, a POSA would recognize that optical elements that gather light are collecting optical elements, i.e., collectors. For example, a POSA would recognize that a collecting optical element could be a lens, mirror, or grating. For example, a POSA would know that a convex lens can collect light, depending on the curvature of its sides and its position relative to the object, and a concave lens can diverge light based on the curvature of its sides and its position. *E.g.*, '582 patent at 46:30-35 ("convex lens … is able to converge and relay the beam of light."); Saleh & Teich (Ex. 26) at 13-15. The structure of example convex lenses is illustrated in the following figure:

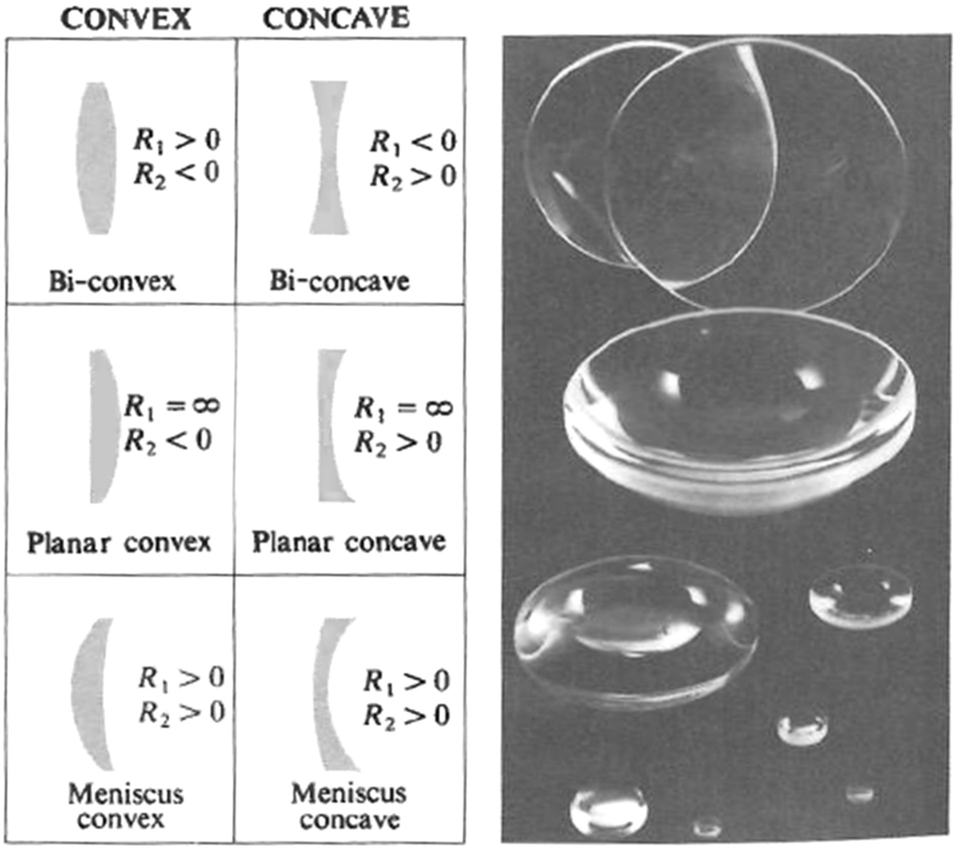


Figure 5.12 Cross sections of various centered spherical simple lenses. The surface on the left is #1 since it is encountered first. Its radius is R_1. (Photo courtesy of Melles Griot.)

Hecht (Ex. 22) at 156. Similarly, a POSA would recognize that a lens, mirror, or grating can be a collecting optical element.

86. More broadly, a POSA would recognize that a collecting optical element refers to a specific subset of structures, also called a "collector." This is confirmed by several technical dictionaries that define "collector":

- "A collector that gathers the backscattered light from molecules and aerosols." G. Vasileiadis, *Raman lidars* *and atmospheric calibration for the Cherenkov telescope array*, 35th Int'l Cosmic Ray Conf., at 1 (2017) (Ex. 21).

- "[I]t's frequently necessary to collect incoming parallel rays and bring them together to a point, thereby focusing the energy." Hecht (Ex. 22) at 150.

87. Because a POSA would understand that "collecting optical element" connotes specific structure, Beckman Coulter's proposed constructions are most consistent with the understanding of a POSA.

C. The specification discloses examples of collecting optical elements.

88. A POSA would recognize that the specification of the Asserted Patents discloses examples of collecting optical elements that perform the functions of "collect[ing] and focus[ing] fluorescent light emitted by a particle illuminated by the light source such that the fluorescent light leaving the collecting optical element converges" and "detect[ing] scattered light emitted by the particle in the flow channel and illuminated by a light source" (and each other function for an "optical element" or "collecting optical element" alleged by either party), namely, objectives. A POSA would understand that objectives are a type of optical element. Thus, a POSA would recognize that the specification discloses that an objective can be the collecting optical element.

89. For example, the '582 patent discloses that the collecting optical element could be an objective comprising "a modified apochromat with a gel-coupled or epoxy bonded near hemisphere lens as the optical element closest to the

sample that is followed by multiple meniscus lenses." '582 patent at 32:60-66. A POSA would know that an apochromat and a meniscus lens are each well-known types of lenses. A POSA would further have recognized that the specification is describing an objective comprising lenses that performs the claimed functions of a "collecting optical element." As another example, the specification discloses that a Schmidt-Cassegrain lens (also called a Schmidt camera) could be the collecting optical element. *E.g.*, '582 patent at 54:13-56:4, Figs. 9-11. A Schmidt-Cassegrain lens is a type of objective that includes a curved mirror and a corrector plate. *Id.* The specification also discloses that other objectives could be a collecting optical element. *E.g., id.* at 5:50-53, 6:26-29, 7:57-60, 23:7-11, 27:59-28:8, 32:48-33:2.

90. Thus, a POSA would have understood that the specification discloses that the collecting optical element could be an objective or its structural equivalents. A POSA would have understood that each of the examples in the specification are consistent with the ordinary structural requirements of a collecting optical element. So, a POSA would have understood "collecting optical element" as Beckman Coulter proposes.

91. Cytek's construction limits the structure to one particular embodiment of the collecting optical elements described in the specification—the Schmidt-Cassegrain lens. *E.g.*, '582 patent at 54:13-56:4, Figs. 9-11. Cytek's construction is improperly narrow because it does not include the broad category of objectives

that constitutes collecting optical elements, and it ignores other examples of collecting optical elements described in the specification, including an objective comprising multiple lenses. *Id*. at 32:60-66.

D. A POSA would understand which optical elements collimate light and are thus "collimating optical elements" or collimators.

92. A POSA would also recognize that a specific subset of optical elements that collimate, i.e., render rays of light more nearly parallel, can be a collimating optical element, that is, collimators. Therefore, a POSA would recognize that optical elements that collimate light are collimating optical elements, i.e., collimators. For example, a POSA would recognize that a collimating optical element could be a lens, mirror, or grating.

93. For example, a POSA would know that a convex lens can collimate light, depending on the curvature of its sides and its position relative to the object. Saleh & Teich (Ex. 26) at 13-15. The structure of example convex lenses is illustrated in the following figure:

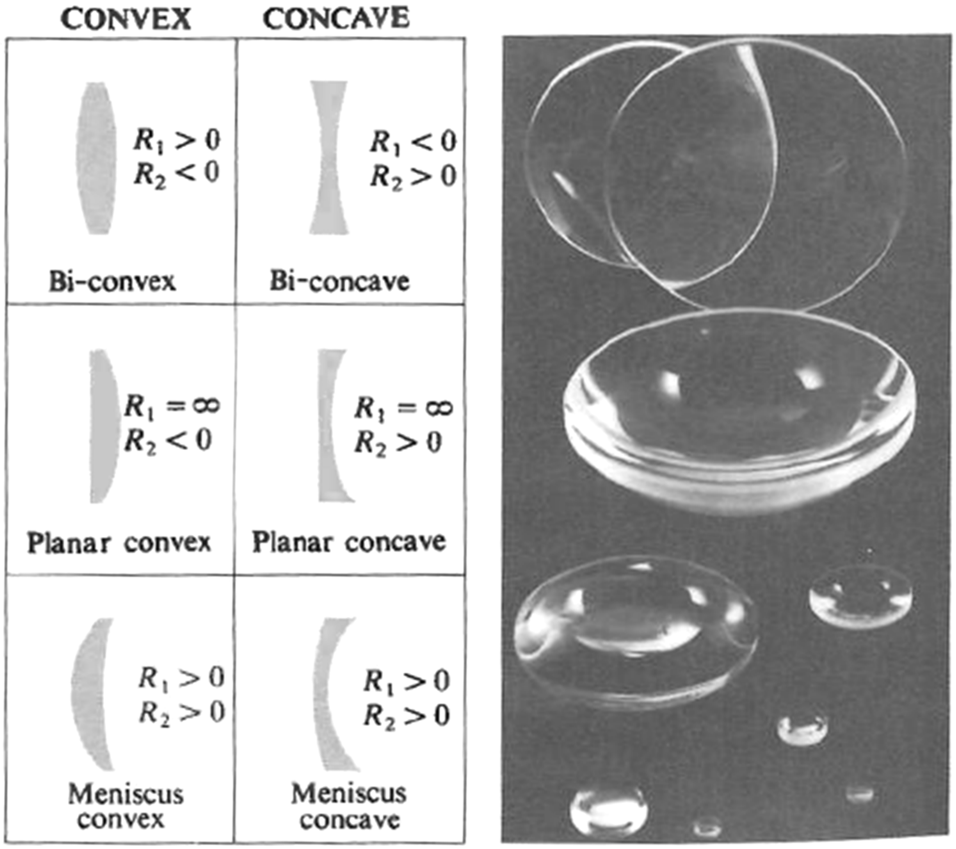


Figure 5.12 Cross sections of various centered spherical simple lenses. The surface on the left is #1 since it is encountered first. Its radius is R_1. (Photo courtesy of Melles Griot.)

Hecht (Ex. 22) at 156. A POSA would understand that a convex lens that collimates light renders light more nearly parallel and is thus a collimator, i.e., a collimating optical element.

94. Similarly, a POSA would recognize that a mirror or grating can be a collimating optical element to the extent they render rays of light more nearly parallel.

95. A POSA would recognize that a collimating optical element refers to a specific subset of structures, also called a "collimator." This is confirmed by several technical dictionaries that define "collimator":

- "collimator" - "[a] device that (a) renders divergent or convergent rays more nearly parallel." FIBER OPTICS STANDARD DICTIONARY (EX. 5) at 132.
- "collimator" is a "device which collimates," leading to a "collimated beam" that is "nearly parallel." WILEY ELECTRICAL AND ELECTRONIC ENGINEERING DICTIONARY (Ex. 11) at 122.

96. Because a POSA would understand that "collimating optical element" connotes specific structure, Beckman Coulter's proposed constructions are most consistent with the understanding of a POSA.

E. The specification discloses examples of collimating optical elements.

97. A POSA would recognize that the specification of the Asserted Patents discloses examples of collimating optical elements that perform the function of "(1) receiv[ing] light from a light source; [and] (2) project[ing] a collimated beam" (and each other function for a "collimating optical element" alleged by either party), namely, a lens, such as an achromatic doublet lens, and structural equivalents thereof. For example, a POSA would recognize that the specification discloses that the collimating optical element could be a lens, such as an achromatic doublet lens

or a singlet lens. *E.g.*, '582 patent at 45:16-43, 58-65, Fig. 25. Figure 25 further illustrates that a lens could be the collimating optical element:

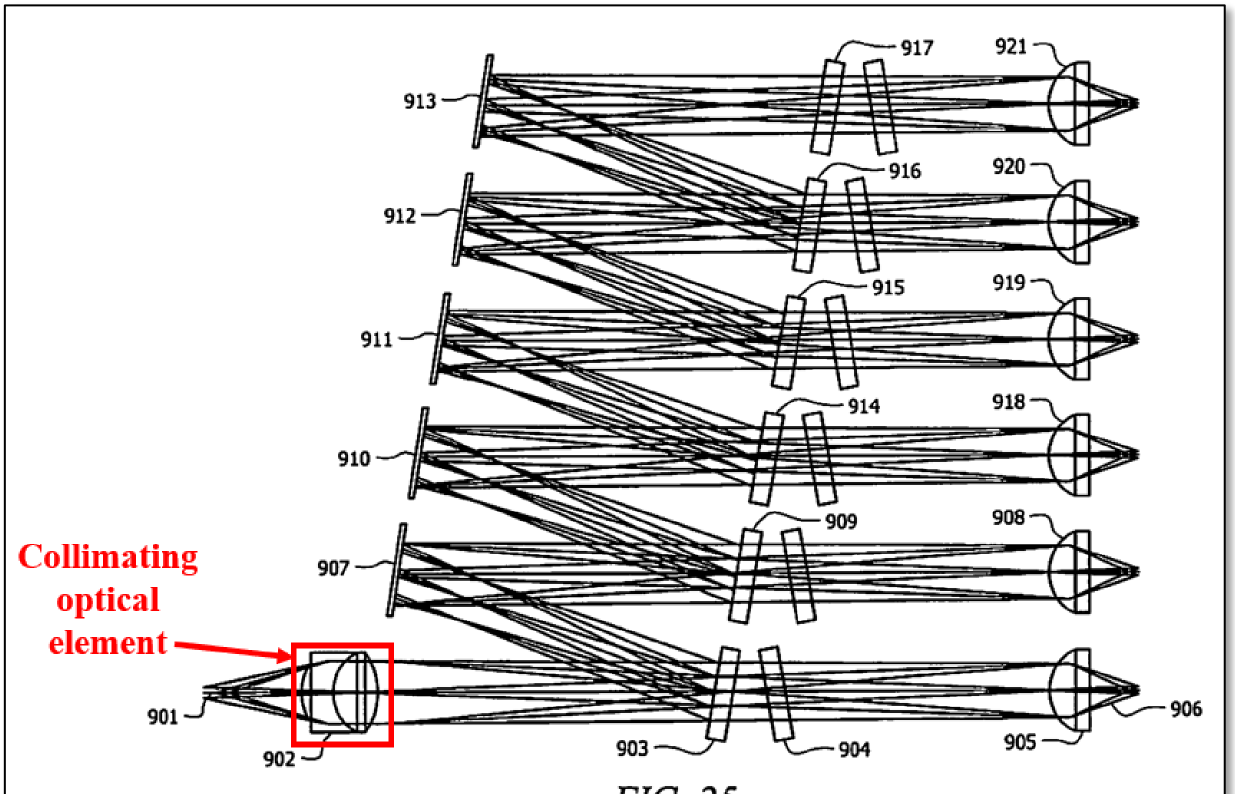


FIG. 25

'582 Patent at Fig. 25 (annotations added). As illustrated in Figure 25, above, the achromatic doublet makes the rays of the beam more nearly parallel—i.e., collimated. *Id.* In particular, "a collimating optical element, in this case an achromatic doublet lens … , may capture the light from [a fiber], and project a magnified image of the [light from the fiber]. … [the] beam of light propagating between the collimating optical element … and the focusing lens … may be effectively collimated." *Id.* at 44:58-66. A POSA would understand that the specification is describing collimating lenses that make the rays of light nearly parallel. A POSA would also recognize an achromatic doublet lens and a singlet lens are each specific structures that collimate light.

98. Thus, a POSA would have understood that the specification discloses that a collimating optical element can be a lens, including an achromatic doublet lens or a singlet lens, or its structural equivalents. A POSA would have understood that each of these examples in the specification are consistent with the ordinary structural requirements of a collimating optical element. So, a POSA would have understood "collimating optical element" as Beckman Coulter proposes.

F. A POSA would understand which optical elements focus light and are thus "focusing optical elements."

99. A POSA would recognize that a specific subset of optical elements that focus, i.e., converge, light are focusing optical elements. Therefore, a POSA would recognize that optical elements that focus light are focusing optical elements. For example, a POSA would recognize that a focusing optical element could be a lens, mirror, or grating.

100. For example, a POSA would know that a convex lens can focus, i.e., converge, light. *E.g.*, '582 patent at 46:30-35 ("convex lens … is able to converge and relay a beam of light."); Saleh & Teich (Ex. 26) at 13-15. In that case, the

convex lens is a focusing optical element. The structure of example convex lenses is illustrated in the following figure:

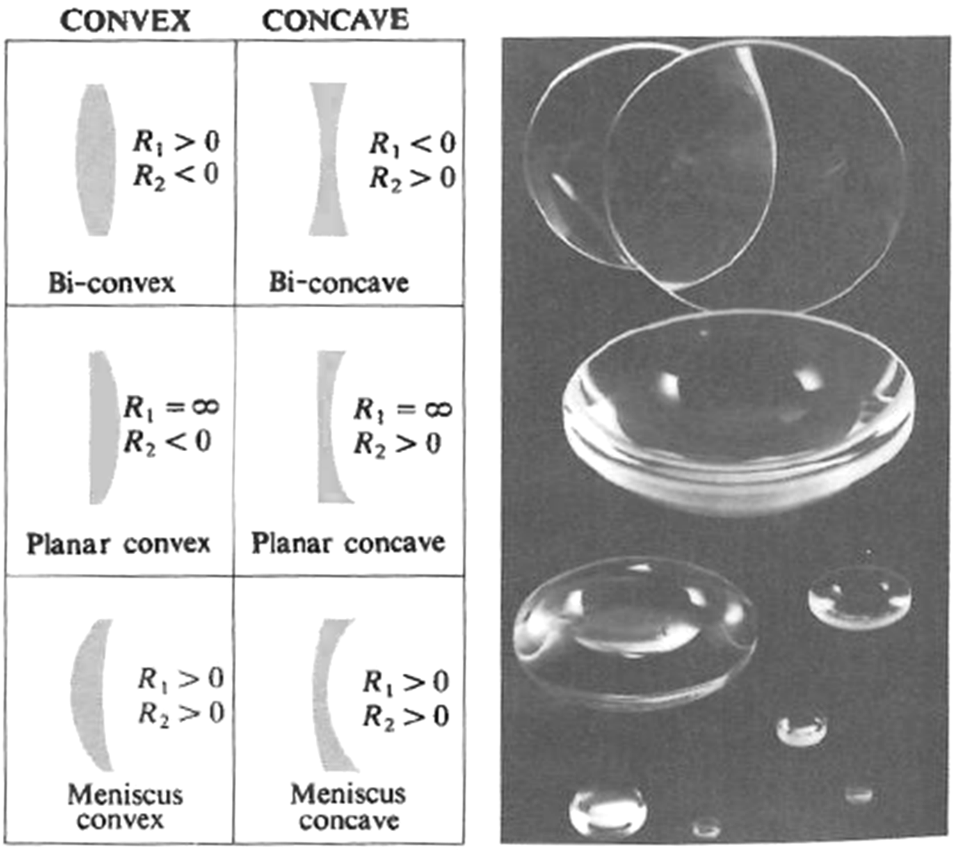


Figure 5.12 Cross sections of various centered spherical simple lenses. The surface on the left is #1 since it is encountered first. Its radius is R_1. (Photo courtesy of Melles Griot.)

Hecht (Ex. 22) at 156. Similarly, a POSA would recognize that a mirror or grating can be a focusing optical element to the extent they converge light. For example, a concave mirror can be a focusing optical element.

101. More broadly, a POSA would recognize that a focusing optical element refers to a specific subset of structures. This is confirmed, for example, by several

articles and other technical references that use the "focusing optical element" in this manner:

- A "lens can act as a focusing optical element." McClelland & Scheinfein, *Laser focusing of atoms: a particle-optics approach*, 8 J. OPT. SOC. AM. B. 1974, 1974-1986 (1991).
- A "focusing lens (or other optical element) … transforms a collimated beam (for example) into a converging beam." R. Paschotta, *Focus*, RP Photonics Encyclopedia (2025), https://www.rp-photonics.com/focus.html.
- Describing a "mirror for grazing incidence" as a "focusing optical element." J. Voss & C. Kunz, *Principle and Limitations of the Hamburg Focusing Mirror Microscope*, *in* 67 SPRINGER SERIES IN OPTICAL SCIENCES: X-RAY MICROSCOPY III (A.G. Michette et al. eds., 1992).

102. Because a POSA would understand that "focusing optical element" connotes specific structure, Beckman Coulter's proposed constructions are most consistent with the understanding of a POSA.

G. The specification discloses examples of focusing optical elements.

103. A POSA would recognize that the specification of the Asserted Patents discloses examples of focusing optical elements that perform the function of "focus[ing] the light from the optical relay element to a size smaller than the object of the light source onto a semiconductor detector" (and each other function for a "focusing optical element" alleged by either party), namely, a lens and structural equivalents thereof. For example, the specification discloses that "a simple singlet

lens" can be the "focusing lens" (i.e. the focusing optical element). *E.g.*, '582 patent at 45:1-4, 45:16-43, Fig. 25. Figure 25 further illustrates that a lens could be the focusing optical element:

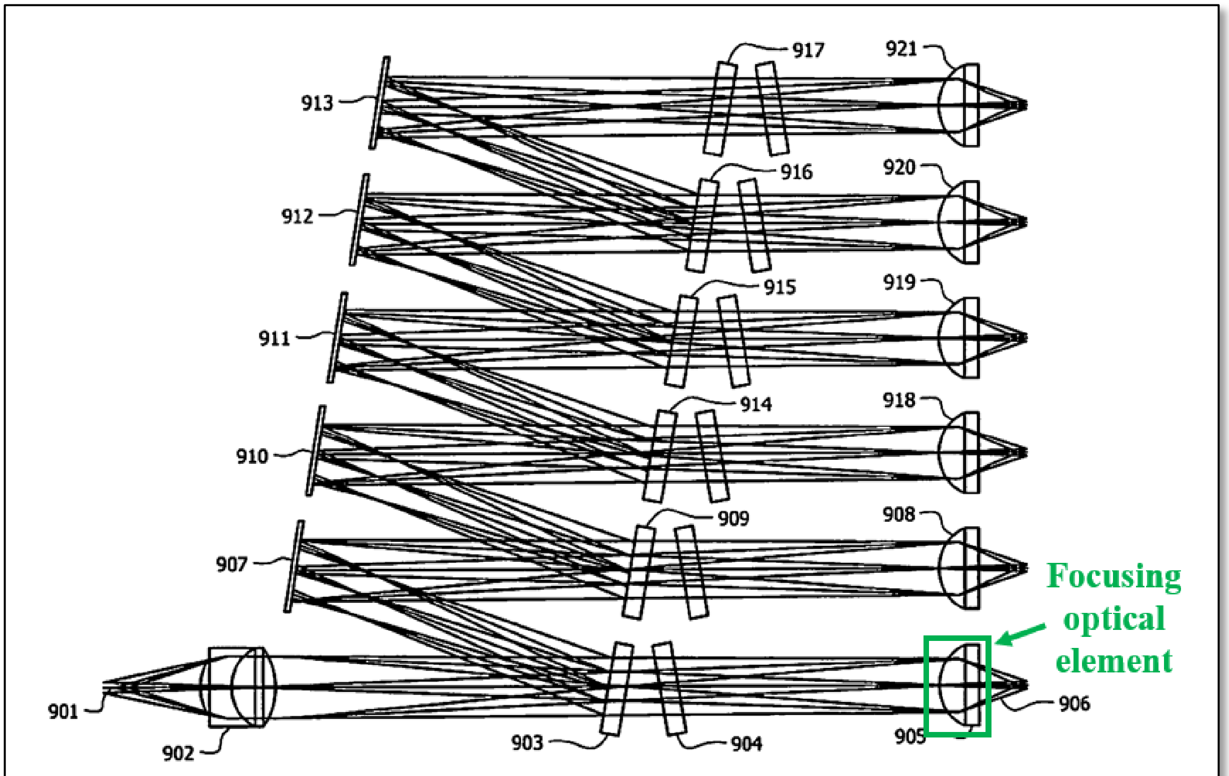


FIG. 25

'582 Patent at Fig. 25 (annotations added). As illustrated above, the "focusing lens" receives the beam from the collimating optical element after if passes through an optical filter. *Id.*; *see also id.* at 45:16-43. As further illustrated, the "focusing lens" focuses the beam to a spot. *Id.* at Fig. 25; 44:66-45:7. A POSA would recognize a lens is a specific structure that can focus light.

104. Thus, a POSA would have understood that the specification discloses that the focusing optical element could be a lens or its structural equivalents.

105. A POSA would have understood that this example in the specification is consistent with the ordinary structural requirements of a focusing optical element. So, a POSA would have understood "focusing optical element" as Beckman Coulter proposes.

XI. FOCUSING LENS

106. I understand that the parties dispute the meaning of the term "focusing lens … configured to focus light."

Claim Term	Beckman Coulter's Construction	Cytek's Construction
"focusing lenses … configured to focus light" '107 Patent, cls. 13, 17	No construction necessary; plain and ordinary meaning That is: lenses to converge light	"lenses that capture all collimated light rays that pass through a filter and project them as converging rays to the focal point of the lens," otherwise indefinite.

107. For the reasons explained below, it is my opinion that the term "focusing lenses … configured to focus light" would have been understood by a person of ordinary skill in the art in the field of optics as having its plain and ordinary meaning. It is my opinion that the plain and ordinary meaning of "focusing lenses … configured to focus light" is "lenses to converge light," which is consistent with Beckman Coulter's proposed construction.

108. A POSA would consider "focusing lens" to be a common term that describes a subset of lenses that focus, i.e., converge, light. This is confirmed, for example, by several technical dictionaries, articles, and other technical references that use the "focusing lens" in this manner:

- A "***focusing lens*** (or other optical element) … transforms a collimated beam (for example) into a converging beam." Rüdiger Paschotta, *Focus*, RP Photonics Encyclopedia (2025), https://www.rp-photonics.com/focus.html (Ex. 25) (emphasis added).
- A "***lens*** can act as a ***focusing*** optical element." McClelland & Scheinfein, *Laser focusing of atoms: a particle-optics approach*, 8 J. OPT. SOC. AM. B. 1974, 1974-1986 (1991) (Ex. 23) (emphasis added).

Because a POSA would understand that "a focusing lens" means any lens that focuses light, Beckman Coulter's proposed constructions are most consistent with the understanding of a POSA.

109. Cytek's proposed construction, on the other hand, is inconsistent with the intrinsic and extrinsic evidence. First, nothing in the specification or claims describes or requires a focusing lens that captures "all … light rays," as Cytek proposes. *See, generally*, '582 patent. Second, a POSA would have understood that it is physically impossible to capture "all collimated light rays that pass through a filter." Since light is made of waves of energy that spread out through space, capturing all rays would require capturing every last bit of energy in the wave. *See* Saleh & Teich (Ex. 26) at 75 ("[T]he wave nature of light precludes the possibility

of … idealized transport" of "light … spatially confined and transported in free space without angular spread."). Given that the collimated rays have some divergence or convergence, requiring them to all be captured by a lens is also physically impossible, for the reasons I described above in Sections VIII.B, VIII.C, and IX.B. In general, it is physically impossible to capture all the light travelling through the system with a single lens.

110. Even further, Cytek's proposed construction limits the term "focusing lens" to lenses that capture collimated light rays and "project them as converging rays to the focal point of the lens," but this is by no means the manner in which a POSA would understand this term. In fact, a POSA would understand that a focusing lens can receive a converging or diverging beam, in which case it would focus light ***not*** at the focal point of the lens. *E.g.*, Saleh and Teich (Ex. 26) at 13-15, 86-89. The following figure shows a cross section of a converging beam along its path of travel, up to a lens which then focuses it:

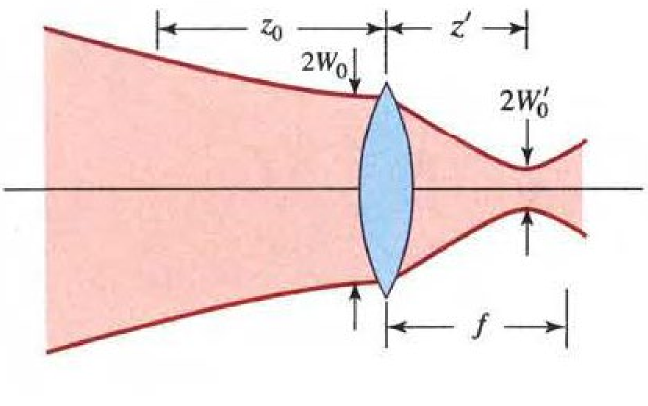


Figure 3.2-3 Focusing a Gaussian beam with a lens at the beam waist.

Saleh & Teich (Ex. 26) at 89. As illustrated, the narrowest point of the focused beam, which is labelled "$2W_0$'" is closer to the lens than the lenses focal length, which is labelled "f." A POSA would have understood that the lens illustrated above is a "focusing lens."Thus, a POSA would not understand a "focusing lens" to require Cytek's unconventional, physically impossible additional limitations that are inconsistent with how a POSA would understand the specification.

XII. CONCLUSION

111. I 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 Section 1001 of Title 18 of the United States Code.

EXHIBIT A

CV for David Schaafsma

dschaafsma@calopten.com

Selected Expertise

- Medical product design / development
- Optics – geometric, diffractive, waveguide, optical technology, optical materials, optical systems design
- Networks, data links, protocols
- Fiber optics, optical sensors
- Lasers & light systems, illumination
- Infrared materials & technology
- Imaging & microscopy (SEM & optical), spectroscopy
- Signal and image processing, spectroscopic identification & pattern recognition
- Spectroscopy, optical materials analysis
- Embedded computer systems, microcontrollers
- Software & programming, Embedded & high level languages
- Electronics, embedded design
- Sensors, data acquisition
- Semiconductor metrology, photovoltaics, renewables
- Project planning, management
- ISO 9000, SPC, GMP
- Tooling, process development
- Market, patent research
- Grant writing
- Expert witness

CV for David Schaafsma

dschaafsma@calopten.com

Employment History

From:	2004	**California Optical Engineering, Inc.**
To:	Present	Escondido, CA
Position:		*President & Principal*

Consulting in technology & product development (primarily medical and industrial), over 40 associates. Specialized in software and hardware (electronics, sensors, optics) development for medical devices, communications systems, and sensing. Recent projects have included:

- ophthalmic optical therapy devices
- fundus camera systems
- optical bilirubinemia measurements for neonates
- image-based and sequential (point) genetic assays (fluorescent)
- smartphone-compatible optical assay systems
- pulse oximetry and optical blood pressure monitoring
- optical blood glucose monitoring
- optical flow cytometry
- confocal fluorescence microsopy
- optical markers of glucose concentration in the eye (lens and aqueous humor)
- optical pattern recognition for anti-counterfeit systems, development of optically-functional coatings
- ophthalmic thermal therapy devices
- design and validation of endoscopes/laryngoscopes
- design and construction of microscope systems for fluorescent assays
- laminar flow and lab-on-a-chip systems, colorimetric and fluorescent
- embedded systems for dosimetry & flow measurement
- in-vivo flow measurement for insulin dosimetry
- ECG/MCT monitors
- machine-vision flow control systems
- monitoring of optical ablation of arterial plaque
- design and experimentation for in-vivo optical probes
- machine vision for computer aided surgery
- colorimetric measurement of fluid concentration
- design of ophthalmic instruments for early detection of eye disease
- image processing for hyperthermia
- robotic automated animal marking systems
- polymer materials analysis & evaluation for angiography and angioplasty
- high-speed hybrid optical-electronic data networks
- materials for optical data storage media
- optical semiconductor metrology
- optical systems for packaging and tracking
- infrared optical imaging for cancer detection

CV for David Schaafsma

dschaafsma@calopten.com

Core specialty areas include electronics (sensors, embedded systems, optical data transport, eCAD, programmable logic/VHDL, ARM, AVR, FPGA, DSP), software (Linux/Windows, C/C++, Java, assembly, Python), and optics (systems level design to ray trace/non-sequential modeling using Zemax, Matlab).

From: 2006 **Computer Aided Surgery Associates**
To: 2009 La Mesa, CA
Position: *Vice President of Engineering*

Developed and demonstrated non-contact alignment system for prosthesis placement (navigation) during total knee arthroplasty (TKA). Image-guided system used dual-band stereoscopic camera system with image processing to analyze alignment and provide feedback to surgeons. Early sponsorship from leading orthopedic companies.

From: 2006 **California State University**
To: 2022 San Marcos, CA
Position: *Adjunct Professor of Applied Physics*

Teach and develop curriculum in electronics, optics, and physics. Oversee student research projects, initiate industry collaboration with university. Lead academician in embedded systems/electronics focus of Applied Physics program, and nascent Electrical Engineering program.

From: 1999 **Ipitek/Tetra Tech Data Systems**
To: 2004 Carlsbad, CA
Position *Director of Sensor Products*

Responsible for overall management and technical leadership of fiber optic sensor group (scientists, engineers, salespeople, and technicians):

- R&D, product management, engineering, business development, sales & marketing.
- Instrument electronic design: photoreceivers (e.g. low noise, high linearity and high speed), embedded processing (uC/PGA, DSP), interfacing (serial, Ethernet, some USB, displays, keypad, etc.), CPLD & FPGA (Xilinx) design.
- Redesigned temperature sensor product, improving performance & cost.
- Initiated supplier relationships with semiconductor, medical, automotive, aerospace customers.
- Designed, built, tested and sold instrumentation for semiconductor metrology, particularly wafer processing machinery, some deposition equipment.
- Designed, built, tested, and sold instrumentation for medical thermal therapy equipment, particularly hyper- and hypo-thermic methods.

- Software development: embedded processing (ARM, 8051, x86, eZ80), DSP (Analog/TI), scientific computing, numerical modeling.
- Conceived, initiated, & directed R&D and product development in thermal, acoustic, pressure, biological, chemical, and e-field sensors, as well as communications devices & systems.
- Other R&D projects: millimeter-wave links, DWDM/UDWDM networks, wavelength cross-connects, fiber optic switches, avionics networks, free space optical communications, laser tracking systems, optical beam steering, and secure communications. Over 30 patent disclosures & 2 patent applications.

From: 1996 **U.S. Naval Research Laboratory**
To: 1998 Washington, DC
Position: *Senior Scientist*

Developed devices & applications for chalcogenide (CG) fibers and integrated optics. Authored three patents, several publications resulting from research. R&D accomplishments: first chalcogenide SM fused coupler, first IR singlemode near-field optical microscope probe, first model of 1.3 um CG fiber amplifiers, made CG fiber Bragg gratings. Built electro-mechanical system for fiber tapering. Wrote optical amplifier modeling code in C using open source compiler (Windows platform). Other R&D areas: IR scene simulation, Raman amplifiers in CG, chemical sensors, microlensed fibers, photosensitive waveguides & photo-doping.

From: 1992 **National Institutes of Standards and Technology**
To: 1996 Boulder, CO
Position: *Research Associate*

R&D in quantum optics of vertical-cavity surface-emitting semiconductor lasers. Set up, instrumented, wrote code for, and maintained optical characterization laboratory. Provided primary optical characterization support for all structures grown in NIST MBE machine. Designed, modeled, characterized laser structures for MBE growth. Wrote code for multilayer dielectric modeling with complex index using Borland C++. Designed instrumentation and wrote instrument control software (in Borland C) for photon counting spectroscopy system (noise floor 4 photons). Other measurements: reflectance, photoluminescence, DCXRD, SEM, and X-ray. Other R&D accomplishments: quantum well interdiffusion, crosstalk in VCSEL arrays, angular and spectral dispersion of and spectral drift of the fundamental lasing mode in VCSELs.

CV for David Schaafsma

dschaafsma@calopten.com

From:	1989	**Bandgap Technology Corporation**
To:	1992	Broomfield, CO
Position:		*Senior Characterization Engineer*

Primary quality control officer for a start-up compound semiconductor manufacturing company. Designed & supervised construction of characterization laboratory with budget over $2M. Developed and maintained characterization facilities (hardware, software, training, calibration, etc). Wrote numerous GUI instrument control & data acquisition applications for HP Unix workstations using XWidget & Athena toolkits. Primary technical interface to customers. Responsible for analysis and interpretation of all wafer test data. Set up and administered HP 9000 Unix cluster network for characterization and manufacturing. Trained and supervised technicians and engineers, implemented SPC. One of 4 lead engineers responsible for design and equipping of 2000 sq-ft Class 10 clean room. Techniques used: PL, photoreflectance, parametric testing, C-V profiling, Hall effect, resistivity/particulate screening, Nomarski microscopy, DCXRD, and RF device characterization.

Patents

Patent Number	Date Issued	Title
6,285,811	2001	Near-field optical microscope with infrared fiber probe
5,949,935	1999	Infrared optical fiber coupler

Application Number	Date	Title
US20060191566A1	2006	Solar concentrator system using photonic engineered materials
US20070246040A1	2006	Wide angle solar concentrator
US20060174867A1	2004	Nonimaging solar collector/concentrator
US20060233492A1	2006	Optical beam combiner/concentrator
US20080170826A1	2007	Misalignment-tolerant optical coupler/connector
WO2001027961A2	1998	Coated cathodoluminescent phosphors

CV for David Schaafsma

dschaafsma@calopten.com

Education

College/University	Degree
University of Colorado, Boulder, CO	Ph.D., Physics
Brown University, Providence, RI	M.S., Physics
Whitman College, Walla Walla, WA	B.A., Physics

Publications / Presentations

1. “Comparison of analysis methods for fluorescence lifetime imaging,” T. Hall, D.A. Dorroh, S.E. Robertson, and D.T. Schaafsma, SPIE BIOS/Photonics West, Paper #8227 (2012).
2. “Fiber pressure sensors based on periodical mode coupling effects,” Haim Lotem, Wen C. Wang, Michael Wang, David Schaafsma, Bob Skolnick, and Haim Grebel, *Proc. SPIE* **5758**, 239 (2005).
3. “All-dielectric miniature wide-band RF receive antenna,” Wen Wang, Weiping Lin, Hank Marshall, Bob Skolnick, and David Schaafsma, *Opt. Eng,* **43**, (2004).
4. “Electro-optic RF receive antenna,” Wen C. Wang, Weiping Lin, Hank Marshall, David Schaafsma, and Richard Chaung, *SPIE Digital Wireless Communication V* **5100**, 149 - 156 (2003).
5. “Fiberoptic temperature sensors for medical applications,” David Schaafsma, Gail Palmer, and James Bechtel, Proc. SPIE, (2003).
6. “Efficacy and Performance of Emissivity Cancellation Probes for Pyrometric Systems,” M. Fisher and D. Schaafsma, *RTP 2000*, Balitmore, MD, Sept. 2000.
7. “Aircraft Fail-Safe Self-Monitoring System,” Anthony C. Jackson and David T. Schaafsma, presented at *the 4th Joint DoD/FAA/NASA Conference on Aging Aircraft*, St. Louis, MO, May 2000.
8. “Chalcogenide fibers: an overview of applications,” J.A. Moon and D.T. Schaafsma, *Fiber & Integrated Optics* **19**, June 2000.
9. “Comparison of conventional and gain-clamped semiconductor optical amplifiers for wavelength division multiplexed transmission systems,” D.T. Schaafsma, E. Miles, and E.M. Bradley, *J. Lightwave Tech.* (July 2000).
10. "Fabrication of Singlemode Chalcogenide Fiber Probes for Scanning Near-Field Infrared Optical Microscopy," D.T. Schaafsma et al, *Opt. Eng.*, (August 1999).
11. "Cross-Gain Modulation and Frequency Conversion Crosstalk Effects in 1550-nm Gain-Clamped Semiconductor Optical Amplifiers," D.T. Schaafsma and E.M. Bradley, *Photon. Tech. Lett.* **11**, 727 (1999).
12. "Singlemode chalcogenide fiber infrared SNOM probes," D.T. Schaafsma, R. Mossadegh, J.S. Sanghera, I.D. Aggarwal, J.M. Gilligan, N.H. Tolk, M.

Luce, R. Generosi, P. Perfetti, A. Cricenti, and G. Margaritondo, *Ultramicroscopy* **77**, 77 (1999).

13. "First Experimental Results with the Free Electron Laser Coupled to a Scanning Near-Field Optical Microscope," A. Cricenti, R. Generosi, C. Barchesi, M. Luce, M. Rinaldi, C. Coluzza, P. Perfetti, G. Magaritondo, D.T. Schaafsma, I.D. Aggarwal, J.M. Gilligan, and N.H. Tolk, *Phys. Stat. Sol. A* **170**, 241 (1998).
14. "Cation vacancy formation and migration in the AlGaAs heterostructure system," P. Mitev, S. Seshadri, L. J. Guido, D. T. Schaafsma, and D. H. Christensen*, Appl. Phys. Lett.* **73**, 3718 (1998).
15. "Modeling of Dy^{3+}-doped GeAsSe glass 1.3 μm optical fiber amplifiers," D.T. Schaafsma, L.B. Shaw, B. Cole, J.S. Sanghera, and I.D. Aggarwal, *Photon. Tech. Lett.* **10**, 1548 (1998).
16. "Chalcogenide optical fiber couplers for chemical sensing, telecommunications, and infrared lasers," D.T. Schaafsma, L.B. Shaw, L.E. Busse, J.S. Sanghera, and I.D. Aggarwal, CLEO 98, paper CThP4 (1998).
17. "Dy^{3+}-doped GeAsSe 1.3 μm optical fiber amplifiers," L.B. Shaw, D.T. Schaafsma, B.J. Cole, P. Pureza, R. Mossadegh, V.Q. Nguyen, J.S. Sanghera, and I.D. Aggarwal, presented at CLEO '98.
18. "Rare earth doped selenide glass optical sources," L.B. Shaw, B. Cole, D.T. Schaafsma, B.B. Harbison, J.S. Sanghera, and I.D. Aggarwal, presented at OFC '98.
19. "Rare earth doped glass fibers as sources for IRSS," L.B. Shaw, D.T. Schaafsma, B.J. Cole, B.B. Harbison, J.S. Sanghera, and I.D. Aggarwal, presented at AeroSense '98.
20. "Dy-doped selenide glass for 1.3 mm optical fiber amplifiers," L.B. Shaw, B.J. Cole, J.S. Sanghera, I.D. Aggarwal, and D.T. Schaafsma, presented at OFC '98.
21. "Fabrication of Singlemode Chalcogenide Optical Fiber," R. Mossadegh, D.T. Schaafsma, J.S. Sanghera, V.Q. Nguyen, R.A. Miklos, and I.D. Aggarwal, *J. Lightwave Technol.* **16**, 214 (1997).
22. "Fused taper infrared optical fiber couplers in chalcogenide glass," D.T. Schaafsma, J.A. Moon, J.S. Sanghera, and I.D. Aggarwal, *J. Lightwave Technol.* **15**, 214 (1997).
23. "Mode splitting in vertical-cavity microlasers from side-emission measurements," D.T. Schaafsma and D.H. Christensen, CLEO 97, paper CWG4 (1997).
24. "Evaluation of the IR transitions in rare-earth doped chalcogenide glasses," L.B. Shaw, D.T. Schaafsma, J.A. Moon, J.S. Sanghera, B.B. Harbison, and I.D. Aggarwal, CLEO 97, paper CWF48 (1997).
25. "Cavity coupling in vertical-cavity semiconductor lasers," D.T. Schaafsma and D.H. Christensen, NIST Technical Note #5047 (1997).
26. "Mode splitting in side emission from vertical-cavity surface-emitting lasers," D.T. Schaafsma and D.H. Christensen, *Phys. Rev.* **B 54**, 14618 (1996).

27. "Cross-sectional microphotoluminescence and buried layer structures," D.H. Christensen and D.T. Schaafsma, 1995 OSA Annual Meeting, p.124, Portland, OR, Sept 10-15 (1995).
28. "Cross-sectional photoluminescence and its application to buried-layer semiconductor structures," D.T. Schaafsma and D.H. Christensen, *J. Appl. Phys.* **78**, 694 (1995).
29. "Vacancy diffusion and Al-Ga interdiffusion in quantum well heterostructures," S. Seshadri, P. Mitev, L.J. Guido, S. Smith, R.D. Burnham, D.T. Schaafsma, and D.H. Christensen, Proc. 21st Intl. Symp. On Compound Semiconductors, San Diego, CA (1994).
30. "Correlation of optical, X-ray, and electron microscopy measurements on semiconductor multilayer structures," D.H. Christensen, R.K. Hickernell, D.T. Schaafsma, J.G. Pellegrino, M.J. McCollum, and R.S. Rai, in *Spectroscopic Characterization Techniques for Semiconductor Technology V*, SPIE Proc. **2141**, 177 (1994).
31. "A self-consistent investigation of coupled vacancy and host-atom diffusion in AlGaAs:GaAs quantum well heterostructures," S. Seshadri, P. Mitev, L.J. Guido, D.T. Schaafsma, D.H. Christensen, M.J. McCollum, S. Smith, and R.D. Burnham, Electronic Materials Conference (1994).
32. "Measurement and simulation of photoluminescence spectra from vertical-cavity surface-emitting laser structures," D.T. Schaafsma, R.K. Hickernell, and D.H. Christensen, in *Quantum Well and Superlattice Physics V*, SPIE Proc. **2139,** 93 (1994).
33. "Comparative photoluminescence measurement and simulation of vertical-cavity semiconductor laser structures," D.T. Schaafsma, R.K. Hickernell, and D.H. Christensen, in *Growth, Processing, and Characterization of Semiconductor Heterostructures*, MRS Symp. Proc. **326**, 483 (1994).
34. "Rapid growth of thick, IC quality GaAs from a flowing solution," E.E. Crisman, C.B. Roberts, D.T. Schaafsma, and H.J. Gerritsen, Fall MRS Meeting, Boston, MA (1989).

Organizations/Affiliations

- Past Executive Editor, *Fiber & Integrated Optics* (peer-reviewed bi-monthly technical journal published by Taylor & Francis)
- Past Member of American Physical Society, Institute of Electrical & Electronics Engineers, Materials Research Society

Litigation/Expert Witness Experience

Depositions: 13
Testimony in Court: 5 (3 ITC, 1 District, 1 Superior)

Start Date	**Client/Case**
2024-present	Quinn Emmanuel Urquhart & Sullivan *[confidential – not disclosed]* Code scanner case.
2024-present	Wilmer Hale *[confidential – not disclosed]* Flow cytometry case.
2024-present	Davis Grass Goldstein & Finlay *San Antonio Regional Hospital* Personal injury involving cardiac monitors.
2024	Alston & Bird *[confidential – not disclosed]* Fiberoptics case. Settled Aug. 2024
2023-present	Troutman-Pepper-Hamilton, LLP *3Shape v Medit* Dental scanners. Consulting and preparation for district court trial, 2 declarations filed. Deposed (2x) May 23-24, 2024.
2023-present	Stoel Rives *Cimbria v. 3U Vision* IR scanner PGR matter.
2023-present	Stearns & Kessler *[confidential – not disclosed]* Nitric oxide therapy IP case.
2023	Riman Law *[confidential – not disclosed]* Optical filters. Settled April 2023.
2022-2023	Ropes & Gray *[confidential – not disclosed]* Orthopedic surgery matter. Settled April 2023.
2022-2023	Latham & Watkins *[confidential – not disclosed]*

	Ophthalmic surgery IPR matter.
2022	Daniels & Tredennick PLLC *[confidential]* Patent prosecution malpractice case.
2022	Skiermont Derby, LLP *[confidential – not disclosed]* Ingestible camera infringement case. Settled 2022.
2022-2023	Perkins Coie, LLP *Sartorius v. Gator Bio* Biosensor infringement case. 3 declarations filed. Deposed May 2023. Testified at ITC Nov. 2023.
2020-2022	Troutman-Pepper-Hamilton, LLP *Align v. 3Shape* Consulting and preparation for district court trial Filed declaration in support of Markman hearing, IPR hearing, and 3 declarations in District Court. Settled Feb. 2022.
2018-2020	Buchanan, Ingersoll, & Rooney PC *Align v. 3Shape* Dental technology intellectual property case. IPR report consulting and preparation. Deposed Feb. 2020.
2018-2023	Crites Law Group *Morris v. Leica Biosystems* Consulting on personal injury case involving automated biopsy equipment. Deposed April 2023. Settled May 2023
2019	Walkup, Melodia, Kelly & Schoenberger *Melville v. Boston Scientific* Consulting on personal injury case involving laser-based bronchoscopy.
2018-19	Pepper-Hamilton, LLP Buchanan, Ingersoll, & Rooney PC *Align v. 3Shape* Dental technology intellectual property case. Prepared expert validity report for ITC Deposed July 2018.

	Testified at ITC court, Washington, DC, Sept. 2018 Deposed August 2019 Testified at ITC court, Washington, DC, Oct. 2019
2018-19	Perkins Coie, LLP *Fontem v. RJ Reynolds* Nathan Kassebaum, Atty. Joe Hamilton, Ptr. Prepared expert declaration for IPR (new filing). Deposed March 2018.
2017	Stradley, Ronon, Stevens & Young, LLP *[confidential]* Prepared expert declaration for trade secret case, interviewed by arbitrating judge. Initial judgment for defendant.
2017	Perkins Coie, LLP *Fontem v. RJ Reynolds* Prepared expert declaration for IPR. Deposed June 2017.
2016/7	Latham & Watkins, LLP *Ikaria-Mallinckrodt v. Praxair* IP litigation for nitric oxide therapy. Prepared expert report. Deposed Dec. 2016 Testified in federal court, Delaware, Mar. 2017
2015	Goodwin-Procter, LLP *Alere v. Family Health* Intellectual Property – Review of IPR filing for lateral flow assays and flow measurement.
2015	Perkins-Coie, LLP Lara Dueppen, Atty. *Fontem v. RJ Reynolds* Intellectual Property - Patent infringement analysis & report for e-cigarettes.
2012-2013	Molever-Conelly, LLP *Kim v. Zeiss* Product Liability – negligent product service resulting in loss of business. Performed product testing, provided expert opinion (reports). Deposed Jun. 2013, Testified at trial Aug. 2013 (judgment for plaintiff).

2012	James R. Rogers *Bicknell v. West Hills Hospital* Personal Injury – product liability, testing of external pacemaker Performed data analysis, product testing.
2012	Weiss & Moy, LLP *Pacific Bioscience Laboratories v. Nutraluxe* Intellectual Property – skin brushes Performed data analysis, product testing, provided expert opinion.
2011	DLA Piper *CareFusion 303, Inc. v. Sigma International* Intellectual Property – infusion pump technology. Performed product analysis and provided part of expert opinion.
2011-2013	Hogan-Lovells, LLP *Alere/Inverness v. Church & Dwight* Intellectual Property – pregnancy test device. Performed product analysis and interpretation. Settled 2013.
2010	Scheuring, Zimmerman& Doyle, LLP *Fonti v. Wilmarth* Personal Injury – product liability, electrosurgical device Performed data analysis, product testing, provided expert opinion.
2009	Peach-Weathers *Franklin v. Ladies' Workout and Omron, Inc.* Personal Injury – body fat analyzer Performed product analysis, testing, expert declaration.
2007-8	McKool-Smith *Medtronic USA, Inc. v. Boston Scientific, Scimed Life Systems Inc., and Boston Scientific Scimed, Inc.* Patent Infringement – angioplasty balloon/stent catheters Performed patent analysis, product testing, claim construction analysis, expert declaration and reports.

IP Development/Analysis

Date	**Client**
2021-2022	[Confidential] Technology development for neonatal jaundice assay.
2019	[Confidential] IP development for pediatric audio company.
2015	[Confidential] Due diligence for acquisition of vascular therapy company.
2014	Convergent Dental, Inc. IP review and analysis of possible renewed application of US20060233492 A1.
2014	Pacific Science & Engineering, Inc. Patent/IP development for closed-loop spirometer.
2012-2014	Tearfilm, Inc. Patent/IP development for dry-eye (keratoconjunctivitis sicca) therapy device.
2008	Karasic Law Group Patent Issues – Personal biomonitor device (pulse, respiration) Performed patent analysis, product viability analysis, product design.
2006-12	Freedom MediTech, LLC Patent, IP validation, technology development Developed optical technology for ophthalmic glucose measurement
2006-9	Helixis, Inc. (now Illumina, Inc.) Patent & IP development Assisted with IP development for genetic assay system
2007-9	Therafuse, Inc. IP development Developed IP & prototypes for optical flow measurement device for drug delivery

2003	L-3 Communications Due diligence – technology/IP analysis for corporate acquisition
2002	Boston Scientific, Inc. Patent & IP development Analyzed (customer) patent for thermal therapy system