

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

OPTICIS CO., LTD.,
Petitioner,

v.

INNEOS LLC,
Patent Owner.

IPR2023-01256
Patent 7,198,416

**SUPPLEMENTAL DECLARATION OF
ALAN E. WILLNER, PH.D.**

Opticis Co., Ltd
EXHIBIT 1016
IPR Petition for
U.S. Patent No. 7,198,416

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I, Alan E. Willner, hereby declare as follows:

I. INTRODUCTION

1. I submitted an original declaration in this matter in connection with the Petition. *See generally* EX1003. Since submitting that declaration, Patent Owner filed its Preliminary Response, which included an initial declaration by its expert Dr. Lebby. The Board has also since instituted an *inter partes* review (IPR) of U.S. Patent No. 7,198,416 (the '416 Patent). *See generally* *Opticis Co., Ltd. V. Inneos LLC*, IPR2023-01256, Paper 15 (PTAB Feb. 2, 2024). Following institution, Patent Owner (Inneos) submitted a response to the Board's Institution Decision. *See generally* Patent Owner Inneos's Response to Institution of IPR ("Response"). In connection with that Response, Patent Owner's expert, Dr. Lebby, submitted a supplemental declaration, maintaining the original positions he took and providing new ones. *See generally* EX2049. And prior to the response, I was also deposed in this matter. *See generally* EX2048 (Dr. Alan Willner's deposition transcript, dated April 11, 2024). I also understand that Mr. Curtis A. Ray, one of the '416 Patent inventors, and Dr. Lebby have been deposed. *See generally* EX1017 (Transcript of Deposition of Mr. Curtis A. Ray); EX1018 (Transcript of Deposition of Dr. Michael Lebby).

2. I have reviewed the Board's Institution Decision, Patent Owner's Response, and Dr. Lebby's initial and supplemental declarations. In response to those materials, I offer the following additional remarks over what I said in my original declaration. I have also reviewed the other material cited herein (e.g., EX1017, EX1018, EX1019, and EX1020). I also continue to stand by my original declaration, and in particular, my opinion that the grounds presented in this proceeding render the Challenged Claims unpatentable.

II. CLAIM CONSTRUCTION ISSUES

3. I addressed claim construction in my original declaration. *See* EX1003, §VII(D)(iii). Following my original declaration, Patent Owner presented constructions for certain claim terms as part of its preliminary response in this IPR, including an opening declaration from Dr. Lebby (EX2003). I understand that Patent Owner maintains its constructions of those terms in its post-institution filings and Dr. Lebby's supplemental declaration.¹ I address those new claim construction arguments, which post-date my original declaration, in the following sections.

A. Preliminary Statement Regarding Claim Construction

4. While I disagree with Patent Owner and Dr. Lebby regarding their claim construction positions, my overall opinion regarding the obviousness of the '416 Patent would not change even if any of their constructions were adopted.

5. The added limitations of the claim constructions suggested by Patent Owner and Dr. Lebby are inconsistent with what a POSITA would understand. However, the added limitations would not make the claims non-obvious. There is nothing new or inventive about basic concepts like integration, alignment (including passive alignment and pre-alignment²), or using a ferrule or similar structure to hold an optical fiber in place. These were commonplace features of optical devices and systems at the time of filing. Indeed, and as noted throughout, not only were these obvious design features for a POSITA to consider and use, they were also already shown or suggested in the prior art that I have used in the various grounds. Moreover, the record indicates that the inventors utilized a pre-existing mechanical

¹ This is true except for the term "focusing means," where Patent Owner now seems to agree with my construction of "focusing means" for purposes of this proceeding.

² Dr. Lebby treats the terms "passive alignment" and "pre-alignment" similarly. *E.g.*, EX2049, ¶¶14, 24. Likewise, the '416 Patent refers to a pre-aligned connector, and also to the connector supporting passive alignment. '416 Patent, 1:38-41, 3:17-18. I use these terms consistently with how the 416 Patent and Dr. Lebby use them.

housing unit, including an integrated ferrule, that was available in the prior art. See below, ¶¶70-71.

6. For instance, Lemoff includes a housing to integrate the optical components together for the express purpose of alignment. Lemoff teaches that “[o]ptical signal emitter 200 also includes housing 230, which secures receptacle 260, optical imaging element 220 and substrate 140 and which holds them in alignment with each other.” EX1003, ¶258 (citing EX1006, 4:12-15 and FIG. 2); *see also id.*, p. 165. *See also* below, §III(A) (explaining that ground 1 renders the Challenged Claims obvious even under Patent Owner’s constructions), §III(B) (explaining that ground 2 renders the Challenged Claims obvious even under Patent Owner’s constructions), §III(C) (explaining that grounds 3 and 4 render the Challenged Claims obvious even under Patent Owner’s constructions), and §III(D) (explaining that ground 5 renders the Challenged Claims obvious even under Patent Owner’s constructions).

B. Whether the Preambles are Limiting

Patent Owner’s Proposed Construction	Petitioner’s Proposed Construction
The preamble is limiting.	The preamble is not limiting.

7. I understand that Dr. Lebby and Inneos take the position that the preambles are limiting. In particular, they contend that each of the following three separate parts are limiting:

1. “An optical combiner...comprising:”
2. “usable in data communication systems for multiplexing the outputs of a plurality of n lasers wherein each of said n outputs has a different output wavelength...”
3. “for transmission into and through a stopped single optical fiber”

See Response, pp. 14-15.

8. In the corresponding district court case, I provided a declaration explaining why it is my opinion that the preamble is not limiting. I stand by that testimony. However, it does not appear that it is necessary in this proceeding to discuss whether the preamble is limiting, except for the term “optical combiner.” As for the other parts of the preamble, which Inneos has separated into items 2 and 3 in the list above, neither Inneos nor Dr. Lebby seem to present arguments as to how the structure of the claimed device would be different if those parts of the preamble are limiting. Furthermore, I had provided evidence in my initial declaration of how each of the grounds of the Petition taught the preamble, to the extent that it was deemed limiting. *See, e.g.*, EX1003, ¶¶169, 220, 247, 289.³ Neither Inneos nor Dr. Lebby seem to have provided arguments that the grounds do not teach a device “[2] usable in data communication systems for multiplexing the outputs of a plurality of n lasers wherein each of said n outputs has a different output wavelength [3] for transmission into and through a stopped single optical fiber.” Instead, they argue (I believe incorrectly, as I explain below) that each of the devices shown in the prior art is not an “[1] optical combiner” as that term is used in the claims. To the extent they make arguments about “a stopped single optical fiber,” that is addressed elsewhere, and does not depend on the preamble being limiting, or the intended use of the device modifying its structure.

9. Therefore, since the dispute at issue appears to be limited to the “optical combiner” part of the preamble, that is what I address in the following section.

10. I also understand that the Board has indicated in its decision instituting an IPR that the term “optical combiner” should be given weight. In particular, the Board stated:

³ That is, my original declaration explained how prior art rendered the claims obvious even if the preambles were limiting.

Thus, the '416 patent's specification discloses an integrated, monolithic molded optical combiner, but also indicates that the optical combiner claimed in the challenged claims is not limited to such a structure but, rather, includes an optical combiner comprised of components that are integrated sufficiently to combine multiple optical inputs into an optical output focused onto a spot on an optical fiber but are not integrated in a pre-aligned unit. ***We give weight to the preamble claim term “optical combiner” because it is needed to specify the type of device being claimed.*** The parties disagree on the meaning of “optical combiner,” i.e., whether it is a device that combines multiple optical inputs into an output as argued by Petitioner, or is limited to light-multiplexing devices that comprise an integrated subassembly of optical components including an integrated, pre-aligned connector with a stop to hold a single fiber optic cable as argued by Patent Owner. ***During trial, the parties can address what the ordinary and customary meaning of the claim term “optical combiner” would be*** to one of ordinary skill in the art in view of “the words of the claims themselves, the remainder of the specification, the prosecution history, and extrinsic evidence concerning relevant scientific principles, the meaning of technical terms, and the state of the art.” Phillips, 415 F.3d at 1327 (quoting Innova, 381 F.3d at 1116).

Institution Decision (Paper 15), 8-9 (emphasis added).

11. Given the Board's determination that “optical combiner” should be given weight because it is needed to specify the type of device being claimed, and the Board's invitation to the parties to address what the ordinary and customary

meaning of the term would be to a POSITA, I address that question in the next section.

C. “Optical Combiner”

Patent Owner’s Proposed Construction	Petitioner’s Proposed Construction
“an integrated ⁴ subassembly of optical components for multiplexing light of different wavelengths, which includes a pre-aligned connector with a stop to hold the single fiber optical cable”	plain and ordinary meaning, which is “a device that combines multiple optical inputs into an output” (if preamble is limiting)

12. The term “optical combiner” appears in the preamble of the claims. Independent claims 1 and 7 both recite “[a]n optical combiner ... comprising” various elements. To the extent that it is determined that this particular portion of the preamble is a limitation of the claims, it should be given its plain and ordinary meaning.

1. Plain and Ordinary Meaning of *Optical Combiner*

13. The plain and ordinary meaning of an “optical combiner” is *a device that combines multiple optical inputs into an output*. This is, after all, the meaning of “combine,” and the point of a “combiner” is that it “combines” multiple inputs into an output. In the case of an *optical* combiner, it is multiple *optical* inputs that are combined into an output.

⁴ I understand that Patent Owner and Dr. Lebbby are using the term “integrated” to connote that the optical components are packaged together in some kind of housing to support passive alignment. *E.g.*, EX2049 ¶30 (explaining that the focusing lens is “integrated” where it is “supported in place by the housing”); *see also* Response, p. 16 (explaining that “integrated optical components” are “components that are integrated sufficiently to utilize passive alignment” and contrasting “a collection of discrete optical components” with a combiner that is a “package”).

14. As an example of how this term is used in the field, I note the following definition from the Photonics Dictionary: “An optical combiner, in the context of optics and display technologies, refers to a device or component that combines multiple optical signals or images into a single output.” *See* EX1019 (available at https://www.photonics.com/EDU/optical_combiner/d5774). This definition is in agreement with the one I have provided, and it is consistent generally with how the term is used in the relevant field, and how it was used by a POSITA as of the priority date of the '416 Patent.

15. This is also consistent with how the '416 Patent uses the term. '416 Patent, 3:19-21 (“This combiner device has the ability to combine individual light signals into an optical path 90 that can be directed towards an optical fiber (not shown for clarity).”); *id.*, 1:56-62 (“The prior art also includes an optical power combiner which utilizes collimators and a focusing lens to concentrate multiple output beams to increase power density; see Lee et al U.S. Pat. No. 5,377,287. The Lee et al device combines the outputs of, for example, 19 passive optical fibers arranged concentrically together with 19 collimating lenses and a Fresnel focusing lens.”).

16. I understand that Dr. Lebby has stated that Lee is an “optical power combiner,” which is shortened to “combiner” for convenience in the '416 Patent. EX2049, ¶25. He also states that he would refer to it as a “power fiber combiner.” EX2049, ¶25. It is unclear what distinction he is trying to draw here. Interestingly, Dr. Lebby does not seem to state that the “optical power combiner” of Lee is not an “optical combiner.” Indeed, an “optical power combiner” is a type of “optical combiner,” which is why the '416 Patent discusses Lee to begin with. Notably, Lee characterizes itself in this way: “When functioning as an optical combiner, the invention includes....” *See* US Patent No. 5,377,287 to Lee et al., Abstract, 2:35; *see also id.*, claims 8-14 (directed to “An optical combiner comprising...”). The

point is not that Lee is the claimed invention; the point is that the patent, when discussing Lee, uses the term combiner consistent with its plain meaning. It is my opinion that a POSITA, in view of the plain words of the term itself, the express statements in the '416 Patent, the phrasing used in Lee, and how the term is used generally in the field, would understand that the ordinary and customary meaning of "optical combiner" as used in the '416 Patent is "a device that combines multiple optical inputs into an output."

17. Dr. Lebby says that "a POSITA reading the specification would not think that the 'optical power combiner' [of Lee] defines what the claimed optical combiner is in any way." EX2049, ¶25. But that is irrelevant. A POSITA reading the specification would understand that the specification consistently uses the term "optical combiner" according to its ordinary, plain meaning. A POSITA reading the specification would understand that the "optical power combiner" of Lee, which the '416 Patent refers to as a "combiner" is indeed a type of "optical combiner."

18. Turning to the prosecution history, I am not aware of anything there indicating that the Applicant had a special definition or understanding of the term, or that the Applicant had disavowed the normal meaning of this term.

19. The Applicant amended the claims to require that "said n laser output beams have n different output wavelengths," and argued this requirement was "[i]n contrast to" a prior art reference. *See* EX1002, pp. 48-49 (amending claims), 51-52 (arguing over prior art cited by examiner but not relied on for a rejection) (Response of Oct. 5, 2005). In so doing, Applicant did not rely on the preamble, or the term "optical combiner" necessarily connoting output beams of different wavelengths (as in Patent Owner's construction). Notably, Applicant chose to amend the claim's body to require this.

20. Additionally, the Applicant submitted a number of drafts of the provisional patent application to support its swear-behind attempt. The first draft

appears at EX1002, pp. 63-73, the second draft (with redlining) appears at pp. 74-84, and the third draft appears at pp. 85-95. These drafts also are consistent with an understanding of an optical combiner as a device that combines multiple optical inputs into an output. For example, the first draft indicated that “this invention relates to an optical multiplexing device which spatially combines multi-wavelength light from a plurality of lasers into an optical fiber.” Dkt. 69-2, p. 64. The second draft added the sentence, “Most combiner devices are used as wavelength division multiplexers,” indicating that not all combiner devices are so used. *Id.*, p. 74. It also indicated that the multiplexing device described in the disclosure is a combiner. *Id.* (e.g., changing title and referring to “The combiner/WDM device described herein”). The third draft is also consistent with this. *Id.*, p. 85.

21. The understanding of “optical combiner” as a device that combines multiple optical inputs into an output is also consistent with how others in the field understand the term. For example, it is how the Lee reference described in the background of the ’416 Patent uses the term. *See* US Patent No. 5,377,287 to Lee et al., Abstract, 2:35; *see also id.*, claims 8-14 (directed to “An optical combiner comprising...”). And as I noted above, it is also consistent with the definition provided by the Photonics Dictionary.

22. I understand that Inneos is proposing to construe the term “optical combiner” as meaning “[i] an integrated subassembly of optical components [ii] for multiplexing light of different wavelengths, [iii] which includes an integrated, [iv] pre-aligned connector [v] with a stop to hold the single fiber optic cable” (bracketing added). This goes beyond how the term is ordinarily used in the art and in the ’416 Patent. As the term is used in the art and in the ’416 Patent, all an optical combiner must do is combine multiple optical inputs into an output. Each of the bracketed requirements above, in Inneos’s proposed construction, is not ordinarily understood as a requirement of an “optical combiner.”

23. For example, an optical combiner:

- (i) Does not need “an integrated subassembly of optical components.” Even the ’416 Patent acknowledges this, as it provides for one embodiment where the optical components are integrated into a plastic molded coupling module 16, and another embodiment where there is not a single coupling module that integrates the optical components. ’416 Patent, 3:39-44 (describing integration in first embodiment), 4:35-53 (describing separately molded collimating lenses and separately molded focusing lens in fourth embodiment). *See also id.*, 4:60-63 (“Monolithic Coupling Optics[.] Each optical coupling and redirection component is integrated within a single monolithic plastic-molded device in *most embodiments*.”) (emphasis added).
- (ii) Does not have to be “for multiplexing light of different wavelengths.” Indeed, the patent expressly acknowledges this. ’416 Patent, 2:5-7 (“[T]he Lee et al [optical] combiner does not multiplex n different wavelength channels[.]”).
- (iii) Does not need to “include[] an integrated ... connector.” As I explain (e.g., in paragraphs 24 and 32-33, and Section II(E) below), the ’416 Patent does not limit the connector to a particular embodiment.
- (iv) Does not need a connector that is “pre-aligned.” As I explain, the ’416 Patent says that passive alignment is optional. ’416 Patent, 4:58-59 (““Passive Alignment[.] All of the optical components within the multiplexer *could utilize* passive alignment mechanisms.”); *see also id.*, 2:15-16 (explaining that “[t]he invention includes *optional passive alignment pins* molded into the combiner”); Abstract (explaining that “mechanical alignment features” are only “[o]ne example” of “*various ways*” to construct one of the patent’s embodiments) (emphases added).

Therefore, pre-alignment (which is included by passive alignment, as Dr. Lebby notes, and as used by the '416 Patent) is also optional. *Cf.* EX2049, ¶14 (explaining that “[p]assive alignment includes the concept of pre-alignment”); '416 Patent, 1:38-41, 3:17-18.

- (v) Does not need the connector to have “a stop to hold the single fiber optic cable.” There are a variety of known connectors for fiber optic cables. Some of these may include a “stop” as illustrated by the fiber stop or seat 60 in the '416 Patent, and some may not, depending on their design. To the extent Inneos means only the fiber stop or seat 60 shown in the drawings of the patent for one of the embodiments, other ways of fixing a single fiber optic cable were well known, and applicable to optical combiners. See, e.g., Section II(E) below.

24. These limitations, which Inneos proposes as part of “optical combiner,” are imported from embodiments in the specification. They also differ from how the term “optical combiner” is customarily used and how it is used within the '416 Patent.

25. The '416 Patent describes optical combiners not encompassed by Inneos's proposed construction. At least some prior art optical combiners did not necessarily multiplex light of different wavelengths. '416 Patent, 2:5-7 (indicating that the Lee et al. optical combiner does not multiplex light of different wavelengths). Moreover, the claims elsewhere specify that “said n laser output beams have n different output wavelengths,” and also refer to “multiplexing,” which would not be necessary if the patent had considered these concepts necessarily encompassed by the term “optical combiner.” Additionally, while the patent explains that “[t]he combiner 10 in this [first] embodiment includes” a “fiber stop or seat 60 formed in a ferrule 80” and refers to a “pre-aligned connector,” other embodiments do not illustrate or describe such a stop or a pre-aligned connector.

See '416 Patent, 3:8-17 (first embodiment); *id.*, 4:35-52 (describing fourth embodiment without referring to a “stop” or a “pre-aligned connector”), FIGS. 9-10 (illustrating fourth embodiment without showing a “stop” or a “pre-aligned connector”). Even if the fourth embodiment *could* include a stop or a pre-aligned connector, nothing in the patent indicates it is *required*, let alone that the term “optical combiner” necessarily is limited to this structure. Furthermore, dependent claim 3 specifically refers to the integrated, “single, monolithic molded block” embodiment from the specification, indicating that independent claim 1 does not import this requirement. This shows that there is no redefinition of the term or clear and unmistakable disavowal of claim scope to incorporate the limitations proposed by Inneos and Dr. Lebby.

2. Dr. Lebby’s Arguments in His Original Declaration Do Not Support Inneos’s Construction

26. Even if “optical combiner” warranted a meaning more limiting than its plain meaning, which it does not, Inneos’s construction is not supported.

27. Dr. Lebby contends that “[a] POSITA reviewing the claims and the specification would understand that the term ‘optical combiner’ is limiting in more ways than the body of the claims as Patent Owner proposes.” EX2003, ¶59. I disagree for the reasons already stated above. Below, I specifically address the reasons he gives, and why they fail to support his position.

28. Dr. Lebby first argues that “the patent specification makes clear that the patented invention covers an integrated device with integrated optical components.” EX2003, ¶60. On the contrary, the patent specification makes clear that the embodiment it refers to as having “integrated” components is optional. The specification introduces the *first embodiment* as being “a combiner 10 comprised of a single piece plastic molded coupling module 16....” ’416 Patent, 3:32-38. The coupling module 16 is then described as being “*formed by integrating* an aspherical

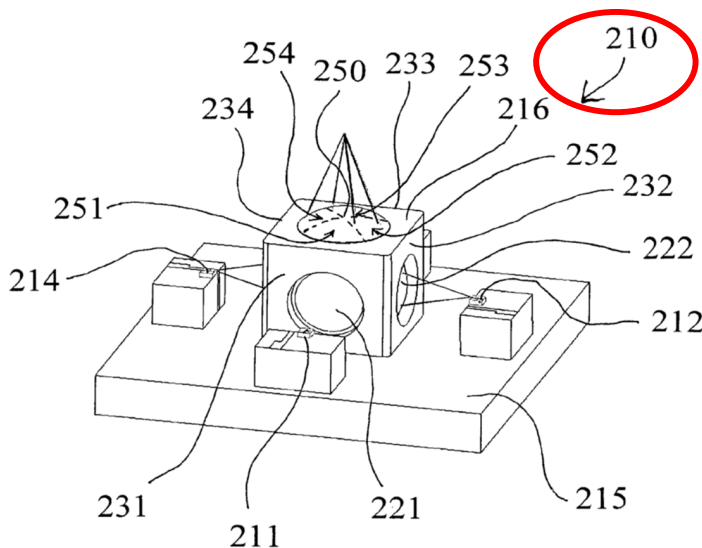
on-axis, offset collimating lens array 21–24, a redirectional prism 40, a focusing lens 30, a fiber optic ferrule 80, and mechanical pins 71–74 for alignment of the optical part 16 to an array of four lasers, all within a single part 16.” ’416 Patent, 3:39-44. Later in the specification, under the heading “Key Features,” and in connection with the single piece molded coupling module 16 of the first embodiment (described as “Monolithic Coupling Optics”), the specification explains that “[e]ach optical coupling and redirectional component is *integrated* within a single monolithic plastic-molded device *in most embodiments*.” That is, the integration of optical components is *optional*.

29. The specification *only ever discusses* the single piece molded coupling module 16 of the *first embodiment* as being formed by “*integrating*” different optical components. The fourth embodiment is described as “a two-piece molded module including a separately molded output lens 350 and separately molded collimating lenses 321–324.” ’416 Patent, 4:36-39. The specification explains that “[t]he focusing lens 350 is supported in its position shown in FIG. 10 by *means known to those skilled in the art* which are deleted in the interest of brevity.” ’416 Patent, 4:42-45. Separately, in the section titled Background and Brief Summary of the Invention, when referring to this two-piece, molded, fourth embodiment, the specification says that “[w]hile a single molded device can be constructed to create one embodiment of the present invention, two or more parts can be combined to accomplish the same function, and may be necessary to achieve certain environmental conditions.” ’416 Patent, 1:51-55.

30. In sum, the patent describes that optical components are “integrated within a single monolithic plastic-molded device in most embodiments” (such as the first embodiment), but that other embodiments (such as the fourth embodiment) include separately molded pieces that are supported in place by means known in the art and not otherwise described in the ’416 Patent.

31. Dr. Lebby also argues that the benefits of the '416 Patent “stem from an integrated optical combiner, and not discrete optical components that must be manually aligned....” EX2003, ¶62. As an initial matter, the '416 Patent does not assert that every embodiment must have every advantage listed in the patent, nor would a POSITA read it so limitingly. Indeed, two of the items Dr. Lebby notes (items *a* and *b* in his list) relate to passive alignment, which the '416 Patent explains is optional: “Passive Alignment[:] All of the optical components within the multiplexer ***could utilize*** passive alignment mechanisms.” EX2003, ¶62 (citing '416 Patent, 4:58-59). That the optical components “***could***” utilize passive alignment is permissive (not mandatory) language. Elsewhere the specification explains that “[t]he invention includes ***optional passive alignment pins*** molded into the combiner,” ('416 Patent, 2:15-16), further indicating that passive alignment is optional. The Abstract also explains that “mechanical alignment features” are only “[o]ne example” of “various ways” to construct one of the patent’s embodiments. The last item he notes (item *d* in his list) relates to the one-piece, monolithic-block embodiment which expressly notes that it applies to “***most embodiments***,” i.e., not to all embodiments. The third item he notes (item *c* in his list) simply states that it is cheap to manufacture because “[r]eplication procedures are extremely fast,” without further elaboration. A POSITA would understand, when the patent describes passive alignment using permissive language (e.g., “could,” “in most embodiments,” “optional”), that what is meant is that passive alignment is not required. That is, a POSITA would understand the '416 Patent to mean what it says—that passive alignment is something that “could” be utilized in some embodiments, even perhaps “most embodiments,” but that not all embodiments are so limited.

32. Inneos argues that each embodiment of the '416 Patent “utilizes integrated, optical components,” and that “FIGS. 1-9 show optical components that are formed from a single, monolithic molded block [*sic*] are all a single unit.” See Response, p.19. While certain *sub-parts* may be so formed, these embodiments do not all show *optical combiners* that are formed as integrated, single molded units. Thus, these arguments do not support Inneos’s overarching claim construction position for the term “optical combiner.” Comparing the first embodiment (FIGS. 1-4) with the third embodiment (FIGS. 7-9) is instructive. The combiner 10 shown in FIGS. 1-4 is a single, monolithic molded block that is a single unit. However, the combiner 210 shown in FIGS. 7-9 is not. Combiner 210 includes coupling optic 216 that is “formed of a single monolithic molded block.” '416 Patent, 3:67-4:2. But combiner 210 further includes four lasers 211-214. *Id.*, 3:62-63. As shown in the figures, the lasers 211-214 are separate components, and they are mounted (using an intermediate structure that is not numbered or described) onto yet another structure – support 215. *Id.*, 3:64-65. It would be clear to a POSITA that the lasers 211-214, their mounting structures (unlabeled), and support 215 are part of the combiner 210:



Id. at FIG. 7; *see also id.* at 3:61-4:9. In the third embodiment, while the coupling optic 216 (*i.e.*, a component of the combiner 210) is molded as a single block, the other components (the lasers 211-214, support 215, and intermediate mounting structures) that form the remainder of combiner 210 are not. At least the third embodiment, therefore, does not support Inneos's claim construction positions. I further note that Inneos's arguments with respect to the third embodiment appear to be in conflict with its arguments with respect to Kurita. In particular, Inneos and Dr. Lebby argue that Kurita is nothing like the '416 Patent because it allegedly uses "discrete parts" that are mounted on a support (e.g., an optical bench). *See, e.g.*, Response, pp. 4-5 and 34; EX1018 at 93:18-20, 294:7-295:11, 305:5-310:3.⁵ But this is what is shown for the optical combiner 210 of FIGS. 7-9 in the '416 Patent, which has various discrete components (e.g., coupling optic 216 and multiple individual lasers 211-214 with their intermediate structures) mounted on a support 215. *See* '416 Patent, 3:61-4:9. Thus, in my opinion, Inneos's arguments are internally inconsistent when considering what a POSITA would understand from the '416 Patent's third embodiment and the teachings of Kurita.

33. Dr. Lebby also points to "the integrated pre-aligned connector" as "[a]nother important structural feature of the optical combiner." EX2003, ¶¶64. According to him, because the only figures "that show a complete optical combiner include the integrated pre-aligned connector," this then shows that "a POSITA would understand the 'optical combiner' claimed in the '416 Patent includes an integrated pre-aligned connector." EX2003, ¶¶65-55. As noted in the paragraph

⁵ Dr. Lebby also emphasizes his view that Kurita and Lemoff use a "free space" design in order to distinguish the '416 Patent. *See, e.g.*, EX1018 at 98:5-20, 101:3-102:12 ("Free space means the light travels through air. It doesn't go through an integrated subassembly as the '416 teaches. So it's completely different."), 309:12-312:5. I note that the third embodiment plainly shows the laser outputs traveling in "free space" between their mounts on the support 215 and the coupling optics 216. '416 Patent, FIGS. 7-9.

above, the patent explains that passive alignment is optional. Moreover, the specification also explains that the fiber optic connector is merely “[o]ne example” of “*various ways*” to make the *single-part* optical coupling module. See ’416 Patent, Abstract (“The single-part optical coupling module can be constructed in various ways to achieve the desired configuration. One example is a single plastic-injection molded part, containing mechanical alignment features, an array of collimating lenses, and a focusing lens housed within a fiber optic connector ferrule.”). Moreover, in connection with the multi-part embodiment (the fourth embodiment), there is no description of an integrated pre-aligned connector at all. Given that the connector is described as one example of various ways to make the single-part embodiment, and is not even mentioned with respect to the multi-part embodiment, a POSITA would not understand the specification to indicate that the term “optical combiner” as used in the ’416 Patent claims must include an integrated, pre-aligned connector. Again, to be clear, the term “optical combiner” does not ordinarily connote an integrated, pre-aligned connector. A POSITA would not understand it to be re-defined here based on this description.

34. Finally, Dr. Lebby points to a “stop” as “[a]nother structural feature of the optical combiner.” EX2003, ¶¶67. Pointing out the alignment functions that it performs, and the supposed inclusion of a stop in all embodiments, Dr. Lebby concludes that a stop is part of the term “optical combiner” as claimed. EX2003, ¶¶67-70. Because passive alignment is an optional feature, the stop that supports passive alignment is also optional. Moreover, the Abstract, which notes that “a fiber optic connector ferrule” is “[o]ne example” of “various ways” to construct the single-part optical coupling modules (itself one of multiple embodiments), does not even mention a stop. The only place that the stop is directly mentioned is in describing the fiber stop or seat 60 of the first embodiment. See ’416 Patent, 3:14, 3:24 (first embodiment). It is mentioned indirectly, through the term “stopped single

optical fiber” and “stopped fiber optic” with respect to the third embodiment. *See* ’416 Patent, 4:24, 4:26 (third embodiment). Given that passive alignment is an optional feature, and that the fiber stop or seat 60 is directly mentioned only once in the specification in the context of one embodiment, a POSITA would not consider it to be encompassed by the term “optical combiner.” This is particularly true given that the ordinary meaning of “optical combiner” does not include a stop.

**3. Dr. Lebby’s Supplemental Arguments in His
Supplemental Declaration Also Do Not Support Inneos’s
Construction**

35. In his supplemental declaration, Dr. Lebby disagrees with my understanding of the plain meaning of “optical combiner” as being a device that combines multiple optical inputs into an output. EX2049, ¶18. He says that he “disagree[s] with the notion that there is a plain and ordinary meaning for optical combiner in general.” EX2049, ¶38. Accordingly, Dr. Lebby never offers what he thinks the plain and ordinary meaning is. Instead, he explains that “there is a clear disavowal of scope to narrow the patent to the particular optical combiner the inventors of the ’416 Patent conceived of.” EX2049, ¶38. I disagree. Dr. Lebby relies on his view of pre-alignment being essential to the invention. But as I have explained above, the patent explains that this alignment is optional. For example, the patent indicates only that the optical components “*could*” (but need not) “utilize passive alignment mechanisms.” ’416 Patent, 4:48-49 (emphasis added). The patent also expressly states those mechanisms are optional: “The invention includes optional passive alignment pins molded into the combiner.” ’416 Patent, 2:15-16. And the Abstract makes clear that “mechanical alignment features” are only “[o]ne example” of “various ways” to make the single-part embodiment, one of multiple embodiments in the patent. ’416 Patent, Abstract.

36. Moreover, even if passive alignment is important to at least some embodiments of the invention, the patent does not use the term “optical combiner” in an idiosyncratic way. Rather, it uses the term consistent with its plain and ordinary meaning, as I have explained above. Importantly, the prosecution history indicates the body of the claim was amended to add elements that Inneos now contends are covered by the term “optical combiner” already.⁶ All of this indicates to a POSITA that the term “optical combiner,” to the extent it is limiting, would be given its plain and ordinary meaning as I have articulated here, i.e., “*a device that combines multiple optical inputs into an output.*”

37. Summarizing his position on the specification, Dr. Lebby states that:

It leaves a POSITA with no doubt what the inventors conceived of and claimed—“The present invention provides, for the first time, an inexpensive, injection molded, one-piece optical combiner capable of combining, separately collimating and focusing the output of multiple lasers into a single optical fiber with a uniform, high coupling efficiency,” EX1001 2:11-15, which at times can be a “two piece combiner,” id. 2:17.

EX2049, ¶27. But if this sentence is supposedly definitional, as Dr. Lebby contends, he does not explain why “*injection molded*” (part of the supposedly definitional quote above) is not part of the claimed “optical combiner.” In distinguishing the background art, the ’416 Patent further says that “[t]he combiner/WDM device described herein utilizes *plastic-mold injection* to create a compact device capable of combining multiple optical signals into a single optical fiber, and which avoids the use of dielectric filters and the use of expensive waveguides.” ’416 Patent, 1:46-51. Dr. Lebby elsewhere relies on this statement for the proposition that “the

⁶ See above, ¶19 (noting that “said n laser output beams have n different output wavelengths” was added to the claim body, and citing EX1002, pp. 48-49).

inventors of the '416 Patent invented a way to passively align the fiber with the optical components using a package so as to eliminate 'dielectric filters requiring alignment or expensive waveguides.'" EX2049, ¶23 (quoting '416 Patent, 1:46-51). Indeed, other parts of the specification further re-iterate the importance of *plastic injection molding*. E.g., '416 Patent, Abstract, 1:51-55, 2:11-17, 3:32-44, 4:35-43, 4:60-63. Importantly, neither Dr. Lebby nor Inneos asserts that this part of the specification would be part of the claimed optical combiner. But neither do they provide a principled way to suggest why a POSITA would understand plastic injection molding not to be part of the optical combiner, while at the same time importing other parts of the specification into their definition of optical combiner.

38. In disputing that the plain and ordinary meaning of "optical combiner" should apply, Dr. Lebby also notes that "[n]o embodiment [of the '416 Patent] consists of discrete components," arguing that because Petitioner's construction would include "discrete components" it therefore "conflicts with the specification." EX2049, ¶28. The crux of Dr. Lebby's argument is that when you place components on a lab workbench, they are "discrete components" that are not integrated, but when you have some housing that holds the components in place they are then "pre-aligned" and "integrated." See, e.g., EX2049, ¶¶6-14. But the specification does not support Dr. Lebby's distinction, as I explain in the paragraph immediately below.

39. The fourth embodiment, shown for example in FIGS. 10 and 11, illustrates "a separately molded output lens 350 and separately molded collimating lenses 321-324." '416 Patent, 4:35-39, FIGS. 10-11. The patent also explains it is not limited to two separately molded lenses, but that "two *or more* parts can be combined" in some embodiments. '416 Patent, 1:51-55 (emphasis added). Even the collimating lenses need not be molded together in a single block, as the patent explains it is "preferable," but not required. '416 Patent, 4:39-43 ("The collimating lenses 321-324 are *preferably* molded into a single but separate monolithic block of

molded material so that the combiner 310 includes two separate molded optics.”); *see also id.*, 1:51-55 (noting that “two **or more** parts can be combined to accomplish the same function” as a “single molded device”). As for how these different parts are “combined,” the patent is largely silent: “The focusing lens 350 is supported in its position shown in FIG. 10 by means known to those skilled in the art which are deleted in the interest of brevity.” ’416 Patent, 4:42-45. In other words, the combination of parts here is not new or inventive.⁷ It was so well known in the art how to combine parts, that no description of it was deemed necessary. Nor does the patent limit the means that are available from the prior art – it says it may be done by “means known to those skilled in the art.” Thus, supporting focusing lens 350 in the fourth embodiment by means of a bench and clamp (means for supporting known to those skill in the art) would be included in the description of this embodiment. It is, and was as of the priority date of the ’416 Patent, a means known to those skilled in the art for supporting optical components.

40. In sum, the fourth embodiment illustrates that the patent does not require pre-alignment or integration. The patent frequently refers to those features as optional, and uses permissive language to describe them. And when introducing the fourth embodiment, the patent makes clear that any means known to those in the art for supporting separate components are available. A POSITA would therefore not consider that “there is a clear disavowal of scope to narrow the patent” as Dr. Lebby asserted. *See* EX2049, ¶38.

⁷ I also explain below that, even under Inneos’s construction, the claims are obvious. For example, because the means for combining the optical parts is admittedly known in the art, even assuming any particular ground lacked the type of integration Inneos argues is required, it would have been obvious to add it based on the patent’s admitted prior art.

4. Inneos's Remaining Arguments Also Do Not Support Inneos's Construction

41. Inneos's Response to Institution of IPR also points to several things in the specification to further support its construction. For example, Inneos argues that "the specification makes clear that the inventors of the '416 Patent were working to solve a particular problem with existing WDM devices typically designed using dielectric filters requiring alignment or expensive waveguides." Response, p. 17. I note that dependent claims 6 and 9 are directed specifically to the requirement that "said optical combiner does not require the use of dielectric filters or waveguides." See '416 Patent claims 6 and 9. Thus, while I agree that creating an optical combiner that does not require the use of dielectric filters or waveguides was one stated object of the '416 Patent, and is reflected in some dependent claims, I do not agree that it is required by all embodiments or by the independent claims. For example, the inclusion of that requirement in dependent claims 6 and 9 indicates that the independent claims do not require it. Also, the patent describes not using dielectric filters or waveguides as "[o]ne of the key objects" out of a list of other objects, and does not indicate that every embodiment must include every object. '416 Patent, 2:21-26. The inclusion of other objects, and the multiple embodiments disclosed, including both one-piece and two-or-more piece devices, all suggest that the term "optical combiner" is not limited beyond its plain and ordinary meaning.

42. Next, Inneos points to a supposed "definition" of "the invention," citing to these two passages:

While a single molded device can be constructed to create one embodiment of the present invention, two or more parts can be combined to accomplish the same function, and may be necessary to achieve certain environmental conditions.

'416 Patent, 1:51-55.

The present invention provides, for the first time, an inexpensive, injection molded, one piece optical combiner capable of combining, separately collimating and focusing the output of multiple lasers into a single optical fiber with a uniform, high coupling efficiency. The invention includes optional passive alignment pins molded into the combiner. An optional two piece combiner is also provided for use in certain environments. For example, the invention in one embodiment combines the output of four lasers arranged in a two dimensional, two by two array into a single fiber.

'416 Patent, 2:11-20. *See* Response, pp. 17-18.

43. These passages use permissive language. They introduce “a single molded device” as “one embodiment of the present invention” and also indicate that “two or more parts can be combined” in other embodiments. '416 Patent, 1:51-55. Also, the fact that “[t]he present invention provides” for a “one piece optical combiner” is permissive, open-ended language. This is reflected in the fact that “[a]n optional two piece combiner is also provided for” in other embodiments. '416 Patent, 2:11-20. The one- and two-piece embodiments referred to here are not even exhaustive, as the earlier passage makes clear that “two *or more* parts can be combined” in some embodiments. '416 Patent, 1:51-55 (emphasis added). In short, these passages are not definitional, and to the extent they might be, they do not define the invention as being limited as Inneos proposed to construe “optical combiner.”

44. Third, Inneos argues that “the specification details the benefits of the '416 Patent's invention that originate from the components being integrated rather than discrete optical components.” Response, p. 19. Inneos relies on the benefits of passive alignment, and based on this argues that “a POSITA would understand that the claimed optical combiner components are integrated, not discrete components.”

Response, p. 19. As I have explained, the patent indicates that passive alignment is optional.

45. I also understand that Inneos has argued, with respect to my construction of the plain meaning of “optical combiner” that “[t]his purposed [sic] construction is simply made-up and not tied to the specification of the ’416 Patent.” Response, p. 23. As context, I note again that the plain and ordinary meaning of an “optical combiner” is *a device that combines multiple optical inputs into an output*. As I explained above, this is the meaning of “combine,” and the point of a “combiner” is that it “combines” multiple inputs into an output. In the case of an *optical* combiner, it is multiple *optical* inputs that are combined into an output. This is how the term is used in the art, and how the ’416 Patent itself uses the term, as I have also explained above. Indeed, the definition is consistent with, and substantially similar to, the one from the Photonics Dictionary that I noted earlier. In short, it is not a “made-up” construction, it is based on the term itself, and reflects how the term is used by persons of ordinary skill in the art, as well as in the ’416 Patent. See, for example, the preceding paragraphs in this section (Section II(C)).

46. In conclusion, my construction of the term “optical combiner” properly reflects its plain and ordinary meaning. Inneos, while acknowledging that it is not advancing a plain and ordinary meaning, fails to support its construction premised on the mistaken belief that the ’416 Patent re-defines the term or otherwise clearly disavows claim scope.

D. “Focusing Means”

47. I understand that, for purposes of this proceeding, Inneos now agrees that the corresponding structure of the focusing means is a focusing lens. See Response, p. 26.

E. “stopped” / “stopped single optical fiber”

Patent Owner’s Proposed Construction	Petitioner’s Proposed Construction
“Abutting a physical structure that prevents the fiber from being inserted further into the optical combiner” // “A single optical fiber that has been inserted into the optical combiner until it abuts a physical structure that prevents the fiber from being inserted further into the optical combiner”	stopped means “fixed”

48. I understand that the Board addressed the term “stopped” in its Institution Decision:

The ’416 patent’s specification discloses that the focusing lens (30) focuses light “onto a spot at which a single optical fiber (not shown) is stopped by fiber stop or seat 60 formed in ferrule 80” (Ex. 1001, 3:11–15), and “[t]he integrated ferrule 80 enables one to place an output fiber optic cable into the pre-aligned connector” (id. at 3:17–18). The ’416 patent’s Figure 1 appears to indicate that the fiber optic cable’s connector can be inserted into the integrated ferrule (80) until it reaches the fiber stop or seat (60). The ’416 patent’s specification, however, does not appear to limit the claim term “stopped single optical fiber” to a fiber having a connector that abuts against a fiber stop or seat but, rather, appears to include a fiber that is fixed in other ways that enable the collimated output beam to be focused onto a single spot on the optical fiber. In our analysis of Grounds 1–4 we construe the term “stopped single optical fiber” as

having the broader of the above two meanings. Regarding Ground 5, even if we give the term “stopped single optical fiber” the narrower meaning argued by Patent Owner, such a structure (SC connector) appears to be disclosed by Bhandarkar (Ex. 1013 ¶ 41). Institution Decision (Paper 15), p. 11. Accordingly, the Board indicated that “[d]uring trial the parties can further address the meaning of “stopped single optical fiber” and address methods for stopping an optical fiber.” *Id.*

1. Meaning of “Stopped” is “Fixed”

49. I agree with the Board’s conclusion that “[t]he ’416 patent’s specification, however, does not appear to limit the claim term ‘stopped single optical fiber’ to a fiber having a connector that abuts against a fiber stop or seat but, rather, appears to include a fiber that is fixed in other ways that enable the collimated output beam to be focused onto a single spot on the optical fiber.” *Id.* Below, I address the arguments presented by Dr. Lebby and Inneos.

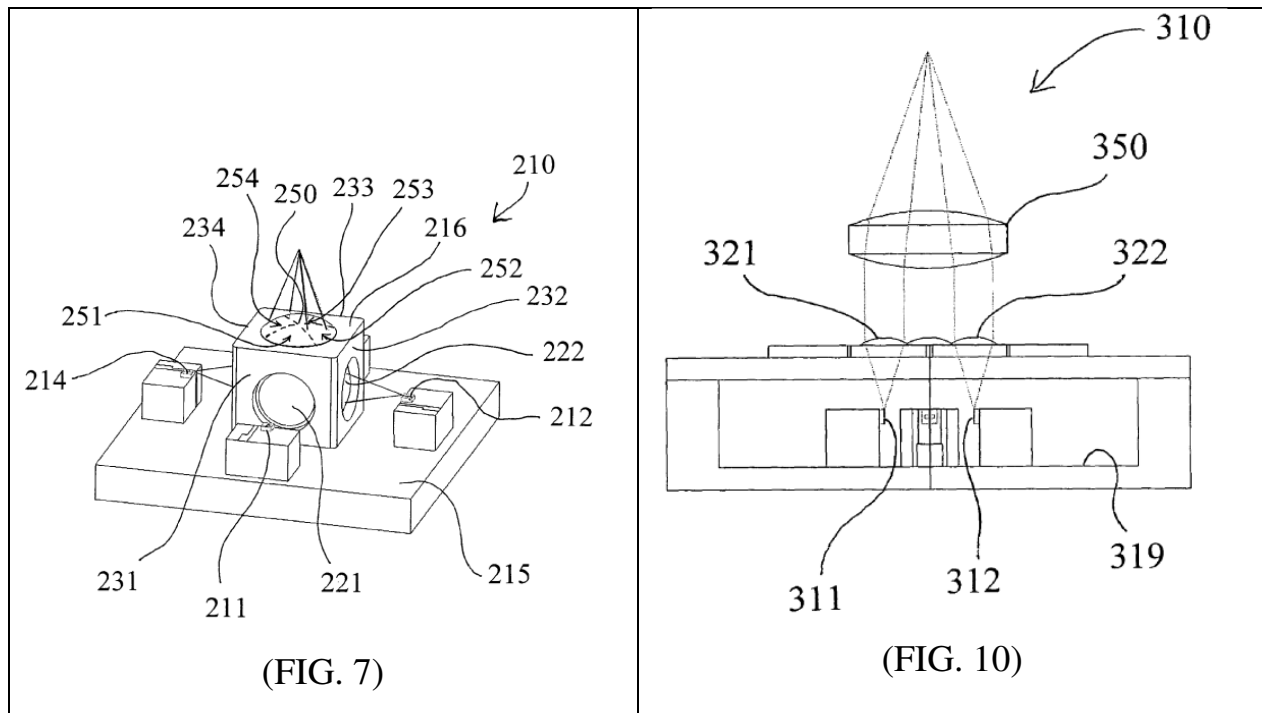
50. I explained in my original declaration accompanying the Petition that a POSITA would have understood the term “stopped” to mean “fixed” in the context of the ’416 Patent claims. EX1003, §VII(D)(iii)(2). I explained, for example, that “it would be clear to a POSITA that the single optical fiber would need to be fixed in place”:

An optical fiber being spatially fixed was well known to be important in optical systems since light needed to be coupled into a very small waveguiding fiber core, and any non-negligible movement could cause significant optical power loss and performance degradation. A “stopped” single optical fiber would not be free or otherwise able to significantly move about.

EX1003, ¶118.

51. By being fixed in this way, I meant that the single optical fiber would not be free or otherwise able to significantly move about *with respect to the optical combiner*. By being fixed, relative to the optical combiner, the light may be coupled into the small waveguiding fiber core, as I had noted in the paragraph quoted above. I offer this clarification to address Dr. Lebby's comment that "it is possible for the fiber to be inserted into the optical combiner without actually being fixed spatially if the package itself is not secured." EX2049, ¶44. I note that the claimed combiner, with an optical fiber fixed relative to it, may be used, for example, in the context of a laptop computer or any other portable device. Of course, if a person picks up the laptop and walks with it, or moves a portable device, the combiner itself may move quite substantially. But the single optical fiber would still be fixed relative to the combiner, even if the combiner itself is moving, and the combiner-fiber combination would still operate properly. None of this affects the analysis I provided for why a POSITA would understand a stopped single optical fiber to be fixed.

52. I also note that the stop or seat 60 is illustrated with respect to the first embodiment (FIGS. 1-4), but the third and fourth embodiments (FIGS. 7-11) do not show a stop or seat 60, or otherwise dictate how the optical fiber is fixed in place. For example, FIGS. 7 and 10 are reproduced below, and *do not show* a stop or seat 60:



What matters is that the light beams are focused to a single spot, not that the connector in which an optical fiber is inserted has any particular form. The connector described with respect to the first embodiment could be used here, but so could other connectors known in the art. The '416 Patent does not limit the connector that may be used in these embodiments to achieve a “stopped single optical fiber.”

2. Dr. Lebby’s Arguments Do Not Support Inneos’s Construction

53. Dr. Lebby argues that “stopped” must refer to the specific example of a stop or seat 60 within ferrule 80 as described with respect to only the first embodiment. EX2003, ¶101. I agree that the stop or seat 60 within ferrule 80 may be used to stop a single optical fiber when the single optical fiber is inserted into the ferrule 80. The seat 60 functions as a stop in the example of the first embodiment because it causes the single optical fiber inserted into the ferrule 80 to become stopped. But it is not the only way the optical fiber may become stopped. Dr. Lebby

acknowledges examples I gave in the district court litigation. EX2049, ¶25 (“In the District Court declaration, [Dr. Willner] discussed methods for semiconductor etching might be used to fix a fiber.”). Examples of such other methods of stopping or fixing the optical fiber include clamping and v-grooves, among other possibilities.

54. Dr. Lebby argues that “[n]o other methods are disclosed in the ’416 Patent’s specification for stopping an optical fiber.” EX2049, ¶41. But a POSITA reading the specification would understand that there are other methods of stopping an optical fiber. As I just explained, clamping and v-grooves, among other possibilities, are examples. A POSITA would understand that the seat 60 is described only with respect to the first embodiment, that it is one example, and that the patent itself is clear that the specification’s description “is not intended to be exhaustive or to limit the invention to the precise form disclosed.” ’416 Patent, 5:12-14.

55. Dr. Lebby also draws a distinction between “fixing” a fiber and “passively aligning or pre-aligning the fiber.” EX2049, ¶43. Fixing it, he argues, could be accomplished by bolting a fiber onto an optical table, but that a POSITA would not understand fixing a fiber in this way as being a “stopped optical fiber.” EX2049, ¶43. I disagree. As an initial matter, as I noted in connection with the “optical combiner” term above, passive alignment and pre-aligning the fiber are optional features not mandated by the claims. A “stopped” optical fiber may be passively aligned or pre-aligned, but it need not be. This seems to be the only basis on which Dr. Lebby argues that a POSITA would not consider a fiber mounted on an optical table to be “stopped.” Such a fiber would be fixed, its movement curtailed, such that it would be caused to halt, and its progress or motion would be arrested. This corresponds with what Inneos argues “stopped” means. *Cf.* Response, p. 30 (Inneos relying on a dictionary definition of “stopped” as meaning “[t]o arrest the progress or motion of; cause to halt” (citing EX2004 p. 1161)).

56. Dr. Lebby also argues that I “discussed methods for semiconductor etching might be used to fix a fiber” in a district court declaration, which he called “a fragile and difficult procedure as the etching needs to be the same every time.” EX2049, ¶45. Accordingly, he said, “[a] POSITA would not rely on these references to construe the meaning of ‘stopped single optical fiber’ as nothing of the sort is disclosed in the specification of the ’416 Patent, and they require semiconductor etching and manual alignment.” EX2049, ¶45. As I explained, clamping and v-grooves are alternate methods to fixing a fiber. A POSITA would have understood them as such, and would have been able to apply them to the technology at issue in the ’416 Patent, notwithstanding Dr. Lebby’s argument that they are a fragile and difficult procedure requiring etching. It would have required nothing more than ordinary skill to do so. Indeed, both these techniques were ubiquitous, and would have been well known to a POSITA and within a POSITA’s skill. Moreover, although not literally within the text of the ’416 Patent, a POSITA would have known that clamping and v-grooves, among other possible methods for fixing a fiber, would have been available and applicable to the stopped optical fiber disclosed in the ’416 Patent.

57. Dr. Lebby also argues that “a POSITA reading the specification would understand that the combiners do include a stop with an integrated pre-aligned connector based on a complete reading of the specification that defines the invention.” EX2049, ¶46; *see also id.*, ¶47-51 (walking through different embodiments). The fact is this: only the first embodiment describes the fiber stop or seat 60. Dr. Lebby contends that the stop is visible in FIG. 6 of the second embodiment, but not described, and that the third embodiment describes using a “stopped single fiber optic,” without providing additional detail. *Id.* This leaves the fourth embodiment, where he acknowledges that a stop is not shown or described. *Id.*, ¶49. But Dr. Lebby concludes that “[a] POSITA would look to other disclosures

in the specification regarding what the invention is to understand that the optical combiner includes a stop and a pre-aligned connector.” *Id.*, ¶51.

58. As I have noted, the specification generally states that it “is not intended to be exhaustive or to limit the invention to the precise form disclosed.” ’416 Patent, 5:12-14. The features of pre-alignment are optional, as I have also noted. Moreover, a POSITA would understand that stopped optical fibers may be achieved by means other than the specific seat 60 described in the first embodiment. Given this, I disagree with Dr. Lebby that a POSITA would assume that the same seat 60 must be included, without change or modification, in every single embodiment of the invention. Such a conclusion ignores the permissive, open-ended nature of the disclosure, and the understanding of a POSITA regarding how a single optical fiber may be stopped in view of that disclosure.

59. For the reasons I have explained, I do not believe that a POSITA would understand the term “stopped” to mean what Patent Owner proposes as its construction. Instead, a POSITA would understand “stopped” to mean “fixed.”

III. THE GROUNDS

60. I provided my opinion on the unpatentability of the challenged claims in my original declaration. *See* EX1003, §VIII. Here, I respond to the positions of Dr. Lebby and Inneos, and to the Board’s Institution Decision where appropriate.

A. Ground 1: Kurita

61. With respect to Kurita, I understand that the Board has said:

On this record, we disagree with Patent Owner’s arguments. Kurita explains that Figure 3 is “a conceptual configuration diagram for the element in the third example according to the present invention,” the “element” being a “light connection element” (Ex. 1004 ¶¶ 10, 15). On this record, we do not view the components of the light connection device in Figure 3 as free floating; rather, it appears that

Kurita's lens (30) cannot be free floating because it must be fixed relative to the collimating lens array (20) and the optical fiber (40) to enable the light from the surface-emitting lasers (11) to become multiplexed and integrated to be transmitted through the optical fiber (40) (Ex. 1004 ¶¶ 10, 11, 15). Thus, the light source array (10A), the collimating lens array (20), the focusing lens (30), and the optical fiber (40) appear to be integrated as needed to enable the light connection device to function properly.

...

Ground 1 is based upon obviousness, not anticipation. Patent Owner's argument is not well taken because it does not address what Kurita would have suggested to one of ordinary skill in the art regarding fixing Kurita's single optical fiber (40) in place.

...

On this record, we are persuaded by Petitioner's contention that Kurita teaches light passing through a 2x2 array of collimating lenses (21) "to a separate radial portion (or sector) of the lens 30" (Pet. 23; Ex. 1003 ¶ 182). On this record, we also find persuasive Petitioner's contention that it would have been obvious that "the lens portions 21 are aligned with the center axis of the focusing lens 30 in such a way that the collimated light passes through separate radial sectors because doing so would have resulted in better coupling efficiency" (Pet. 23 (citing Ex. 1003 ¶¶ 183–184)).

...

Based upon the above-discussed evidence and arguments, we conclude that Petitioner establishes a reasonable likelihood that the

optical combiner claimed in claims 1, 2, 6, 7, and 9 would have been obvious to one of ordinary skill in the art over Kurita.

Institution Decision (Paper 15), pp. 13-14.

62. In sum, the Board appears to reject Patent Owner's arguments regarding Ground 1. I agree with the Board's analysis. Even so, I address Patent Owner's arguments below, based on Dr. Lebby's original declaration (EX2003), his supplemental declaration (EX2049), and Inneos's response to the Institution Decision (Response). As I noted above, I also have considered Dr. Lebby's deposition testimony, portions of which I refer to below.

63. Dr. Lebby argues that "Kurita discloses a free space, conceptual design that must be manually set up and aligned." EX2003, ¶113. He also argues that "Kurita does not disclose an integrated, compact optical combiner that performs multiplexing." EX2003, ¶114. Later, Dr. Lebby acknowledges that "Kurita discloses an optical arrangement to multiplex multiple laser signals onto a single fiber," EX2003, ¶115. Therefore, I take his comment here to mean that Kurita is not integrated or compact. He further states that the "components [of Kurita] are not integrated into a subassembly." EX2003, ¶115. He also argues it would be expensive because it "would require manual alignment to deploy the system." EX2003, ¶116. This is the crux of his criticism of this ground—Kurita is not integrated, and requires manual alignment. Dr. Lebby further advances this position in his supplemental declaration. There, he argues that "[a] POSITA would understand how to reproduce the setup taught in Kurita using a traditional optical bench." EX2049, ¶57 (further noting that the optical bench results in manual alignment). During deposition, Dr. Lebby further emphasized that his position that Kurita is manually aligned and not integrated is based on his position that Kurita would be implemented on an optical bench. *E.g.*, EX1018, 83:17-21, 89:15-22.

64. As an initial matter, I have explained above, in context of claim construction, that neither integration nor passive alignment are claim requirements. Accordingly, Dr. Lebby's point, even if it were valid, is incorrect.

65. Moreover, Dr. Lebby takes an unrealistic view of Kurita that is inconsistent with how a POSITA would understand the reference. I agree with the Board in the Institution Decision, where it stated that:

On this record, we do not view the components of the light connection device in Figure 3 as free floating; rather, it appears that Kurita's lens (30) cannot be free floating because it must be fixed relative to the collimating lens array (20) and the optical fiber (40) to enable the light from the surface-emitting lasers (11) to become multiplexed and integrated to be transmitted through the optical fiber (40) (Ex. 1004 ¶¶ 10, 11, 15). Thus, the light source array (10A), the collimating lens array (20), the focusing lens (30), and the optical fiber (40) appear to be integrated as needed to enable the light connection device to function properly.

Institution Decision (Paper 15), p. 13.

66. While a POSITA may look at FIG. 3 of Kurita and understand how to implement the conceptual diagram on an optical bench, there is no reason why a POSITA would not also understand how to implement the conceptual diagram in a packaged, integrated device (e.g., with a housing). I note that Dr. Lebby never argues otherwise—he merely states that the optical bench is *one way* to do it.⁸ A POSITA reading Kurita would not understand it to be limited solely to an experimental setting on an optical bench. Rather, a POSITA would understand that

⁸ See EX1018, 305:5-307:19 (e.g., “[C]ould there be other ways to do that [i.e., other than ‘use an optical bench to realize what Kurita is teaching’]? I’m sure there are.”); *id.*, (e.g., “And so there could be other ways to implement Kurita.”); *id.*, (e.g., “I certainly didn’t come into this deposition to think about the other ways.”).

Kurita had invented a practical device, and would have understood how to implement it outside of a laboratory. Indeed, an optical bench would not even be the first thought of a POSITA—a POSITA would have been much more likely to implement Kurita in a practical device, with a housing, using integrated, pre-aligned components. For example, Kurita states that “[h]ere, each of the above-mentioned examples illustrates one example of the present invention, and it is *possible to apply the present invention* as light connection elements or light connection devices *in various optical devices* that would require a composition that would allow plural lights to be multiplexed to be entered into a single optical fiber.” EX1004, ¶[0018] (emphasis added). A POSITA would know given the disclosure of Kurita how to “apply the present invention ... in various optical devices,” and in particular, would know that housing of the optical components would be advantageous in a commercially viable product. It is contrary to common sense to believe that a POSITA would read Kurita as limited to experimental setups and not real-world applications with a housing. This is confirmed by Kurita itself, as explained below.

67. Kurita states that “[t]he present invention relates to light connection elements and light connection devices for inputting laser lights into and outputting them out of optical fibers that are used with multistage switching networks inside optical computers and switchboards, and with optical communications, laser processing, etc.” EX1004, ¶[0001].⁹ A POSITA would also know given the disclosure of Kurita how to use the invention “inside optical computers and switchboards, and with optical communications, laser processing, etc.,” and in particular, would know that housing of the optical components would be needed in

⁹ To be clear, this list is expansive, and includes “optical communications, laser processing, etc.” as possible applications in addition to “multistage switching networks inside optical computers and switchboards.” Kurita is not limited to optical computers. Even if it were, a POSITA would still not be limited to implementing it on a lab workbench as Patent Owner appears to argue.

a commercially viable product. This housing would result in the components being integrated. Accordingly, a POSITA would understand that Kurita does teach an integrated device where the optical components are housed, or packaged, together. Additionally, a POSITA would also have understood that pre-alignment of the optical components would have been useful in the disclosed applications of Kurita (e.g., because it is typically less costly and labor intensive compared to active alignment, and can be valuable in commercial implementations), and would have been available as an option to choose from when implementing the device of Kurita. *E.g.*, EX1018, 32:7-33:5 (acknowledging “passive alignment” as a “tool[] in the toolbox for engineers” when designing optical systems); 39:7-40:19 (acknowledging that passive alignment was known to have advantages); 83:13-15 (“And if you want to have something practical for commercial applications, you want to use passive alignment.”); 83:16-22 (“Passive alignment, as I’ve indicated in paragraph 14 of my second declaration, means there is enough tolerance to get good alignment without the need to perform active alignment with a light that is being shone through an optical part of the system. So it actually saves a lot of time and it saves a lot of cost.”); 85:1-4 (“And you want to, as much as possible, avoid the optical bench scenarios like I’ve shown in the image in paragraph 12, which is opposing expert’s optical lab.”). The housing that a POSITA would have understood to be utilized in a commercially viable product, for example, could also be utilized to provide for passive alignment of the optical components.

68. Moreover, even if that were not the case, it would have been obvious for a POSITA to implement the device of Kurita in a packaged, integrated device, utilizing passive alignment. It would have been obvious for numerous reasons. It was well known how to package components together, and it was also well known that packaging components together allowed them to be used advantageously in a variety of settings. A POSITA would have been motivated to use Kurita’s device in

practical applications, not just in a laboratory setting on an optical bench as Patent Owner conjectures. This is supported, for example, by many of my statements in the paragraph above, such as when I noted that a POSITA would know that passive alignment is typically less costly and labor intensive compared to active alignment, and can be valuable in commercial implementations, and would further know that using a packaged, integrated device is how passive alignment can be achieved. This would motivate a POSITA to implement the device of Kurita in a packaged, integrated device, utilizing passive alignment. This is further confirmed by the packaged, integrated devices taught in both Lemoff and Bhandarkar, and by the reasons noted by Dr. Lebby in his deposition that I referred to in the previous paragraph (e.g., EX1018, 83:13-15 (“And if you want to have something practical for commercial applications, you want to use passive alignment.”)). That this was obvious and well known is also confirmed by the ’416 Patent. The ’416 Patent teaches that multi-part optical combiners can be combined according to any “means known to those skilled in the art,” the means which the patent notes “are deleted in the interest of brevity.” ’416 Patent, 4:43-45. Thus, if this means the fourth embodiment of the ’416 Patent is integrated and passively aligned as Patent Owner contends, the patent admits that combining the elements of an optical combiner into an integrated and passively aligned device is known in the art. As I noted in my original declaration, the patent’s admitted prior art confirms the obviousness of the claims. *See* EX1003, §VIII(A)(i). I also explained that “[t]o the extent it is argued that Kurita does not expressly disclose a limitation of the Challenged Claims, it would have been obvious over Kurita’s disclosure, to a POSITA at the time of the purported invention,” citing to (among other things) the patent’s admitted prior art. *See* ¶167. The patent’s admission that combining multiple parts into an integrated optical subassembly therefore further confirms that it would have been obvious for

a POSITA to implement the device of Kurita in a packaged, integrated device, utilizing passive alignment.

69. Other sources also teach integrated devices. For example, as I also noted in my original declaration, Lemoff teaches that “[o]ptical signal emitter 200 also includes housing 230, which secures receptacle 260, optical imaging element 220 and substrate 140 and which holds them in alignment with each other.” EX1003, ¶258 (citing EX1006, 4:12-15 and FIG. 2); *see also id.*, p. 165. As I also noted in that paragraph, it was desirable to align a light emitter and a light receiver in order to improve the efficiency of light transmission from the light emitter to the light receiver. *Id.*, ¶258. A POSITA would have been motivated to provide a housing for the device of Kurita at least in order to improve alignment, as was well known.

70. Additionally, I note that the record indicates that the inventors utilized a pre-existing mechanical housing unit, including an integrated ferrule, that was available in the prior art. EX2045, ¶15 (“The notation ‘Same as current’ (cell 36B) refers to the mechanical design previously developed for a construction used in U.S. Patent Number 6,396,978. Using a pre-existing mechanical design would have been cost-effective because we already owned the mold machine to create the necessary housing for the optical components.”); EX1017, 83:17-86:8 (explaining that the “same basic form factor” of the pre-existing “CWDM mux that includes filters” was considered for the ’416 Patent’s housing), 98:10-100:3 (e.g., explaining that “This type of ferrule would be standard, yes,” when referring to an “Aduro LX4 mux” that is “essentially” what is shown in U.S. Patent Number 6,396,978). I also note that U.S. Patent Number 6,396,978 (EX1020) is a continuation-in-part of U.S. Patent No. 6,201,908 (EX2018). The same housing is provided in both patents, EX1020 and EX2018.

71. These patents establish that integrated optical subassemblies utilizing passive alignment and integrated, pre-aligned connectors with a stop were well

known in the art and within a POSITA's level of skill. EX2018, 2:65-67 ("Another feature of the present invention is to integrate a fiber optic connector within the optical module to passively align an optical fiber to the coupling optic."); 3:66-4:3 ("The molded coupling module 60 in the embodiment illustrated in FIG. 1 includes a fiber optic cable receptacle 80 integrally molded therein for receiving the end of a fiber optic cable (not shown) so that the end of the cable engages receptacle seat 81."); 2:50-56 ("One of the key features and a primary object of the present invention is to provide a compact and cost effective optical multiplexer and demultiplexer for both single-mode or multi-mode fiber optic communication systems wherein the device includes preformed and premolded passively aligned optics."); *see also* EX1020, 3:33-37 ("The molded coupling module 60 in the embodiment illustrated in FIG. 1 includes a fiber optic cable receptacle 80 integrally molded therein for receiving the end of a fiber optic cable (not shown) so that the end of the cable engages receptacle seat 81."), 1:23-28 (incorporating EX2018 by reference).

72. Dr. Lebby also acknowledges that packaging of optical components was known, and advantageous for protecting the optical components and providing optical and electrical connections. Additionally, he acknowledges that passive alignment was a tool in a POSITA's toolbox, and that it would have been possible to implement with Kurita. *E.g.*, EX1018, 24:4-25:13 (e.g., "[T]he term '**packaging**' from a POSITA's standpoint is something that is **used to protect** the chips or semiconductor chips and components **from the environment**. Also, it **allows optical and electrical connections** [T]he '416 patent is, can be referred to as a package that has -- does protect components from the environment and does allow both electrical and optical connections to the outside world."); 31:8-32:6 (e.g., "Both active and **passive alignment** were **known** techniques and were **known previous to 2003**"); 39:7-40:19 ("Both active and **passive alignment** were **tools engineers could use** to deal and design optical systems. Both active and **passive alignment** have both

advantages and disadvantages.... But certainly you're correct, and I've already stated on record *passive alignment is a tool that engineers could use and both has advantages and disadvantages* depending on how it's used.”); 279:8-281:2 (e.g., “And so a person of ordinary skill in the art *could actually apply* active alignment as well as *passive alignment to Kurita.*”) (all emphases added).

73. Additionally, I note that Dr. Lebby mentioned many times in his deposition that Kurita is implemented on an optical workbench because it is designed for optical computers. E.g., EX1018, 136:16-137:19 (noting he would “automatically” think to implement the system on an optical workbench because it is for optical computers), 143:21-145:1 (e.g., “it's a system that's designed for an optical computer and it's a system that's designed for an optical bench”), 221:16-222:12, 223:17-224:18 (e.g., “Certainly I don't see Kurita being an integrated solution at all. It is not designed for integration. It's designed for an optical computer in an optical bench, that's probably a hundred times bigger than what the '416 is designed.”), 283:4-22 (e.g., “And Kurita is an optical system, at least the design for an optical computer that goes on to an optical bench.”), 284:3-285:6. I disagree that Kurita is limited to an optical computer (see EX1004, ¶[0001] for a list of other applications, including optical communications, similar to the '416 Patent), and I also disagree that being limited to an optical computer means the system must be implemented on an optical workbench. But I note Dr. Lebby's opinion here is contrary to what the '416 Patent itself teaches. The '416 Patent teaches that optical computing is one of the potential applications of the combiner/WDM device described in the patent. EX1001, 5:4-10 (under “Potential Applications” heading, listing “Optical computing”). Dr. Lebby's different positions – that Kurita must be implemented in a lab workbench because it is used in optical computing, and that the claimed device of the '416 Patent cannot be implemented on a lab workbench,

even though optical computing is a potential application – simply contradict each other and are not what a POSITA would understand.

74. In short, packaging optical components was common, was known to be advantageous in certain applications, and would have been obvious to a POSITA in the context of Kurita.

75. Dr. Lebby next goes element-by-element, addressing what he perceives as deficiencies in Kurita. I address his arguments in turn.

1. Claim Elements [1.0], [1.1], and [1.2]

76. Dr. Lebby argues that Kurita does not disclose an optical combiner because the “discrete, individual component parts [of Kurita] are not integrated and, thus, do not disclose an optical combiner as claimed.” I disagree that this is a requirement of the claim, as I addressed above in the section on claim construction of the term “optical combiner.” Notwithstanding, even if Patent Owner’s construction is accepted, Kurita teaches, and at the very least, it would have been obvious, to incorporate Kurita’s components into a housing such that they would be integrated for the reasons I have already explained.

77. Dr. Lebby also argues that “Kurita does not disclose a “stopped single optical fiber.” EX2003, ¶130. Dr. Lebby does not appear to dispute that it would have been obvious to “fix” the stopped optical fiber, rather he argues that under Inneos’s proposed construction, “[s]imply fixing the fiber in place does not satisfy this limitation.” EX2003, ¶131. As I have explained in connection with claim construction, the claim does not require anything more than that the single optical fiber is fixed. Notwithstanding, even if Patent Owner’s construction is accepted, Kurita teaches, and at the very least, it would have been obvious, to fix the single optical fiber by a physical structure (such as a stop) that prevents the fiber from being inserted further into the optical combiner. That is, Kurita teaches, or it would have been obvious, that a single optical fiber would be inserted into the optical combiner

until it abuts a physical structure that prevents the fiber from being inserted further into the optical combiner.

78. This would be so for the same reasons that I previously explained it would be obvious to fix the optical fiber in place in Kurita. *See* EX1003, ¶¶172-173. For example, I explained that “[t]o the extent that Patent Owner argues that a ‘stopped optical fiber’ requires a structure having similarity to the stated examples of a ‘fiber stop or seat 60 formed in ferrule 60’ described in the ’416 Patent (see EX1001, 3:11-15), it would have been obvious to a POSITA at the time of the alleged invention that such a structure would have been used in the setup of Kurita. This is so because a POSITA would recognize that the optical fiber 40 should not be floating free in space, but rather, that the optical fiber 40 would be secured, and using a seat or ferrule was (and still is) a typical way to secure an optical fiber.” EX1003, ¶173. In rebuttal, Dr. Lebby argues that “Kurita does not teach or suggest pre-aligning the fiber with the focusing lens using a pre-aligned connector with a stop to allow the fiber to be passively aligned.” EX2003, ¶131. He further says “[a] POSITA would need to go through a great deal of experimenting to properly align the fiber with the discrete components disclosed in Kurita,” and that “[t]he alignment would most likely be carried out in the lab.” EX2003, ¶132. I disagree.

79. As Dr. Lebby states, “[t]o be used in a data communication system, the fiber needs to be capable of staying in position when the system is deployed.” This is not a novel observation. A POSITA would have known this as of the priority date of the ’416 Patent. Kurita discloses that it is used for optical communications. EX1003, ¶171. A POSITA reading Kurita as of the priority date of the ’416 Patent would have known that the fiber it discloses should stay in position (relative to the combiner) when the system is deployed. Moreover, to the extent Kurita has to be modified, it would not have required “a great deal of experimenting to properly align the fiber,” as Dr. Lebby alleges. I note that Dr. Lebby does not explain why it would

require such experimentation, or the nature of experimentation at issue, to align the fiber. But his premise seems to be that Kurita is a disjointed collection of discrete parts. But as I have already explained above, it would have been obvious to house the components of Kurita together in a package for purposes of alignment. It would have been obvious, in connection with this, to utilize a connector that has a physical structure (such as a stop) that prevents the fiber from being inserted further into the optical combiner, as I have already said. And alignment of components is something that was very common as of the priority date. A POSITA would have been familiar with alignment techniques (including passive alignment), and would have been able to utilize such alignment techniques with Kurita's device. *E.g.*, EX1018, 32:7-33:5 (acknowledging "passive alignment" as a "tool[] in the toolbox for engineers" when designing optical systems); 39:7-40:19 (acknowledging that passive alignment was known to have advantages); 83:13-15 ("And if you want to have something practical for commercial applications, you want to use passive alignment."); 83:16-22 ("Passive alignment, as I've indicated in paragraph 14 of my second declaration, means there is enough tolerance to get good alignment without the need to perform active alignment with a light that is being shone through an optical part of the system. So it actually saves a lot of time and it saves a lot of cost."); 85:1-4 ("And you want to, as much as possible, avoid the optical bench scenarios like I've shown in the image in paragraph 12, which is opposing expert's optical lab."). It would have required no more than routine skill. Indeed, aligning optical components is necessary for any optical system to function properly, and it was a matter of routine for a POSITA to engage in such alignment, including pre-alignment and passive alignment.

80. As an additional reason to what I noted above, it also would have been obvious to try this kind of connector, i.e., a connector with a physical structure (such as a stop) that prevents the fiber from being inserted further into the optical

combiner. A POSITA would have known that connectors for an optical combiner can be chosen based on a given application. Connectors are also commonly standardized (e.g., see EX2003, ¶52 (“new standards for these shorter interconnect cables emerged (such as DVI, HDMI, USB, etc.).”). As of the priority date of the ’416 Patent, there was a finite number of available connectors, and a POSITA would have been able to interchange one for another with a reasonable expectation of success. That was part of the point of standardization for the connectors. EX2045, ¶15 (“The notation ‘Same as current’ (cell 36B) refers to the mechanical design previously developed for a construction used in U.S. Patent Number 6,396,978. Using a pre-existing mechanical design would have been cost-effective because we already owned the mold machine to create the necessary housing for the optical components.”); EX1017, 83:17-86:8 (explaining that the “same basic form factor” of the pre-existing “CWDM mux that includes filters” was considered for the ’416 Patent’s housing), 98:10-100:3 (e.g., explaining that “This type of ferrule would be standard, yes,” when referring to an “Aduro LX4 mux” that is “essentially” what is shown in U.S. Patent Number 6,396,978).

2. Claim Elements [1.3] and [1.4]

81. Dr. Lebby argues that Kurita does not disclose that the plurality of collimating lenses are integrated into the optical combiner. EX2003, ¶135. To the extent this integration is a requirement (I have explained already that it is not), then the integration would have been taught by Kurita and is at least obvious for the reasons I have noted above in the previous section.

82. In his supplemental declaration, Dr. Lebby makes the additional comment that because Kurita’s light emitting portions 11 and lens portions 21 are placed at respectively corresponding planar positions that therefore means “the components are placed physically away from each other - so that cannot be integrated at all.” EX2049, ¶54. If this were true, then the components of the ’416

Patent could not be integrated either. For example, the collimating lenses 321-324 and lasers 311, 312 are also placed physically away from each other (see '416 Patent, FIGS. 10-11). The '416 Patent also explains that "[l]asers 11, 12 are located at the focal points of the input [collimating] lenses," which would mean (as shown in FIGS. 1-4) that the lasers 11, 12 are placed physically away from the collimating lenses 21-24. *See* '416 Patent, 3:11-18. Indeed, claim 1 requires that the collimating lenses are "positioned to receive ... the output of said n laser output beams," meaning that the lasers and collimating lenses may be positioned away from each other. The fact that light emitting portions 11 and lens portions 21 are placed at respectively corresponding planar positions in Kurita does not in any way preclude them from being packaged together, or integrated. As I have explained already, a POSITA would understand that they would be or that it would have been obvious to do so.

83. Dr. Lebby also argues that I "provide[d] no rationale as to why fiber stop or seat 60 formed in ferrule [8]0 would be used [in Kurita], other than it is a 'typical way' of securing an optical fiber." EX2049, ¶66 (citing EX1003 ¶173). To be clear, what I stated is that it would have been obvious to use such a structure "because a POSITA would recognize that the optical fiber 40 should not be floating free in space, but rather, that the optical fiber 40 would be secured," and that a fiber stop or seat 60 formed in ferrule 80 was a typical way to secure a optical fiber. In other words, I explained that a POSITA would have secured the fiber so that it would not be floating free in space. I also had explained that "it would be highly problematic for the beams converging at the 'one point' (i.e., the location of the optical fiber for coupling light into) to converge onto one end of the optical fiber 40" if the fiber were floating free in space. EX1003, ¶172. To re-state the obvious: A POSITA would have been motivated, based on the conceptual drawing and corresponding description in Kurita, to secure the optical fiber by a physical structure (such as a stop) that prevents the fiber from being inserted further into the

optical combiner for the reasons I explained in my original declaration and also explained above in connection with the preamble (claim elements [1.0], [1.1], and [1.2]).

84. Inneos's other arguments for why this claim element is allegedly lacking are premised on integration and alignment, which I have already addressed.

3. Claim Elements [1.5] and [1.6]

85. Dr. Lebby argues that Kurita does not disclose that the focusing lens is integrated. EX2003, ¶142. To the extent this integration is a requirement (I have explained already that it is not), then the integration would have been taught by Kurita and is at least obvious for the reasons I have noted above in the previous section. It also is not clear if Inneos maintains this argument, since it now seems to agree with my construction of "focusing means," and has dropped its argument that focusing means requires a "lens integrated into the optical combiner that is in alignment with the collimating lenses and the core of the stopped optical fiber." *See* Response, p. 26 ("For the purposes of this Response, Inneos agrees that the corresponding structure is a focusing lens.").

86. Dr. Lebby also argues that "[l]ens 30 in Kurita does not perform the exact function asserted in the claim." EX2003, ¶143. In particular, he argues that "Kurita does not disclose the claimed function because there is no stop that is part of Kurita's system, so the collimated output beams are not being focusing [sic] onto a single spot at said stopped single optical fiber." EX2003, ¶143. I have addressed the argument about a stop above, in connection with the preamble (claim elements [1.0], [1.1], and [1.2]). Accordingly, the lens 30 of Kurita does perform the same claimed function. Dr. Lebby also argues that the structure is different, because "Kurita's lens 30 is not integrated into an optical combiner." EX2003, ¶149; *see also id.*, ¶¶147-148. I have addressed the argument about integration above, in

connection with the preamble (claim elements [1.0], [1.1], and [1.2]). Accordingly, the lens 30 of Kurita is the same structure.

87. Moreover, because Inneos now seems to agree that the corresponding structure of the focusing means is a focusing lens, and the lens 30 in Kurita undoubtedly is a focusing lens, there does not seem to be any dispute that Kurita discloses the claimed focusing means. EX2003, ¶115 (acknowledging that one of the components of Kurita's device is "'a lens 30 for focusing the lights from the individual lens portions 21'" (quoting EX1004, ¶¶[0015]-[0016])).

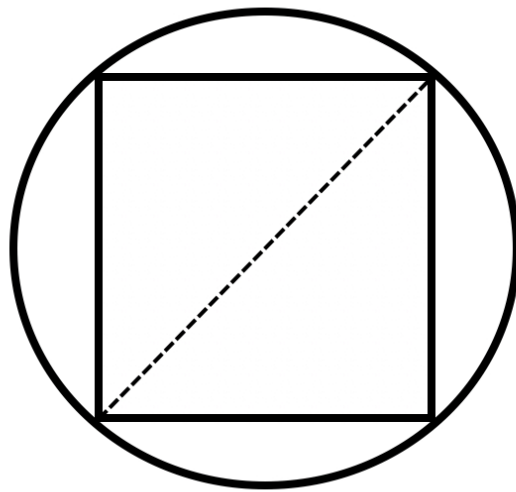
88. Dr. Lebby also argues that "Kurita's lens 30 does not disclose n separate radial sectors on its surface that each of said n collimated beams passes through." EX2003, ¶155. He draws particular attention to FIGS. 1-2 of Kurita, showing a 3x3 array of lens portions 21 (the collimating lenses), and notes that the collimating lenses in Kurita are integrated in rows, not radially. *Id.* I disagree with Dr. Lebby's conclusion. Additionally, in my original declaration, I emphasize that I relied on FIG. 3 of Kurita and its corresponding description, noting that "[w]ith this two-by-two array, aligned along the center focal axis, Kurita has a separate radial sector of the focusing lens to focus each separate laser output onto the optical fiber, just like the alleged invention of the '416 Patent." EX1003, ¶143; *see also* EX1003, ¶182 and §VII(A).¹⁰

89. Dr. Lebby's assertion that the collimating lenses being arranged in rows is mutually exclusive with those lenses being in a radial arrangement is incorrect, and is inconsistent with the '416 Patent. And it is not clear why he considers the

¹⁰ Even though I relied on the embodiment of FIG. 3, Kurita is clear that the description of the figures are not isolated from each other. For example, in describing FIG. 2, Kurita says: "As for the lens array 20, the lens 30, and the optical fiber 40, the same ones as in the first example shown in FIG. 1 may be utilized." EX1004, ¶[0013]. And in describing FIG. 3, Kurita says, "this composition being set forth to be similar to the second example shown in FIG. 2," after introducing the components of the light connection device. EX1004, ¶[0015].

three-by-three example of FIGS. 1-2, when I relied on the two-by-two example of FIG. 3. In particular, I had focused on the case of a two-by-two array of collimating lenses, as shown in FIG. 3 of Kurita, because this is similar to the two-by-two array of collimating lenses shown in the '416 Patent, which are described in the '416 Patent similarly to how they are described in Kurita. That is, the '416 Patent explains, for example, that "FIGS. 1-4 utilize a two-dimensional, two by two array of input lasers as well as collimating lenses." '416 Patent, 3:47-49. Claim 2, moreover, depends from claim 1, and further requires that "said four lasers and four collimating lenses are each formed in a two-dimensional, two by two array." Accordingly, not only is a two-by-two array, as shown in Kurita's FIG. 3 and described in the text, consistent with the '416 Patent – it is the example that the '416 Patent shows, and required by a dependent claim.

90. Moreover, it is simple geometry that you can draw a circle inscribing the square formed by the elements of a two-by-two array, meaning that the elements are radially arranged with respect to the inscribed circle. Since this pattern from the collimating lens array is repeated on the focusing lens, it results, as I have explained, in each collimating beam passing through a separate radial sector. That is, the claim requirement of the "focusing means having n separate radial sectors on its surface, and each of said n collimated beams passes through a separate one of said n sectors of said focusing means" is met. *E.g.*, EX1017, 51:2-53:10. An illustration of this principle follows:



The inscribing circle's diameter is the same as the diagonal of the square formed by the elements of the two-by-two array.

91. As a result of the collimating lenses being radially arranged, as I explained in my initial declaration, and which Dr. Lebby does not appear to dispute,¹¹ lens 30 in Kurita has n separate radial sectors on its surface that each of said n collimated beams passes through. *See* EX1003, §VIII(B)(iii).

92. Dr. Lebby further reiterates his position that Kurita does not disclose radially arranged collimating lenses in his supplement declaration. *See* EX2049, ¶¶67-71. Dr. Lebby addresses FIG. 3 of Kurita, noting that “by observation, the lens portions in FIG. 3 are in a collinear arrangement. The lenses are not offset in a radial direction.” EX2049, ¶69. He also refers to Kurita's laser chips as being in a “square layout,” which he contrasts with a “radial solution.” EX2049, ¶71. As I explained above and elsewhere, a square layout, for a two-by-two array, is radially aligned. As I noted, it is simple geometry that a circle having a diameter equal to the diagonal of the square may be formed such that the corners of the square (the laser chips) are

¹¹ His dispute is that the collimating lenses in Kurita are not radially arranged. They are. He appears to agree that if they are radially arranged, it follows that the focusing lens has the claimed radial sectors.

along the circle's circumference – i.e., the chips are radially arranged with respect to this circle. Moreover, it would have been obvious, for the reasons I explained in my original declaration, that the collimating lenses would be radially arranged around a central axis of the focusing lens in Kurita. EX1003, ¶¶183-184. Dr. Lebby's arguments to the contrary are incorrect in terms of what it means for the lenses of a two-by-two array to be radially arranged.

4. Claim 2

93. Dr. Lebby disagrees with my analysis for claim 2 because, according to him, the collimating lenses of Kurita are integrated into rows, not in a radial arrangement. EX2003, ¶161. I addressed this argument above, with respect to claim 1.

94. Inneos also alleges that Kurita does not disclose or teach “pie-shaped radial sectors on lens 30” as required by claim 2. Response, p. 42. This appears to be based on the same argument that Kurita does not teach radial sectors, which I have already addressed. However, to be clear, the “pie-shaped quadrant” nature of these sectors itself follows from “arranging a two-by-two array of light emitting portions 11 and lens portions 21 to make them radially arranged with respect to a center focal axis of the focusing lens (lens 30),” as well as the fact that there are four such lens portions 11, four such lens portions 21, and therefore four radial sectors. *See* EX1003, ¶190.

5. Claim 6

95. Dr. Lebby does not separately address this claim, other than by way of his analysis of claim 1.

6. Claim 7

96. Dr. Lebby does not separately address this claim, other than by way of his analysis of claim 1.

7. Claim 9

97. Dr. Lebby does not separately address this claim, other than by way of his analysis of claim 1.

B. Ground 2: Kurita in view of LaMarche and/or Lemoff

98. I understand that the Board has said:

Patent Owner's above-stated arguments against the combinability of Kurita with LaMarche and/or Lemoff raise some questions as to whether Petitioner has adequately explained why one of ordinary skill would have combined Kurita with LaMarche and/or Lemoff to arrive at the optical combiner claimed in the '416 patent's challenged claims. The parties may further address during trial whether claims 1, 2, 6, 7, and 9 would have been obvious to one of ordinary skill in the art over Kurita combined with Lemoff and/or La Marche.

Response, pp. 20-21.

99. The Board has noted "some questions" regarding some of Patent Owner's arguments. I address Patent Owner's arguments below, based on Dr. Lebby's original declaration (EX2003), his supplemental declaration (EX2049), and Inneos's response to the Institution Decision (Response).

100. To the extent that Inneos's arguments on Ground 2 relate to the issues I have addressed elsewhere, such as alignment, integration, or Kurita's teaching of the claim elements (Ground 1), I refer to my discussion elsewhere.

1. LaMarche is analogous art

101. Dr. Lebby argues that LaMarche is not in the same field of endeavor. EX2003, ¶171; *see also id.*, ¶¶182-195. I disagree. As I explained before, "[b]oth Kurita and LaMarche are in the same field (i.e., optical technologies); and they each teach optical devices utilizing similar components, such as light sources, collimating

lenses, and a focusing lens.” EX1003, ¶204. “Similarly, Kurita and LaMarche are analogous art to the ’416 Patent. As described in the paragraph above, both are directed to optical devices and utilize similar components, such as light sources, collimating lenses, and a focusing lens.” EX1003, ¶205. “The ’416 Patent, likewise, is directed to optical devices utilizing similar components as both Kurita and LaMarche.” EX1003, ¶205. *See also* EX1003, ¶¶145-150 (noting, for example, that LaMarche teaches optical signals that are wavelength division multiplexed). Simply put, a POSITA considering how to make an optical combiner such as disclosed in the ’416 Patent would be familiar with, and would consider, a broad array of optical technologies. This would include, at least, optical interconnection arrangements such as disclosed in LaMarche, and the optical connection element and optical connection device such as disclosed in Kurita. As I also explained, a POSITA “would have had at least a bachelor’s degree in electrical engineering, physics, or a related field, and at least 2 years of practical experience in optical technologies.” EX1003, ¶105. This background, including the education and the practical experience in optical technologies, would have enabled a POSITA to realize that the optical technologies in LaMarche are in the same field of endeavor as those of Kurita and the ’416 Patent. For example, Dr. Lebby has an extensive background in different optical technologies, which he relates in the section of his report dealing with his background and qualifications. EX2003, ¶¶8-25 (describing, e.g., work in “nearly every aspect of optoelectronics”); EX1018, 20:15-21 (“[S]ome of the things I called out certainly are applicable and pertinent to what’s being described in the ’416 patent.”). Moreover, a POSITA also would have looked to LaMarche, even if not in the same field, because it teaches radial collimating lenses that improve coupling efficiency, and a POSITA would have recognized that the problem addressed by LaMarche (including its design of optical components such as collimating lenses to improve efficiency) would be reasonably pertinent to that

addressed by the inventors of the '416 Patent. The '416 Patent shows a concern for coupling efficiency (*e.g.*, '416 Patent, 1:56-2:10), as well as how to arrange optical components such as collimating lenses (*id.*).

**2. A POSITA would have been motivated to combine
LaMarche and Kurita**

102. Dr. Lebby also argues that even if LaMarche were considered by a POSITA, a POSITA would not have been motivated to combine LaMarche with Kurita. *See* EX2003, ¶¶196-220. First, he says that the problems each was addressing are different, particularly pointing to Kurita using fewer components and LaMarche using more components. EX2003, ¶198. Regardless of the problems each may have been solving, a POSITA would have been motivated to combine the references for the reasons I already explained. *See, e.g.*, EX1003, ¶¶202-210, 222. Moreover, the proposed combination involves using LaMarche's radial arrangement of collimating lenses to the existing collimating lenses of Kurita. That is, the combination of Kurita and LaMarche does not involve adding additional components to Kurita because Kurita already has collimating lenses, so Dr. Lebby's comments about LaMarche utilizing additional components are not relevant.

103. Dr. Lebby next argues that Kurita discourages increasing the number of optical components, while LaMarche increases the number of separate, individual components. EX2003, ¶¶199-202. Again, this misses the point. The combination I have proposed does not increase the number of components in Kurita, it merely adopts the radial arrangement taught in LaMarche to the existing components of Kurita.

104. Dr. Lebby next argues that the simultaneous broadcasting in LaMarche "results in losses of light and would not have necessarily improved coupling efficiency or achieved greater bandwidths." EX2003, ¶203. Again, this misses the point. The combination I have proposed does not utilize the simultaneous

broadcasting of LaMarche, it merely adopts the radial arrangement taught in LaMarche to the existing components of Kurita.

105. Dr. Lebby's other arguments similarly miss the point of what I have proposed. For example, he claims that the combination "would result in an inoperable optical arrangement" because Kurita is "much smaller" and LaMarche is "bigger." EX2003, ¶216. But I have not proposed bodily incorporating the system of LaMarche into Kurita. Instead, I have proposed incorporating "LaMarche's teachings of a radial arrangement of collimating lenses" (e.g., EX1003, ¶202) – that is, arranging the existing collimating lenses of Kurita radially. The comparative sizes of Kurita and LaMarche simply are not relevant to the combination. He further calls the combination "impractical" because "[t]he alignment required for LaMarche is significantly longer, and still commercially impractical, to align as opposed to Kurita." EX2003, ¶218. His premise is that because LaMarche has more components, it is harder to align. But again, I have not proposed incorporating the components of LaMarche into Kurita, merely the radial arrangement of collimating lenses using the existing collimating lenses of Kurita.

106. I also note that LaMarche, e.g., in connection with its FIG. 2, illustrates and explains what happens when light emitting devices 201, 202 (e.g., lasers) are positioned near input probe lenses 203, 204 (collimating lenses) and pupil lens 205 (a focusing lens). *See* EX1005, FIG. 2, 3:21-47. Such an explanation – directly related to the optical arrangement shown in Kurita, for example, – would have been useful to a POSITA and further indicated to a POSITA the applicability of LaMarche, and its combinability with Kurita.

**3. A POSITA would have been motivated to combine Lemoff
and Kurita or Lemoff and Kurita in view of LaMarche**

107. Before getting to the motivation to combine, Dr. Lebby makes several observations about Lemoff. EX2003, ¶¶221-224. In particular, he argues that

“Lemoff teaches against using optical wavelength multiplexers for short distances.” EX2003, ¶222 (citing EX1006, 1:42-48). Therefore, per Dr. Lebby, Lemoff “emulates” a WDM multiplexer, apparently without actually being a WDM multiplexer. EX2003, ¶223. I disagree with this interpretation, which is contrary to what Lemoff states.

108. As an initial matter, Lemoff does not use the term “emulate,” and it is not clear what Dr. Lebby means by it. In any event, it is unmistakable that Lemoff includes a WDM multiplexer. Lemoff’s abstract declares that “[a]n optical signal emitter for a multi-channel, wavelength division multiplexed (WDM) optical communication system is disclosed.” EX1006, Abstract. Lemoff’s Summary of the Invention declares that “[t]he invention provides a multi-channel optical signal emitter for a wavelength division multiplexed (WDM) communication system that combines multiple signal components into a multi-channel optical signal without using an optical multiplexer or other device external to the emitter.” EX1006, 1:52-56. And in the detailed description, when explaining that “[s]ome embodiments of the invention advantageously employ VCSELs [vertical cavity surface emitting lasers],” Lemoff declares that “they [i.e., VCSELs] are well suited for use in WDM systems.” EX1006, 4:55-58. There is thus no equivocation in Lemoff that it is a WDM system, and in particular, a WDM multiplexer, and a POSITA would recognize it as such. Lemoff’s device combines multiple optical inputs from lasers having different wavelengths into a single fiber output. There is no question therefore that it is a WDM multiplexer. If by “emulate” Dr. Lebby implies otherwise, then I believe he is incorrect.

109. Dr. Lebby is also incorrect that Lemoff teaches against using optical wavelength multiplexers for short distances. Indeed, as just noted, Lemoff itself is an optical wavelength multiplexer, and can be used for short distances. The passage at EX1006, 1:42-48, states that “The invention provides a multi-channel optical

signal emitter for a wavelength division multiplexed (WDM) communication system that combines multiple signal components into a multi-channel optical signal ***without using an optical multiplexer or other device external to the emitter.***” EX1006, 1:42-48 (emphasis added). This refers back to the background, which discusses disadvantages associated with the “complex optical multiplexer” typical in the art. EX1006, 1:34-49. It is similar to what Kurita says about such typical complex optical multiplexers. EX1004, FIG. 4, ¶[0002] (explaining conventional system in terms of FIG. 4), ¶[0004] (noting problem with costs). Properly understood, Lemoff is not disparaging optical wavelength multiplexers. Rather, Lemoff is clearly noting disadvantages with the complex, expensive optical wavelength multiplexers then typical of the prior art, which were external to the emitter. As shown in FIG. 4 of Kurita, for example, the light sources are first focused into multiple optical fibers 130 before being fed into the external optical wavelength multiplexer 140.

110. For short distances,¹² Lemoff teaches that instead of an external device like in the prior art (such as shown in FIG. 4 of Kurita), an emitter apparatus (such as emitter 200 in FIG. 2 of Lemoff) packages together the light source (lasers) and other components (such as optical imaging element 220). This is also similar to what Kurita teaches, as Kurita also combines the lenses and lasers together without relying on an external device (e.g., prior art multiplexer 140 in FIG. 4 of Kurita) into which separate input signals are fed through multiple optical fibers as in the prior art. In other words, Lemoff does not say that it is not an optical multiplexer. It asserts it is not an optical multiplexer that is external to the emitter. That is why Lemoff says

¹² I discuss short distances here because Dr. Lebbby has argued that in the context of short distances Lemoff teaches away from optical multiplexers. EX2003, ¶225. He is incorrect, as I explain in the paragraph above. Notwithstanding, Lemoff is not limited to short distances. E.g., EX1006, 3:35-43 (noting that “short distance communication” relates only to some “embodiments,” not all of them). Nor is Kurita limited to any particular distance.

that it “provides” a WDM communication system (including an optical multiplexer) “without using an optical multiplexer or other device *external to the emitter.*” EX1006, 1:42-48 (emphasis added). Dr. Lebby’s position is contradicted by the actual teachings of Lemoff.

111. Accordingly, Lemoff and Kurita are in agreement in terms of what they teach about optical multiplexing devices. Lemoff does not teach against the use of an optical multiplexing device, but rather is closely in accord with Kurita.

112. Dr. Lebby also argues that a POSITA would not have been motivated to combine Lemoff with Kurita. *See* EX2003, ¶¶225-236. He first notes that Lemoff discourages using optical wavelength multiplexers for short distances. EX 2003, ¶225. As I just noted, this is not accurate. What Lemoff discourages is the traditional prior art multiplexers that were external to the emitter. Both Lemoff and Kurita are optical wavelength multiplexers that may be used for short distances. Nothing in Lemoff discourages the combination. In any event, I am relying on Lemoff in this ground (Ground 2) only for its “teaching the use of a seat and ferrule arrangement for securing an optical fiber,” which is the integrated, pre-aligned connector Patent Owner claims is missing from the prior art. *E.g.*, EX1003, ¶201. Using Lemoff’s connector (its seat and ferrule arrangement) does not implicate the concerns Dr. Lebby raises. The use of such a connector may be generally applied to many kinds of optical devices, and certainly to the one taught in Kurita as I have already explained.

113. Dr. Lebby also argues that “Lemoff teaches against using the system disclosed in Kurita for short distances” because Lemoff is concerned about costs while Kurita is an “expensive” system. EX2003, ¶226. However, Kurita is also concerned about costs, and teaches a low cost device. *See, e.g.*, EX1004, ¶[0005] (noting that “[t]he object of the present invention” is achieved in part by “attempting to reduce ... the costs”), ¶¶[0019]-[0020] (noting the “Effects of the Invention” as

“allowing low costs,” among other things). I understand that Dr. Lebby asserts, contrary to the reference itself, that Kurita is “expensive” because of the costs of manual alignment. *E.g.*, EX2003, ¶[0116]. I have already addressed his arguments on alignment elsewhere. In short, a POSITA would have understood Kurita to teach a packaged device, and at least it would have been obvious in view of Kurita to package its optical components together, and to utilize pre-alignment. Regardless, given that all I am relying on Lemoff for in this ground (Ground 2) is its pre-aligned, integrated connector (its seat and ferrule arrangement), I do not believe that a POSITA would have been dissuaded by any issues of cost to make the combination.

114. Dr. Lebby also argues that “Lemoff would not be capable of housing the design disclosed in Kurita,” arguing that Lemoff is too small, Kurita too large, and therefore it would not be practical for its intended purpose, and a POSITA would not look to Lemoff for that reason. EX2003, ¶¶231-233. I disagree. The part of Kurita that I relied on for the claimed optical combiner could be substantially the same size as Lemoff. Kurita is silent as to the size of its components, and Lemoff contemplates that optical imaging element 220 may include multiple lenses. But just as I explained above in connection with LaMarche, I also have not proposed bodily incorporating the system of Lemoff into Kurita. Instead, I have proposed incorporating Lemoff’s “teaching the use of a seat and ferrule arrangement for securing an optical fiber” (*e.g.*, EX1003, ¶201) – that is, a POSITA would be able to use a seat and ferrule arrangement in Kurita that is appropriately sized for the system of Kurita. The comparative sizes of Kurita and Lemoff simply are not relevant to the combination. Connectors for optical fibers were very well known in the art at the time of the invention, and it would have been routine and well within the skill of a POSITA to apply the teaching of Lemoff to Kurita for the reasons I have already explained. *E.g.*, EX1018, 307:20-308:2 (“Q Could you implement the system of Kurita using a housing similar to what we saw in Lemoff? A Well, there’s no reason

why you wouldn't put a housing over the free space discrete components of Kurita."). Lemoff's teaching that the connector is pre-aligned and integrated into the housing also would have been easy for a POSITA to apply to Kurita, regardless of any perceived relative size differences. Moreover, although Dr. Lebby notes that the minimum core diameter in Lemoff is 100 μm (EX2003, ¶233), Lemoff actually discloses that "[t]he optical fiber used in some embodiments has a core diameter that is lot less than 100 μm ." EX1006, 3:35-37. And Kurita is silent regarding its particular size, and a POSITA would have understood it to teach embodiments of various sizes. I understand that Dr. Lebby acknowledges that the components of Kurita could have a similar size to the same components in the '416 Patent. EX1018, 292:11-300:10. But he insists the device in Kurita would be larger because it has to be implemented on an optical bench, and the spacing of holes in the bench dictates where the components can be placed. EX1018, 127:15-131:10. But as I have noted, Kurita is not limited to a lab workbench, and when implemented in a commercially viable product, a POSITA would indeed utilize housing and spacing between the components that allows for the size of Kurita to be appropriate to the application it is being used for. It is not reasonable to insist that Kurita is limited to a large 1x1x0.5m profile. *See* EX1003, ¶231 (arguing that Kurita, at 1x1x0.5m, is 10-50 times larger than Lemoff).

115. Dr. Lebby next goes element-by-element, addressing what he perceives as deficiencies in Kurita in view of LaMarche and/or Lemoff. I address his arguments in turn.

4. Claim Elements [1.0], [1.1], [1.2], [1.3], [1.4], and [1.5]

116. Dr. Lebby relies on his arguments for Ground 1, which I have already addressed. My comments apply equally to this ground (Ground 2) also.

5. Claim Element [1.6]

117. Dr. Lebby argues that “LaMarche does not disclose a one-to-one radial alignment of collimating lenses. LaMarche discloses a single collimating lens for every array of lasers. EX1005 at 4:43-49, 5:27-29. Because Kurita discloses an array of lasers, at most LaMarche would teach one collimating lens—one lens per array as disclosed in LaMarche’s Figure 6.” EX2003, ¶240. As I explained in my original declaration, I am not relying on LaMarche for its teaching of laser arrays, I am relying on the laser light sources in Kurita. *E.g.*, EX1003, ¶223. I am not even relying on LaMarche for its association of lasers to collimating lenses. Kurita teaches a one-to-one alignment of collimating lenses to lasers. What I am relying on LaMarche for is its teaching that the collimating lenses are arranged radially. As I also explained, there is nothing special about the arrays 620-1 through 620-M being associated with collimating lenses instead of singular laser sources being associated with collimating lenses. In FIG 4 of LaMarche, the collimating lenses are associated with singular laser sources 401, 402. EX1003, ¶223. In short, I disagree that a POSITA in combining Kurita and LaMarche would have removed the collimating lenses already present in Kurita to arrive at what Dr. Lebby contends would be the “one collimating lens” that he says LaMarche would teach here.

118. Dr. Lebby makes similar arguments about LaMarche in his supplemental declaration. EX2049, ¶72. In addition, he argues that the collimated light in LaMarche does not enter into separate radial sectors of the pupil lens but instead creates a box pattern. EX2049, ¶76. I have already explained that the separate radial sector limitation follows as a result of the arrangement of the lasers, collimating lenses, and focusing lens, a point Dr. Lebby seems not to dispute. Dr. Lebby points to particular features of LaMarche (such as the pattern of light emitting device array 620-1 shown in FIGS. 7-8) which I do not rely on in the combination. To be clear, the light emitting device array 620-1 of LaMarche is not part of the

combination. The light source is from Kurita, the focusing lens is from Kurita, even the collimating lenses are from Kurita – it is only the radial arrangement of those lenses from LaMarche that I rely on. Given this, the separate radial sector limitation follows for reasons I have explained already, and Dr. Lebby’s remarks are not pertinent to the combination I have proposed.

119. Dr. Lebby also argues that Lemoff does not disclose the stopped optical fiber because “the ferrule surrounds the fiber and is flush with the end of the fiber such that there is not a stop that is part of the ferrule” and therefore Lemoff does not disclose “a stop inside a ferrule.” EX2003, ¶243.

120. In order to provide foundation for the following discussion, I reproduce FIG. 2 of Lemoff below.

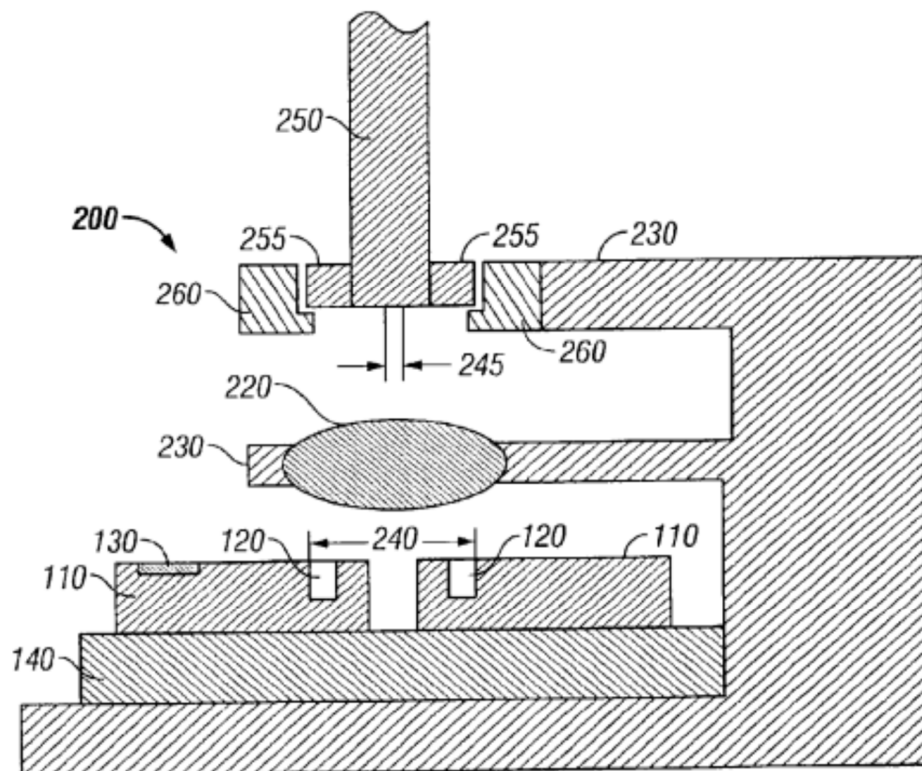


FIG. 2

As I explained in my original declaration, “Lemoff teaches that the receptacle 260 and ferrule 255 constitute a connector ‘by means of which various optical fibers may be plugged into or removed from optical signal emitter 200 when the emitter is initially installed in an optical communication system or when maintenance is performed.’” EX1003, ¶224 (quoting EX1006, 5:63-6:2).

121. The receptacle 260 shown above in FIG. 2 is shaped similarly to the fiber seat or stop 60 of the ’416 Patent. The fiber–ferrule assembly is inserted into the receptacle 260 and is prevented from being inserted further into the optical combiner by means of this physical structure. In other words, the fiber when inserted like this “abuts a physical structure [i.e., receptacle 260, which functions as a stop] that prevents the fiber from being inserted further into the optical combiner.” Therefore, even if Inneos’s construction of “stopped single optical fiber” is correct (it is not as I have already explained), Lemoff teaches it. I understand that during his deposition, Dr. Lebby agreed that “receptacle 260 in Lemoff’s Figure 2 certainly has a stop.” EX1018, 272:18-273:21. He also agreed that “the fiber is stopped on 260,” though he argued that “it’s not a stop within the ferrule, so it’s a completely different design.” EX1018, 260:15-17. As best as I can tell from Dr. Lebby’s argument that “there is not a stop that is part of the ferrule,” he is adding as an additional, unstated requirement of Inneos’s construction that a stop be part of the ferrule. In effect, he is requiring that the fiber itself must directly touch the stop, and argues Lemoff does not teach this because the fiber in Lemoff is surrounded by ferrule 255 and it is ferrule 255 which directly touches the stop, i.e., receptacle 260. This additional requirement is also unwarranted. The ’416 Patent never illustrates the single optical fiber, and does not otherwise indicate that the fiber itself (as opposed to a casing or other structure around it) must come into direct physical contact with the stop. In any event, as I explained in connection with Ground 1, this

sort of connector structure was not new, and it would have been obvious to incorporate this structure here for the same reasons noted in Ground 1.

122. Dr. Lebby also argues the ferrule of Lemoff is not integrated because it is “pluggable and removable.” EX2003, ¶244. However, the receptacle 260 (that forms the connector together with ferrule 255) is not removable from optical signal emitter 200. It is the receptacle 260 that functions as a stop, and which is the “physical structure” required by Inneos’s proposed construction of “stopped single optical fiber.” A “ferrule” is not part of the claims and not part of Inneos’s claim construction, so the argument that the ferrule 255, as opposed to the receptacle 260, must be integrated does not appear supported. But as I just noted, to the extent the identical connector disclosed in one of the ’416 Patent’s embodiments is required here, it would have been obvious to add.

6. Claim 2

123. Dr. Lebby argues that “LaMarche discloses discretely placed optical elements and not collimating lenses that are formed in a two-dimensional, two by two array; the input probe lenses 630-1 through 630-M that Petitioner refers to are not integrated into an optical combiner.” EX2003, ¶248. When $n=4$ in LaMarche, such that there are four radially arranged input probe lenses 630-1, 630-2, 630-3, and 630-4, LaMarche teaches that they are radially arranged. For $n=4$, this results in a two-by-two array of lenses. Dr. Lebby appears to be arguing that “formed in a two-dimensional, two by two array” has some additional structural requirement that is not met by what he calls LaMarche’s discretely placed optical elements. The specification makes clear that the term array here refers to the arrangement of collimating lenses. ’416 Patent, 3:39-49, 3:55-60, 3:62-63, 4:32-34, FIGS. 1-11. No special formation process is described or otherwise required. In the context of the fourth embodiment of the ’416 Patent, the patent even makes clear that the collimating lenses are preferably molded into a single monolithic block, but that they

need not be. '416 Patent, 4:39-42. Nor has Inneos proposed any special construction for this term. In sum, LaMarche provides further teaching (in addition to Kurita) of this claim. *See* EX1003, ¶¶226-228.

7. Claim 6

124. Dr. Lebby does not separately address this claim, other than by way of his analysis of claim 1.

8. Claim 7

125. Dr. Lebby does not separately address this claim, other than by way of his analysis of claim 1.

9. Claim 9

126. Dr. Lebby does not separately address this claim, other than by way of his analysis of claim 1.

C. Grounds 3 and 4: Lemoff or Lemoff in view of LaMarche

127. I understand that the Board has said:

[Ground 3:] Because Petitioner relies solely upon Dr. Willner's opinion evidence as support for the argument that Lemoff would have suggested, to one of ordinary skill in the art, use of a collimating lens with each of the light emitting apertures (120), and Patent Owner challenges that argument with citation to declarant testimony that disputes the factual basis for Dr. Willner's conclusions, we determine that we are presented with a material issue of fact as to whether one of ordinary skill in the art would have arrived at the subject matter of claims 1, 2, 6, 7, and 9 in view of the disclosures of Lemoff, and that this issue can be best resolved on a complete trial record.

Institution Decision (Paper 15), p. 22.

[Ground 4:] In view of Patent Owner's above-stated challenges to the evidence and arguments relied upon by Petitioner, we determine that Patent Owner raises questions as to whether a person of ordinary skill in the art would have combined the disclosures of Lemoff and LaMarche to arrive at the subject matter of claims 1, 2, 6, 7, and 9.

The parties may further address this issue during trial.

Institution Decision (Paper 15), p. 24.

128. The Board has noted "some questions" regarding some of Patent Owner's arguments, as well as a "material issue of fact." I address Patent Owner's arguments below, based on Dr. Lebby's original declaration (EX2003), his supplemental declaration (EX2049), and Inneos's response to the Institution Decision (Response). This includes the material issue of fact regarding Ground 3 that the Board raised.

129. To the extent that Patent Owner's arguments on Grounds 3 and 4 relate to the issues I have addressed elsewhere, such as alignment, integration, or Lemoff's or LaMarche's teaching of the claim elements (Ground 2), or the motivation to combine them, I refer to my discussion elsewhere.

1. A POSITA would have been motivated to combine Lemoff and LaMarche

130. Dr. Lebby argues that a POSITA would not modify Lemoff by incorporating the radial arrangement of collimating lenses shown in LaMarche. In particular, he argues that "Lemoff and LaMarche are not capable of being physically combined," and finds it "[n]otabl[e]" that "LaMarche predates Lemoff by over 10 years." EX2003, ¶269. He appears to base this conclusion on a comparison of the relative sizes of different components in each device. EX2003, ¶¶270-275. But just as I explained above in connection with both LaMarche and Lemoff in combination with Kurita, I have also not proposed bodily incorporating the system of LaMarche

into Lemoff. Instead, I have proposed incorporating LaMarche's "teaching of a radial arrangement for an arbitrary number M of collimating lenses (input probe lenses 630-1 through 630-M in LaMarche) coupled to the focusing lens (pupil lens 640)" (e.g., EX1003, ¶239) – that is, a POSITA would be able to use radially arranged collimating lenses in Lemoff that are appropriately sized for the system of Lemoff. The comparative sizes of Lemoff and LaMarche simply are not relevant to the combination.

131. Dr. Lebby also argues a POSITA would be "discouraged" to use the optical arrangement in Lemoff because of having to manually align many components and because the system of LaMarche has a high amount of loss. EX2003, ¶280. First, I have already addressed alignment elsewhere. Second, many of the components Dr. Lebby refers to in LaMarche are ones that I simply do not rely on in the proposed combination. These include light emitting devices 620-1 through 620-M, light detectors 680-1 through 680-K, output probe lenses 670-1 through 670-K, and ball array 650. *See* EX2003, ¶280 (referring to these components). The only components from LaMarche that I rely on are the input probe lenses 630-1 through 630-M. Nor would the amount of loss that Dr. Lebby speculates there may have been in the simultaneous broadcasting device of LaMarche be particularly discouraging to a POSITA, because I do not rely on simultaneous broadcasting in the combination and so any loss that is a result of simultaneous broadcasting would not be reflected in the proposed combination.

132. For the same reasons, the alleged concerns about LaMarche being an "extremely expensive optical arrangement" are beside the point even if credible. *See* EX2003, ¶282. The part of LaMarche I rely on in the proposed combination is a set of collimating lenses (input probe lenses 630-1 through 630-M). These would not significantly increase the cost of the Lemoff system, and certainly not to a degree that would discourage a POSITA from making the combination given the advantages

to coupling efficiency and the other reasons for combining that I discussed in my original declaration. As I have noted elsewhere, Lemoff explicitly contemplates multiple lenses as part of the optical imaging element 220. And much of the alleged cost, as I understand it, is based on Dr. Lebby's opinions about the device requiring manual alignment (see EX2003, ¶264), which I have addressed elsewhere. Lemoff teaches that the optical components are packaged together in housing 230, obviating concerns about manual alignment.

133. I also note that LaMarche, e.g., in connection with its FIG. 2, illustrates and explains what happens when light emitting devices 201, 202 (e.g., lasers) are positioned near input probe lenses 203, 204 (collimating lenses) and pupil lens 205 (a focusing lens). See EX1005, FIG. 2, 3:21-47. Such an explanation – directly related to the optical arrangement shown in Lemoff, for example, – would have been useful to a POSITA and would have further indicated to a POSITA the applicability of LaMarche, and its combinability with Lemoff. As I have explained, it was known that collimating lenses improve coupling efficiency, and it was a standard practice to utilize collimating lenses. LaMarche confirms this.

2. Claim Elements [1.0], [1.1], and [1.2]

134. Dr. Lebby argues that Lemoff does not disclose “an integrated subassembly of optical components for multiplexing light of different wavelengths, which includes an integrated, pre-aligned connector with a stop to hold the single fiber optic cable.” EX2003, ¶296. He apparently is referring only to the passage I cited for the term “optical combiner,” and not the remainder of Lemoff. *Id.* (referring to “[t]his passage,” i.e., EX1006, 1:52-56). Of course, I did not know what construction Inneos was proposing for the term “optical combiner” when I prepared my original declaration. If I had, I could have specifically cited other passages for the term “optical combiner” that directly address each of these elements, e.g., EX1006, 1:52-56, 4:59-65, 5:65-6:2, 6:33-36. I explain these passages in the next

paragraph. I also note that in my original declaration, I relied on the embodiment of FIG. 2 of Lemoff, which has these features. That is, it shows an integrated subassembly of optical components for multiplexing light of different wavelengths, which includes an integrated, pre-aligned connector with a stop to hold the single fiber optic cable.

135. Lemoff teaches multiple optical components – e.g., die 110, optical imaging element 220 – that are packaged together within housing 230. EX1006, 6:33-36 (“In various embodiments of the invention, housing 230 may be any device, apparatus or material that secures receptacle 260, optical imaging element 220 and substrate 140 and that holds them in alignment with each other.”). Lemoff teaches that these optical components are for multiplexing light of different wavelengths. E1006, 1:52-56 (“The invention provides a multi-channel optical signal emitter for a wavelength division multiplexed (WDM) communication system that combines multiple signal components into a multi-channel optical signal.”), 4:59-65 (“In some embodiments of the invention, the optical signal component that is emitted by each die has a wavelength different from that of the optical signal component emitted by any other die.”). Lemoff teaches that there is an integrated, pre-aligned connector with a stop to hold the single fiber optic cable. EX1006, 5:65-6:2 (“The fiber and ferrule assembly is then inserted into receptacle 260, which surrounds and secures the fiber and ferrule assembly. Receptacle 260 and ferrule 255 constitute a connector, by means of which various optical fibers may be plugged into or removed from optical signal emitter 200 when the emitter is initially installed in an optical communication system or when maintenance is performed.”). Indeed, the pre-aligned connector is held in alignment by the housing already mentioned. EX1006, 6:33-36.

136. Even though Lemoff teaches every element of the construction of “optical combiner” for which Dr. Lebby argues, he still asserts that “Lemoff does

not use a combiner at all or combine the wavelengths.” EX2003, ¶297. This makes little sense. First, combining wavelengths (if it is supposed to be different from “multiplexing”) is not part of Patent Owner’s construction of “optical combiner.” Second, Lemoff is clear that it combines wavelengths. E1006, 1:52-56 (“The invention provides a multi-channel optical signal emitter for a wavelength division multiplexed (WDM) communication system that *combines multiple signal components* into a multi-channel optical signal.”) (emphasis added), 4:59-65 (“In some embodiments of the invention, the *optical signal component* that is emitted by each die has a *wavelength different* from that of the optical signal component emitted by any other die.”) (emphasis added). Dr. Lebby is left arguing that Lemoff merely “emulates” WDM, but he does not say what he means by “emulate,” or why Lemoff lacks any structural characteristics of an “optical combiner.” Notably, Dr. Lebby does not seem to explain why Lemoff is not “an integrated subassembly of optical components for multiplexing light of different wavelengths, which includes an integrated, pre-aligned connector with a stop to hold the single fiber optic cable” (i.e., Inneos’s proposed construction of “optical combiner”).

137. At most, Dr. Lebby argues that Lemoff does not multiplex the light “onto a single spot of a fiber as required by the claims.” EX2003, ¶299. As noted above, Patent Owner now seems to agree that the corresponding structure of “focusing means” is a focusing lens. Because the imaging element 220 focuses light, it is therefore a focusing lens, and literally meets the “focusing means” claim requirement. EX1006, 2:20-23 (“FIG. 2 shows a cross sectional view of a second example of the invention, in which a lens focuses independent components of a multi-channel optical signal into an optical fiber;”). This element therefore does not appear to be in dispute anymore. Notwithstanding, I address Dr. Lebby’s argument here. Dr. Lebby refers to the butt coupling shown in FIGS. 1A and 1B. EX2003, ¶299. This example is largely beside the point (I did not rely on it, and there is no

focusing lens in this embodiment to focus the output beams onto a single spot). *I relied on FIG. 2, and in particular, optical imaging element 220, which focuses the light onto the fiber.* I do not rely on the butt coupling embodiment of FIGS. 1A and 1B.¹³ As to FIG. 2, Dr. Leiby states merely that “Lemoff does not disclose the light is focused onto a single spot.” EX2003, ¶300. Lemoff discloses that optical imaging element 220 “focuses” the light onto a signal-receiving area 245, to an area having size as large or smaller than the fiber core. Indeed, this is also what the ’416 Patent discloses.

138. First, with respect to Lemoff, Lemoff explains that “FIG. 2 shows a cross sectional view of a second example of the invention, in which a lens *focuses* independent components of a multi-channel optical signal *into an optical fiber.*” EX1006, 2:20-23 (emphasis added). Lemoff further explains that “Optical signal emitter 200 also includes optical imaging element 220 which is a simple *bi-convex lens* configured to image the optical signal components emitted from the signal-emitting area into the signal-receiving area, that is, from emission apertures 120 into the core of optical fiber 50.” EX1006, 6:7-11 (emphasis added). Additionally, “optical imaging element 220 should have a *magnification factor* that is *equal to or less than* diameter 245 of the signal-receiving area divided by diameter 240 of the signal-emitting area.” EX1006, 6:25-29 (emphasis added). As shown in FIG. 2, diameter 240 of the signal-emitting area is larger than diameter 245 of the signal-receiving area. In other words, optical imaging element 220 (e.g., a simple bi-convex lens), focuses the light from signal-emitting area 240 onto signal-receiving

¹³ While I do refer to these figures, and their corresponding description, that is because the specification makes clear that FIG. 2 includes some similar components as FIGS. 1A and 1B. EX1006, 6:50-54 (“FIG. 2 is a cross sectional view of optical signal emitter 200, according to an embodiment of the invention. Optical signal emitter 200 includes die 110, emission apertures 120, pads 130, and substrate 140, which are similar to those described above with respect to FIGS. 1A and 1B.”).

area 245. The light from the emitters is combined, and converged (i.e., focused) onto the smaller signal-receiving area, by optical imaging element 220. In this manner, the light is focused “into an optical fiber,” as noted above in Lemoff. EX1006, 2:20-23. That the magnification factor of optical imaging element 220 is equal to or less than the ratio of these diameters indicates that the spot size of the resulting focused beam is equal to or less than the core of the optical fiber.

139. Turning now to the '416 Patent, it teaches that the focusing lens 30 focuses the light into the optical fiber:

Lasers 11,12 are located at the focal points of the input lenses and the light is collimated, reflected off a prism 40 and *focused* by the focusing lens 30 *onto a spot at which a single optical fiber* (not shown) *is stopped* by fiber stop or seat 60 formed in ferrule 80.

'416 Patent, 3:11-15 (emphasis added). The patent further teaches that “the spot size 50 of the focused beam [is] made smaller th[a]n the fiber core” '416 Patent, 3:22-26; *see also id.*, FIG. 1 (illustrating spot size 50). In other words, both Lemoff and the '416 Patent teach that a focusing lens focuses light into the fiber. In particular, both teach that light is focused into a fiber core. Moreover, the spot size 50 shown in the '416 Patent (smaller than the fiber core) overlaps with what Lemoff teaches about the spot size of the focused beam (equal to or less than the fiber core). A POSITA would understand that, just as the '416 Patent does, Lemoff teaches that the light is focused onto a single spot by a focusing lens. The '416 Patent does not describe the focusing lens in more specific terms, and therefore appears to contemplate many different kinds of focusing lenses. Lemoff is similarly expansive, though it does provide some examples. *E.g.*, EX1006, 6:7-11 (explaining that “optical imaging element 220 ... is a simple bi-convex len”); *id.*, 6:16-22 (“Various embodiments of the invention may use optical imaging elements that include

a plano-convex lens, a graded-index (GRIN) lens, a diffractive optical element, a Fresnel lens, another type of lens, or any arrangement of one or more optical components functioning to image the optical signal components from the signal-emitting area onto the signal-receiving area.”).

140. Dr. Lebby also argues that Lemoff does not disclose an integrated, pre-aligned connector. EX2003, ¶301. I have addressed this argument above in the context of Ground 2, where I relied on Lemoff for the stopped single optical fiber – and the single stopped optical fiber in Lemoff is an integrated, pre-aligned connector. To the extent that Lemoff is found not to teach a stopped single optical fiber as Inneos has construed the term, it would have been obvious to modify Lemoff to include a stopped single optical fiber for the reasons I explained above in the context of Ground 1.

3. Claim Elements [1.3] and [1.4]

141. With respect to Ground 3, I had explained that Lemoff alone suggested the “plurality of collimating lenses” based on its disclosure that the optical imaging element may include any arrangement of one or more optical components functioning to image the optical signal components from the signal-emitting area onto the signal-receiving area. I also relied on general background knowledge of a POSITA. *See* EX1003, ¶¶256-261. Dr. Lebby argues that “[a] POSITA would understand that ‘optical components’ can refer to any number of optical components and does not suggest using collimating lenses or ‘n collimating lenses, said lenses being spaced apart and positioned to receive and collimate the output of said n laser output beams,’ as required by claim element [1.3].” EX2003, ¶314. I agree with Dr. Lebby that “optical components” can refer to any number of optical components—but to the extent he is suggesting that “collimating lenses” are not optical components that may be referred to by this phrase, I disagree. As I explained in my original declaration, collimating lenses were well known optical components whose

use was known to improve coupling efficiency, and would have been suggested to a POSITA reading Lemoff for precisely that purpose.

142. Dr. Lebby argues that “[t]here is no disclosure that even if collimating lenses were used in some capacity that they would be arranged over each emission aperture in Lemoff.” EX2003, ¶315. As I stated in my original declaration, this arrangement would “improve the coupling efficiency, and maximizing efficiency is specifically noted in Lemoff itself.” EX1003, ¶257. It was also well known in the art to arrange collimating lenses to correspond with light emission sources. For example, the Lee reference (US5,377,287) referred to in the background does just this: “The Lee et al device combines the outputs of, for example, 19 passive optical fibers arranged concentrically together with 19 collimating lenses and a Fresnel focusing lens.” ’416 Patent, 1:59-62. I also noted in my original declaration that “Lee was not unique in this respect, as coupling the outputs of multiple lasers into fiber using collimating lenses and a focusing lens was common by the time of the alleged invention of the ’416 Patent.” EX1003, ¶57. I proceeded to provide examples. EX1003, ¶58 (EX1011 provides one example of a 2-dimensional array of lasers that was “coupled ... to a matched microlens array to individually collimate light from each laser”), ¶¶59-60 (EX1007 provides another example of a system having N fiber outputs coupled with N collimating lenses and a focusing lens), ¶¶61-62 (noting that Kurita and LaMarche also provide examples of collimating lenses correlating with light sources); *see also id.*, ¶64 (explaining that “these are standard optical components, their combination was well known, and it was well within the skill of a POSITA to arrange these components together”); *id.*, ¶¶65-69 (explaining collimating lenses improve coupling efficiency).

143. In contrast to Dr. Lebby’s assertion that “nothing in Lemoff discloses how any such collimated lenses would be integrated into the optical signal emitter or form a subassembly,” Lemoff discloses that optical imaging element 220 is

packaged within housing 230, and that element 220 may include any arrangement of one or more optical components. *See* EX1006, 6:12-15, 6:33-36 (noting, expansively, that “housing 230 may be any device, apparatus or material that secures receptacle 260, optical imaging element 220 and substrate 140 and that holds them in alignment with each other”). Notwithstanding this disclosure, it would have been obvious to a POSITA how to house a set of lenses within housing 230 of Lemoff to ensure proper alignment, as I have explained. I also note that the ’416 Patent admits that combining optical elements together for support is known in the art. ’416 Patent, 4:42-45 (“The focusing lens 350 is supported in its position shown in FIG. 10 by means known to those skilled in the art which are deleted in the interest of brevity.”).

144. Dr. Lebby also argues, based on the embodiment of FIG. 3 of Lemoff indicating that the aperture corners point toward the center of signal-emitting area 125, that “[a] POSITA will understand that this causes the signals to point to different parts of the core fiber so the various spots do not overlap with each other,” and that “collimating the light to be multiplexed onto a single spot on the fiber, as the ’416 Patent claims require, ... would defeat the intended purpose of Lemoff.” EX2003, ¶316. Apparently, Dr. Lebby considers “its purpose” to be “emulating WDM over short distances.” EX2003, ¶284; *see also id.*, ¶283 (explaining “Lemoff’s intended purpose [is] to create a small, low cost, signal emitter that can be used for short distances compared to the complexity and size of the system in LaMarche and its inherent losses and high degree of sensitivity”). First, Lemoff explains that the arrangement of die can vary by embodiment. *E.g.*, EX1006, 4:26-432. Second, nothing about the aperture corners pointing toward the center of signal-emitting area 125 prevents the collimated light from being multiplexed onto a single spot. Indeed, that is what Lemoff describes, as I have already explained above.

145. With respect to Ground 4, Dr. Lebby “disagree[s] that a POSITA would have modified the optical signal emitter disclosed in Lemoff to include 16 collimated

lenses because it would not have led to a predictable result.” EX2003, ¶320. By 16 collimated lenses, apparently Dr. Lebby is referring to the embodiment of FIG. 3 (which has 16 collimated apertures), rather than the embodiment of FIG. 2 (which, like the embodiment of FIGS. 1A and 1B, has five apertures). In any event, a POSITA would have recognized that the number of collimating lenses should correspond to the number of lasers, or light emitting apertures. Dr. Lebby’s opinion about predictability is based on his belief that “[t]he micro-package disclosed in Lemoff is not combinable with LaMarche” and “[t]he resulting device would be inoperable.” EX2003, ¶320. But the size of the package in Lemoff is not relevant to whether it would be combined with LaMarche. A POSITA would understand how to provide appropriately sized collimating lenses, and would not slavishly incorporate the exact device of LaMarche but would rather apply its teaching in the context of Lemoff using the POSITA’s ordinary skill in the art.

146. Dr. Lebby also argues that “LaMarche’s radially aligned collimating lenses is not equal to an ‘n’ number of lasers as Dr. Willner contends LaMarche teaches.” EX2003, ¶321. I have addressed this argument in connection with Ground 2 above. I am not relying on the arrays of light emitting devices of LaMarche, and it would have been obvious to a POSITA for reasons I have already explained to correlate the number of collimating lenses to the number of lasers in Lemoff.

4. Claim Elements [1.5] and [1.6]

147. With respect to Ground 3, Dr. Lebby argues that the optical imaging element 220 does not perform the exact function disclosed in the claim. EX2003, ¶327. He points out several supposed problems.

148. He argues that I rely on FIG. 1A, which is a different embodiment than FIG. 2, which I relied on for other elements. EX2003, ¶329(a). While I do refer to FIG. 1A, and its corresponding description, that is because the specification makes clear that FIG. 2 includes some similar components as FIGS. 1A and 1B. EX1006,

6:50-54 (“FIG. 2 is a cross sectional view of optical signal emitter 200, according to an embodiment of the invention. Optical signal emitter 200 includes die 110, emission apertures 120, pads 130, and substrate 140, which are similar to those described above with respect to FIGS. 1A and 1B.”). Dr. Lebby also argues that the embodiment of FIGS. 1A and 1B does not include optical imaging element 220. EX2003, ¶329(b). To be clear, it is the embodiment of FIG. 2 that I am relying on. But the embodiment of FIG. 2 is described with reference to the similar aspects of FIGS. 1A and 1B, as just noted. Dr. Lebby’s discussion of butt coupling is therefore irrelevant.

149. Dr. Lebby also argues that Lemoff “discourages from using an optical imaging element for this arrangement.” EX2003, ¶329(c). Again, Dr. Lebby misreads what I said. I am not proposing to add an optical imaging element to the embodiment of FIGS. 1A and 1B. I am relying on the embodiment of FIG. 2, which has an optical imaging element. But, as explained above, and in Lemoff, the embodiment of FIG. 2 is described with respect to FIGS. 1A and 1B for the components that are similar between them. Based on these reasons cumulatively, Dr. Lebby disagrees with the modification. EX2003, ¶329(d). But since each of the reasons he outlined is not the actual combination I have proposed, the ultimate conclusion he draws from it is also incorrect.

150. Dr. Lebby again refers to butt coupling in the embodiment of FIG. 1B, this time to argue that Lemoff does not disclose “focusing...onto a single spot at said stopped single optical fiber.” EX2003, ¶330. As I rely on the embodiment of FIG. 2, which includes optical imaging element 220 and does not use butt coupling, these comments are not relevant.

151. Dr. Lebby also argues that Lemoff does not disclose the corresponding structure because he believes more than just a focusing lens is required. EX2003, ¶¶331-335. I have discussed integration and alignment elsewhere, and those remarks

also apply here. Nonetheless, I understand that Inneos no longer argues that the focusing means requires more structure than a focusing lens (which optical imaging element 220 undoubtedly is). *See* Response, p. 26. Accordingly, I understand that Inneos has abandoned these arguments.

152. Dr. Lebby also argues that Lemoff does not teach “focusing means having *n* separate radial sectors on its surface, and each of said *n* collimated beams passes through a separate one of said *n* sectors of said focusing means...” EX2003, ¶337. He relies again on the mistaken belief that I am relying on the embodiment of FIGS. 1A and 1B which do not have an optical imaging element 220. As I explained, that is incorrect. I am relying on the embodiment of FIG. 2, which does include optical imaging element 220.

153. Dr. Lebby also argues that “[t]o the extent Petitioner or Dr. Willner rely on Lemoff’s disclosures in FIGS. 2 and 3, this optical arrangement does not result in the optical signals passing through separate radial sectors of an optical imaging element 220. The emission apertures form an inner and an outer circle.” EX2003, ¶338. Again, this is not a correct statement of what I am relying on. The embodiment of FIG. 2 uses a similar arrangement of some of the elements of FIGS. 1A and 1B, as Lemoff explains. That does not include emission apertures that form an inner and an outer circle, as in the embodiment of FIG. 3.

154. With respect to Ground 4, which is the combination of Lemoff and LaMarche, Dr. Lebby argues that Lemoff cannot show the identical function of the focusing means as Lemoff does not disclose collimating lenses and LaMarche is relied on for the collimating lenses. EX2003, ¶340. My understanding is that to be an equivalent structure, it is the combination that is considered, not any single piece of art in isolation. Even so, as Patent Owner no longer contends that any additional structure beyond a focusing lens is required for the focusing means, and the optical

imaging element 220 undoubtedly is a focusing lens, it is not clear there is any dispute left on this element.

155. Dr. Lebby is also incorrect about my reliance on the embodiment of FIG. 2. *E.g.*, EX2003, ¶341 (arguing that “Lemoff discourages using an imaging element 220 in arrangements such as FIGS. 1A and 1B.”). Lemoff is clear that in the embodiment of FIG. 2, which I rely on, the emission apertures 120, among other structures, are “similar to those described ... with respect to FIGS. 1A and 1B.” EX1006, 6:50-54 (“FIG. 2 is a cross sectional view of optical signal emitter 200, according to an embodiment of the invention. Optical signal emitter 200 includes die 110, emission apertures 120, pads 130, and substrate 140, which are similar to those described above with respect to FIGS. 1A and 1B.”).

5. Claim 2

156. Dr. Lebby argues that “Dr. Willner relies on modifying the emission apertures disclosed FIG. 1A from five apertures to four apertures; however, in this arrangement Lemoff discourages using an optical imaging element 220.” EX2003, ¶352. I disagree. Dr. Lebby apparently is referring to the same passage he had previously referred to, which says that “[r]educing the diameter of the signal-emitting area may advantageously allow use of an optical fiber with a smaller core diameter, eliminate the need for an optical imaging element, or both.” EX1006, 3:62-65. So Lemoff teaches that reducing the diameter of the signal-emitting area (which reducing the number of apertures to four from five *may* do, but also may not depending on the size and relative geometry of the die), *may either* allow for use of a smaller core diameter *or* eliminate the need for an optical imaging element (or both). But it need not. And even if it does, the optical imaging element 220 may still be used, and may still result in improved coupling efficiency, even if the gain is not as large as when the signal-emitting area is larger. In short, Lemoff teaches this claim element for the reasons I previously noted.

6. Claim 6

157. Dr. Lebby does not separately address this claim, other than by way of his analysis of claim 1.

7. Claim 7

158. Dr. Lebby does not separately address this claim, other than by way of his analysis of claim 1.

8. Claim 9

159. Dr. Lebby does not separately address this claim, other than by way of his analysis of claim 1.

D. Ground 5: Bhandarkar

160. With respect to Bhandarkar, I understand that Inneos has not provided any substantive response other than to argue it is not prior art. Accordingly, for all the reasons I explained in my original declaration, because Bhandarkar discloses the claimed optical combiner, it renders the claims obvious to the extent it is considered prior art. *See* EX1003, §VIII(E).

161. Because I was not aware of Patent Owner's proposed constructions when I prepared my original declaration, I did not address those constructions. To avoid any doubt, I am now addressing those constructions in the context of Bhandarkar. Even if Patent Owner's constructions are accepted, Bhandarkar renders the claims obvious. Patent Owner's lack of arguments to the contrary indicates that apparently Patent Owner agrees.

1. Optical Combiner

162. As noted above, Patent Owner argues that "optical combiner" means "an integrated subassembly of optical components for multiplexing light of different wavelengths, which includes a pre-aligned connector with a stop to hold the single fiber optical cable."

163. The WDM multiplexer of Bhandarkar is an integrated subassembly of optical components. This is evidenced, for example, by FIG. 5, which shows the optical components (e.g., GSE lasers 520, collimating lenses 540, and single focusing lens 560) housed within receptacle 550. *See* EX1013, ¶¶[0038]-[0043]; *see also id.*, ¶[0037] (“With the configuration of the present invention, the coupling efficiency of the WDM multiplexer is increased by approximately 23% with the sensitivity of the laser placement being negligible up to approximately an 8 micron offset from the optimal position. As a result, it is likely that with the present invention, active positioning of the lasers may be avoided during packaging of the WDM multiplexer.”); *id.*, ¶[0041] (“Both the collimating lens array 540 and the single focusing lens 560 may be integrated into the receptacle 550 such that the collimating lens array 540, the single focusing lens 560 and the receptacle 550 may be fabricated as a single unit.”). Receptacle 550 provides the housing that packages the device together, and, as noted in paragraph [0037], allows for passive alignment.

164. This integrated subassembly of optical components, moreover, is for multiplexing light of different wavelengths. The “WDM” of WDM multiplexer 500 refers to “wavelength division multiplexing.” Moreover, Bhandarkar is explicit about having different wavelengths of light that are multiplexed together. EX1013, ¶[0038] (“As shown in FIG. 5, the WDM multiplexer 500 includes a substrate 510 upon which are positioned an array of GSE lasers 520 in a hermetic enclosure 530. In one exemplary embodiment, the array of GSE lasers 520 is a 2×2 array in which four GSE lasers 520 are provided for generating light beam signals at four different wavelengths that are to be multiplexed together.”).

165. Finally, the integrated subassembly of optical components includes a pre-aligned connector with a stop to hold the single fiber optical cable. EX1013, ¶[0013] (“The WDM multiplexer includes a receptacle that houses the plurality of lasers, the plurality of collimating lenses and the focusing lens. The receptacle

includes a ferrule sleeve for coupling the point of light to an optical fiber or fiber optic connector.”); ¶[0039] (“A narrower portion 554 of the receptacle 550 provides a mechanism for connecting the WDM multiplexer 500 to a fiber optic connector (not shown) that carries the multiplexed signal to the outside world.”); ¶[0041] (“At the opposite end of the channel 570, a fiber-optic connector (not shown), such as a SC connector, may be coupled to the WDM multiplexer 500.”). For example, a SC connector is one type of connector mentioned, but the specification is also clear that it is only one example. Other types of connectors may be used, and the precise connector design is not limited—any suitable connector may be used. This would include a pre-aligned connector with a stop to hold the single fiber optical cable, a design that was well known in the art and would have been immediately obvious to try for a POSITA. For example, the multiplexer shown in FIG. 1 of the patent illustrates a connector with a stop (similar to the one shown in the ’416 Patent). As I have explained in connection with the other grounds, also, this type of connector was well known and would have been obvious to a POSITA to include for all the reasons previously explained.

2. Stopped Single Optical Fiber

166. As noted above, Patent Owner argues that the term “stopped single optical fiber” means “[a] single optical fiber that has been inserted into the optical combiner until it abuts a physical structure that prevents the fiber from being inserted further into the optical combiner.”

167. The WDM multiplexer of Bhandarkar includes a physical structure, such that when a single optical fiber is inserted into the WDM multiplexer (i.e., the optical combiner) it abuts the physical structure which then prevents the fiber from being inserted further into the WDM multiplexer. This is apparent, for example, from FIG. 5, and the observation that a fiber inserted into the connector must be stopped, that is, prevented from being further inserted. It is also apparent from the

observations I made above, in connection with the term “optical combiner,” explaining that the optical combiner of Bhandarkar included a pre-aligned connector with a stop to hold the single fiber optical cable. Again, a pre-aligned connector with a stop to hold the single fiber optical cable was a design that was well known in the art and would have been immediately obvious to try for a POSITA. Indeed, the multiplexer shown in FIG. 1 of Bhandarkar illustrates a connector with a stop (similar to the one shown in the ’416 Patent).

IV. RESPONSE TO COMMENTS ON MY DEPOSITION

168. I understand that Inneos has made several comments as it relates to the content of my deposition. For example, Inneos states that “Dr. Willner, repeatedly exhibited an inability to answer basic questions on claim construction and the prior art references, often giving nonresponsive answers.” *See* Response, p. 87. Inneos has also made other remarks, interspersed in its response, to the effect that I would not, could not, or did not respond to questions in an appropriate manner. *See, e.g.,* Response, p. 23 (arguing “Dr. Willner would not engage over this construction at his deposition”); p. 40 (“However, at deposition, Dr. Willner would not answer whether FIGS. 1-2 in Kurita disclose a radial arrangement of lenses, even though he cited these figures in support for his opinion.”); p. 49 (“At deposition, Dr. Willner would not answer a simple question about what is shown in FIG. 6 in terms of N or the effects of modifying $N=1$ would have on the system of LaMarche.”).

169. I also note that Inneos’s counsel during the deposition made similar remarks. For example, I was asked: “So, Dr. Willner, was it your strategy in this deposition not to engage on any of the claim construction positions that you took other than what is expressly written in your declaration?” EX2048, 176:3-6; *see also id.*, 176:12-14 (“Was it your strategy not to engage on any of the prior art references you relied on other than what was expressly written in your declaration?”); *id.*, 176:20-22 (“Was it your strategy to run out the clock on your

deposition by taking several minutes to answer basic questions?”). As I said at the time, I did not have a strategy “other than to try to be helpful and answer your questions.” EX2048, 176:16-18; *see also id.*, 176:8-10 (“I -- I don't know if I had a strategy. I wanted to be helpful and -- and answer your question.”), 177:2-4 (“I -- I actually don't agree with the question. So I have been trying to be helpful throughout and answer the questions in an accurate way.”).

170. In general, I do not respond to every instance in which Inneos has mischaracterized my testimony. The deposition transcript speaks for itself. However, given the repeated nature of the remarks, I will make a few comments to answer these unnecessary characterizations.

171. In support of its remarks, Inneos has cited to EX2048 at 64:25-69:15, 72:22-74:8, 169:17-175:22, 138:18-143:11, 150:3-152:15, 27:9-36:5, 37:2-39:17, 159:6-160:25. *See Response*, p. 87.

172. Looking at 64:25-69:15, I responded about how I construed “optical combiner” in my declaration from the district court in the related lawsuit regarding the '416 Patent. I answered questions about what “output” means. When asked if the output needs to be multiplexed, I explained that I had not given that opinion, and had not defined the term “multiplex,” which I would want to think about carefully before doing. The term “multiplex” is used in a variety of contexts – not just in wavelength division multiplexing as relevant to the '416 Patent, but in other contexts also. That is why I explained that the term “may have different connotations to it,” and it would be hard to define on the spot during a deposition. EX2048, 66:6-12, 17-21. The question may have seemed simple to counsel, but as I explained in the deposition, it was not, and I tried to answer forthrightly and carefully.

173. I was also asked about a construction different than the one I had proposed, i.e., inserting the term “singular” – which I had not used – into the construction of “optical combiner,” something that had not been proposed by any

party prior to the deposition. I explained: “again, because we're changing the words, I spent a fair amount of time being careful about the wording, so I'd want to think about what the -- what -- what the boundary conditions are for using that term.” EX2048, 69:8-12. Again, the question may have seemed simple to counsel, but I explained in the deposition why I did not think it was, and tried to answer forthrightly and carefully. In engineering, it is often important to consider various cases when defining terms, and it is a process that can require nuanced analysis not always suitable for being performed in the midst of a deposition.

174. Looking at 72:22-74:8, I was asked whether light receiving devices in LaMarche (one of the references used in the grounds) receive an output. I explained that LaMarche has a number of embodiments, and given that the term “output” is related to claim construction, I would like to be able to answer in terms of a specific example. EX2048, 73:8-19. While counsel may have thought this also was a simple question, as I explained, to answer carefully it would have been helpful to focus on a specific example. Counsel moved on to other questions, and did not give me an opportunity to address the question in terms of a specific embodiment from LaMarche. It also is not clear to me if the question as phrased (“receiving an output”) was what counsel meant, as opposed to receiving inputs that are then processed to form an output. Because counsel moved on, the issue was not clarified.

175. Again, I am not focusing on everything that Patent Owner cited to. The transcript speaks for itself. But looking at the last citation, to 159:6-160:25, I was asked about the term “butt coupling.” I explained that Lemoff uses the term, and that I thought it would be helpful to turn to Lemoff to see what it had to say. Counsel did not want me to do that, and so I explained how a POSITA may think of “butt coupling,” noting that I was doing so outside the context of Lemoff. *See* EX2048, 12-25. I directly answered the question, and also noted that it would be more helpful to turn to Lemoff which discusses the term. I fail to see how any of this is supposed

to show that I “repeatedly exhibited an inability to answer basic questions on claim construction and the prior art references,” as Patent Owner has argued.

176. As just one more example, Patent Owner has argued that “when asked how a POSITA would understand the phrase ‘to image the optical signal,’ which is contained in the paragraph that Dr. Willner relies on and a phrase he uses in his opinion (EX1003 ¶256), he said he would have to think about it and would not provide an answer beyond the four corners of his report.” Response, p. 59. As support, Patent Owner cites to EX2048 163:19-168:24. *Id.* When asked about the term, I immediately noted that I thought Lemoff had used it, and that it was somewhere in my report. *See* EX2048, 163:25-164:6. I was then told that I was being asked the question “beyond how a particular reference has used the term.” EX2048, 164:8-12. I explained that “‘Imaging’ is -- is a big term.” EX2048, 165:21. Imaging optics, particularly when not tied to a particular reference such as Lemoff, is a large field and the term imaging, or even the phrase “to image the optical signal,” may have different connotations depending on context. As I explained, it would be hard to give a careful definition on the spot in a deposition that fully captured the meaning. Again, counsel may have thought this was a simple question, but it is not. I tried to explain this during the deposition, and to give a careful and forthright answer.

177. In sum, I answered the questions I was asked, and tried to do so carefully. If I was asked a broad, open-ended question, or a question that was not simple or straightforward, I noted the particular concerns I had about the question. As I said, the transcript may speak for itself, but as I have the opportunity here in my supplemental declaration, I also want to be clear that my responses were not evasive or otherwise inappropriate.

V. CONCLUSION

178. The foregoing represents my opinion to date but as discussed above I reserve the right to supplement my opinion if, among other things, further evidence or information becomes available.

179. In signing this declaration, I understand that the declaration will be filed as evidence in a contested case before the Patent Trial and Appeal Board of the United States Patent and Trademark Office. I acknowledge that I may be subject to cross examination in the case and that cross examination will take place within the United States. If cross examination is required of me, I will appear for cross examination within the United States during the time allotted for cross examination.

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

Dated: July 26, 2024

Respectfully submitted,



Alan E. Willner, PhD