UNITED STATES DISTRICT COURT
EASTERN DISTRICT OF NEW YORK

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VEECO INSTRUMENTS INC.,

Plaintiff,

- against -

SGL CARBON, LLC, and SGL GROUP SE,

Defendants.

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MEMORANDUM & ORDER
No. 17-CV-2217 (PKC)

PAMELA K. CHEN, United States District Judge:

Plaintiff Veeco Instruments Inc. ("Veeco") brings this action against Defendants SGL Carbon, LLC ("SGL Carbon") and SGL Group SE ("SGL Group") (collectively, "SGL"), seeking damages and injunctive relief for SGL's alleged infringement of Veeco patents in violation of the Patent Act, 35 U.S.C. § 271. Before the Court are (1) Veeco's motion for a preliminary injunction against SGL Carbon (Dkt. 23), and (2) Veeco's motion for expedited discovery (Dkt. 21). For the reasons stated below, the Court grants Veeco's motion for a preliminary injunction and denies Veeco's motion for expedited discovery as moot.

BACKGROUND[1]

I. Overview

Plaintiff Veeco is a New York-based company that designs, manufactures, and services equipment that enables the manufacture of light-emitting diodes ("LEDs"), power electronics, hard drives, and other electronic components and devices. (Declaration of Sudhakar Raman ("Raman

[1] The facts stated in this Memorandum and Order ("Order") are based on the declarations, deposition transcripts, and exhibits submitted by the parties in connection with Plaintiff's motion for a preliminary injunction (Dkt. 23) and motion for expedited discovery (Dkt. 21). Where this Order makes factual determinations and inferences, or resolves factual disputes between the parties, those determinations, inferences, and resolutions represent the Court's findings for purposes of Federal Rule of Civil Procedure 52(a)(2).

Decl."), Dkt. 26-13, ¶¶ 4-5.) In 2003, Veeco began obtaining patents related to metal-organic chemical vapor deposition ("MOCVD") reactors, a technology that enables high-volume fabrication of metal-organic semiconductor wafers, which can, in turn, be processed into LEDs. (Raman Decl. ¶¶ 8, 11; Dkt. 25-7.) Between 2003 and 2016, Veeco invested more than $475 million in research and development, and intellectual-property acquisitions, to develop its MOCVD technology, and further spent millions of dollars more on sales, advertising, personnel, and infrastructure for its MOCVD products. (Raman Decl. ¶ 9.) Veeco's sales of MOCVD products and services increased gradually over the same timeframe, and, since 2014, Veeco has accounted for roughly 60% of the global MOCVD market. (Raman Decl. ¶ 9.)

Veeco attributes its dominant share of the MOCVD market, in large measure, to a distinctive feature of Veeco's MOCVD reactors: a removable wafer carrier, typically made of graphite, that is mounted on a spindle centrally positioned within the reactor. (Raman Decl. ¶¶ 10, 14, 24.) According to Veeco, this distinctive assembly—*i.e.*, a wafer carrier detachably mounted on a spindle—increases the throughput of Veeco's MOCVD reactors by up to 40% and confers additional advantages over MOCVD reactors that do not incorporate a similar assembly. (Raman Decl. ¶¶ 14-15; *see also* Reply Declaration of Dr. Alexander Glew ("Glew Reply Decl."), Dkt. 42-26, ¶ 83.) Veeco owns several patents related to this assembly, including U.S. Patent No. 6,726,769 (the '769 Patent), which is directed to Veeco's unique wafer carrier design. (Raman Decl. ¶ 11; *see also* Dkt. 20-1 (the '769 Patent).)

Although Veeco directly manufactures, sells, and services its MOCVD reactors, Veeco relies on third-party suppliers to manufacture and sell wafer carriers for those reactors. (Raman Decl. ¶¶ 18, 30.) To that end, Veeco has granted limited licenses to several suppliers, including SGL, authorizing them to manufacture and sell Veeco's proprietary wafer carriers to Veeco and

Veeco's customers, typically in exchange for a reasonable royalty for each wafer carrier sold. (Raman Decl. ¶ 32.) In particular, under various written agreements, Veeco has authorized SGL to manufacture and supply wafer carriers to Veeco and Veeco's customers since at least 2010. (Raman Decl. ¶¶ 34, 39.)[2]

In or around 2013, while continuing to manufacture wafer carriers for Veeco's MOCVD systems, SGL began manufacturing wafer carriers for a new entrant into the MOCVD market, a China-based company called Advanced Microfabrication Equipment, Inc. ("AMEC"). (Declaration of Christoph Henseler ("Henseler Decl."), Dkt. 36-4, ¶ 15.) After struggling to break into the MOCVD market in 2013, 2014, and 2015, AMEC began to see market traction in 2016, finishing the year with a small but significant share of global sales. (Dkt. 26-18 (IHS Technology Q1 2017 Report); Declaration of Dr. Kenneth Serwin ("Serwin Decl."), Dkt. 36-6, ¶ 28; Dkt. 54-3 (September 2017 AMEC Presentation).) AMEC's upward trend has continued in 2017, with some (including AMEC itself) predicting that AMEC could overtake Veeco as the market leader in MOCVD systems by the end of the year. (Dkt. 54-3; *see also* Reply Declaration of Christopher Gerardi ("Gerardi Reply Decl."), Dkt. 42-2, ¶ 20.)

According to Veeco, the recent surge in AMEC's market share is attributable in large part to SGL's infringement of certain U.S. patents that Veeco owns related to its spindle-mountable wafer carriers. (Pl.'s Br., Dkt. 26-1, at 2-3.) In particular, Veeco claims that SGL has infringed and, unless enjoined, will continue to infringe the '769 Patent by selling spindle-mountable wafer carriers to AMEC and AMEC's customers, in violation of 35 U.S.C. § 271. (Pl.'s Br. at 11-15.)

[2] The written agreements between Veeco and SGL Carbon do not grant SGL Carbon a general license to manufacture products infringing on the '769 Patent, but they also do not expressly prohibit SGL Carbon from supplying such products. (*See* Raman Decl., Exs. 1-4.) Veeco does not assert contract claims in this action.

In early 2017, prior to filing this action, Veeco informed SGL through in-person meetings and by letter that SGL is infringing Veeco's patents and requested that SGL cease sales of wafer carriers to AMEC and AMEC's customers. (Raman Decl. ¶ 42.) When SGL did not cease these sales, Veeco filed the above-captioned action to recover damages and to enjoin SGL Carbon[3] from further infringement. (Raman Decl. ¶ 42; Compl., Dkt. 1 (filed April 12, 2017).)

II. Veeco's Patents

Veeco's claims of patent infringement against SGL Carbon are based on two U.S. patents that were obtained by Emcore Corporation ("Emcore") in 2001 and later acquired by Veeco through an acquisition of Emcore's MOCVD division in 2003. (Raman Decl. ¶ 8; Dkt. 25-7; Dkt. 20-1; Dkt. 20-2.) The two patents are U.S. Patent No. 6,506,252 (the '252 Patent, Dkt. 20-2), and U.S. Patent No. 6,726,769 (the '769 Patent, Dkt. 20-1), the latter of which is a "continuation" of the '252 Patent that "incorporates [the '252 Patent] by reference in its entirety" ('769 Patent 1:8-15). Both patents are titled "Susceptorless Reactor for Growing Epitaxial Layers on Wafers by Chemical Vapor Deposition," and both patents have the same specification. (*Compare* Dkt. 20-2, *with* Dkt. 20-1); *see also Broadcom Corp. v. Qualcomm Inc.*, 543 F.3d 683, 689-90 (Fed. Cir. 2008) (reviewing continuation patents "sharing the same specification"); *AK Steel Corp. v. Sollac*, 344 F.3d 1234, 1236 (Fed. Cir. 2003) (same).[4]

The '769 Patent gives a general description of the field of the invention and the general purposes of the invention. The specification states that, "[t]he present invention relates to making

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[3] Although the complaint names SGL Carbon and SGL Group as co-defendants, Veeco's motion for a preliminary injunction is directed only to U.S.-based SGL Carbon. (Dkt. 23.)

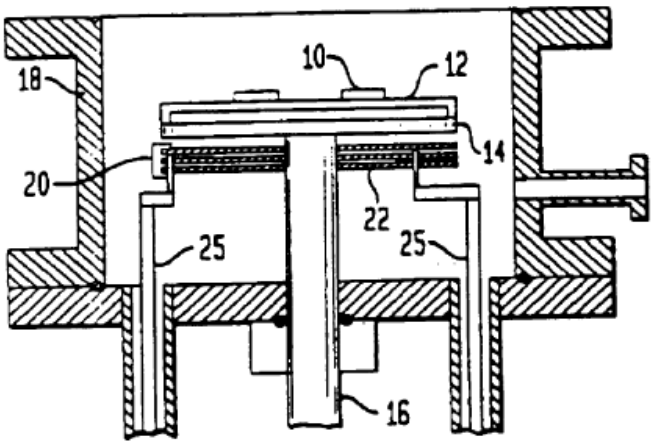
[4] "A continuation patent application is an application filed subsequently to another application, while the prior application is pending, disclosing all or a substantial part of the subject-matter of the prior application and containing claims to subject-matter common to both applications, both applications being filed by the same inventor or his legal representative." *Wi-LAN USA, Inc. v. Ericsson, Inc.*, 675 F. App'x 984, 987 n.2 (2017) (quotation omitted).

semiconductor components and more particularly relates to devices for growing epitaxial layers on substrates, such as wafers." ('769 Patent 1:18-20.) According to the specification, in the "typical" chemical vapor deposition process, a solid substrate, "usually a wafer, is exposed to gases inside a CVD reactor. Reactant chemicals carried by the gases are introduced over the wafer in controlled quantities and at controlled rates while the wafer is heated and usually rotated. . . . When the reactant gas reaches the vicinity of a heated wafer, the organic components [of the gas] decompose, depositing the inorganic components on the surface of the wafer in the form of . . . epitaxial layers." ('769 Patent 1:50-2:5.) Thereafter, "the coated wafers are subjected to well-known further processes to form semiconductor devices such as lasers, transistors, light emitting diodes, and a variety of other devices." ('769 Patent 1:33-36.)

A. Typical Prior Art

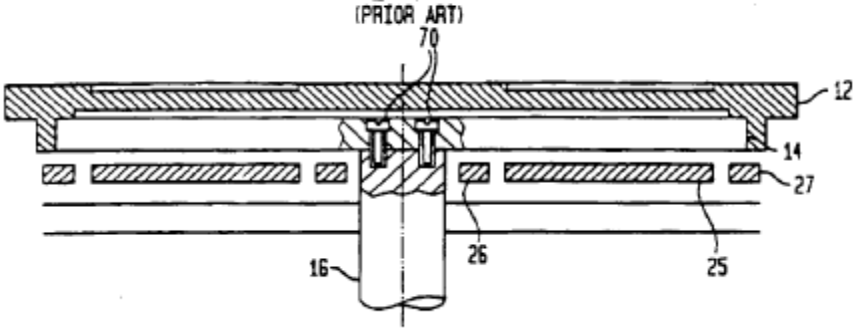
In relevant part, the '769 Patent specification describes the prior art as a "vertical CVD reactor" in which "a wafer **10** is placed on a wafer carrier **12**, which is placed on a susceptor **14**." ('769 Patent 2:33-35.) "The susceptor **14** is permanently mounted and supported by a rotatable spindle **16**, which enables rotation of the susceptor **14**, the wafer carrier **12** and the wafer **10**." (*Id.* 2:39-42.) "A heating assembly **20**, which may include one or more heating filaments **22**, is arranged below the susceptor **14**," such that "[t]he heating assembly **20** heats the susceptor **14**, the wafer carrier **12** and, ultimately, the wafer **10**." (*Id.* 2:44-49.) In the normal operation of the prior art, "[a]s the wafer-supporting assembly (spindle/susceptor/wafer carrier) rotates the heated wafer **10**, the reactant gas is introduced into the reaction chamber **18**, depositing a film on the surface of the wafer **10**." (*Id.* 2:53-56.) This "typical" prior art is illustrated in the following diagrams from the '769 Patent, the components of which refer to the numbering stated in this paragraph.

FIG. 1
(PRIOR ART)



('769 Patent at ECF[5] 3.)

FIG. 4
(PRIOR ART)



('769 Patent at ECF 6.)

The '769 Patent specification then describes certain shortcomings of the typical prior art, each of which relates to the prior art's incorporation of a "susceptor" as part of the "wafer-

[5] "ECF" refers to the pagination generated by the Court's CM/ECF system, and not the document's internal pagination.

supporting assembly (spindle/susceptor/wafer carrier)" that rotates the substrate wafers during the deposition process. ('769 Patent 2:53-55.)

First, a CVD reactor "having both a susceptor and a wafer carrier contains at least two thermal interfaces": one interface between the heating assembly and the susceptor, and a second interface between the susceptor and the wafer carrier. ('769 Patent 2:66-3:3.) The drawback of this feature is that "the typical susceptor possesses a significant heat capacity, and thus a large thermal inertia, substantially increasing the time required to heat and cool down the wafer carrier **12**. This results in a longer reactor cycle and consequent reduction in the productivity of the reactor." (*Id.* 3:13-18.)

Second, in CVD reactors with a susceptor, "the susceptor must withstand a large number of reactor cycles since it is permanently mounted in the reaction chamber, and typically may not be easily replaced without interrupting the reactor cycle, opening up the reactor and removing the parts that permanently attach the susceptor to the spindle, such as screws, bolts and the like." ('769 Patent 3:23-29 (illustration reference number omitted).)

Third, "every additional interface in the wafer-supporting assembly," including the interfaces with the susceptor, "increases the manufacturing tolerance requirements" of the CVD reactor, because, for example, "the spacing between the susceptor **14** and the wafer carrier **12** must be precise and uniform to produce the required uniform heating of the wafer." ('769 Patent 3:34-40.) The specification explains that, over time, the susceptor may gradually become deformed due to its exposure to extreme heat, and "[t]he accumulated deformation of the susceptor eventually may lead to an excessive vibration of the wafer-supporting assembly during rotation in the deposition process, and the resulting loss and destruction of coated wafers." (*Id.* 3:49-54.)

Fourth, in a CVD reactor with a permanently mounted susceptor, "the susceptor is typically rigidly attached to the spindle to minimize the vibration during the operation of the reactor. The spindle/susceptor connection is heated during the repeated operation of the reactor and sometimes becomes difficult to disassemble, complicating the maintenance and the replacement procedures." ('769 Patent 3:55-61.)

Fifth and finally, susceptors typically increased the weight of the wafer-supporting assembly in a CVD reactor, which is problematic because "the heavier is the wafer-supporting assembly, the larger is the mechanical inertia of the spindle. In turn, the high mechanical inertia increases the strain on the spindle-supporting assembly, reducing its lifetime." ('769 Patent 3:62-65.)

B. Description of the Invention

The '769 Patent specification states that "[t]he present invention" addresses the shortcomings of the prior art, described above, "by providing a novel CVD reactor in which the wafer carrier is placed on the rotatable spindle without a susceptor, and a related method of growing epitaxial layers in a CVD reactor." ('769 Patent 4:8-12; *see also id.* 8:55-57 ("In contrast to the prior art CVD reactor shown . . . , the reactor of the present invention does not include a susceptor.").)[6] The patent specification then speaks of the "invention" as having multiple aspects. One aspect of the invention is "an apparatus for growing epitaxial layers on one or more wafers by chemical wafer deposition . . . and includes a reaction chamber, a rotatable spindle, a heating means for heating the wafers and a wafer carrier for supporting and transporting the wafers between a deposition position and a loading position." (*Id.* 4:38-44.) As another aspect of the invention, the specification refers to "a method of growing epitaxial layers on one or more wafers

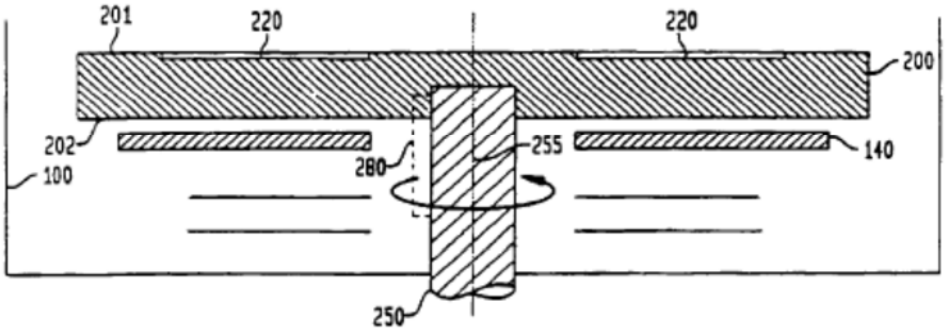
[6] The "related method" is disclosed in another patent, U.S. Patent No. 6,685,774 (the '774 Patent), which, like the '769 Patent, is a continuation of the '252 Patent. (*See* Compl., Dkt. 1, Ex. C at ECF 88.)

by chemical wafer deposition." (*Id.* 6:64-66.) As another aspect, the specification describes "[t]he wafer carrier of the invention," which "may include a top surface and a bottom surface" with certain physical characteristics. (*Id.* 5:1-10.) As another aspect, the specification also delineates "the wafer-supporting assembly of the present invention," which, in contrast to the prior art, does not include a susceptor. (*Id.* 7:49-53.)

C. Illustrations of the Invention

The specification contains illustrations showing the different aspects and embodiments of the invention.[7] One illustration, reproduced below, is described as "a highly schematic front cross-sectional view of the wafer-supporting assembly of the present invention, showing the wafer carrier mounted on the upper end of the spindle in the deposition position." ('769 Patent 7:49-53.)

FIG. 5A



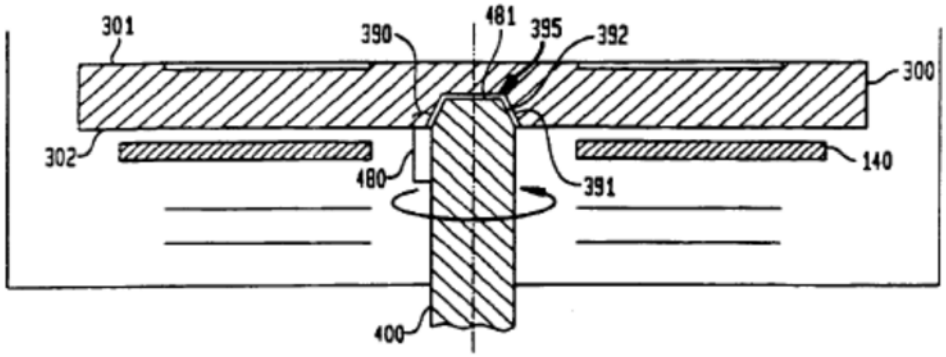
('769 Patent at ECF 6.) This illustration shows "the reaction chamber **100**, a spindle **250** having an upper end **280** located inside the reaction chamber **100**, a wafer carrier **200** and a radiant heating element **140**." ('769 Patent 10:53-57.) As shown in the illustration, the wafer-supporting assembly of the invention does not include a susceptor; instead, the wafer carrier is mounted

[7] The specification states: "It shall be understood that these embodiments are not limiting and the present invention encompasses any subject matter that is within the scope of the appended claims." ('769 Patent 10:35-39.)

directly on the end of the spindle. Also as shown in the illustration, "[t]he spindle **250** has a cylindrical shape and an axis of rotation **255**," and, during the deposition process, "the upper end **280** of the spindle **250** is inserted in the central recess **290** of the wafer carrier **200**." (*Id.* 11:1-16.)

Another illustration shows a variation of the wafer-supporting assembly with a modified spindle:

FIG. 6A

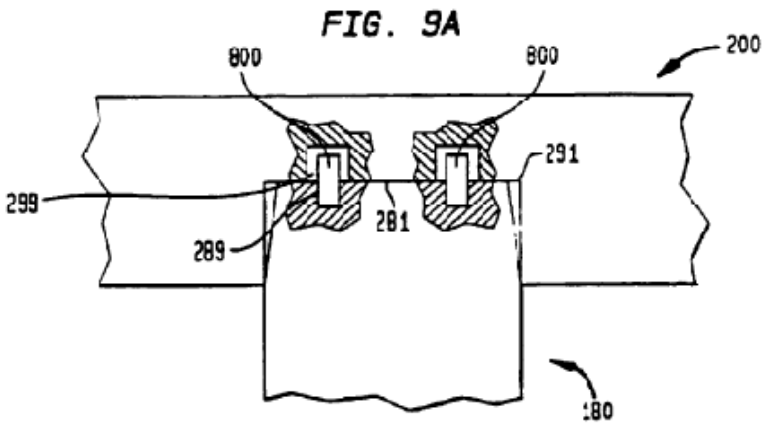


('769 Patent at ECF 8.) The specification explains that, in this variation of the invention, "the spindle **400** includes a narrow portion **485**, [which] includes the spindle wall **482**, [and] terminates in a top surface **481**." (*Id.* 12:4-7.) The distinctive aspect of this variation is that, unlike other variations, "the upper end **480** of the spindle **400** is inserted into the central recess **390** until there is a tight fit between the spindle wall **482** and the walls of the recess **390**, which creates a force of friction for retaining the wafer carrier **300** in the deposition position." (*Id.* 12:16-21.)[8]

Finally, the specification contains several illustrations showing the possibility of a separate "retaining means" in the wafer-supporting assembly. ('769 Patent 11:42-61.) As the specification

[8] With respect to the structure of the spindle, the specification also states: "The upper end of the spindle preferably terminates in a substantially flat top surface, which is also substantially perpendicular to the axis of rotation of the spindle." ('769 Patent 6:15-17.)

explains, "[t]he invention does not exclude the possibility that intermediate elements may be present between the spindle **120** and the wafer carrier **110**, for example the elements that would facilitate retaining the wafer carrier **110** on the spindle **120**, such as rings, retainers, and the like, as long as these intermediate elements do not interfere with the removal or detachment of the wafer carrier . . . [during] the normal course of the operation of the reactor." (*Id.* 8:60-67.) As examples of such retaining elements, the specification contains illustrations depicting spindles that include vertical indentations or notches that could be fitted into a correspondingly designed wafer carrier, as a means to improve the fit between the spindle and the wafer carrier, as shown in the figure below:



(*Id.* at ECF 11.)

D. Relevant Claims

Although the '252 Patent and '769 Patent share the same title and specification, their claims are markedly different. The claims of the '252 Patent are directed to an apparatus comprising (i) a reaction chamber, (ii) a rotatable spindle, (iii) a wafer carrier, and (iv) a heating element. (*See* Dkt. 20-2 at ECF 18.) By contrast, the claims of the '769 Patent are directed more narrowly to the wafer-supporting assembly of the apparatus disclosed in the '252 Patent—*i.e.*, the wafer carrier

and the spindle assembly for such a reactor. (*See* '769 Patent at ECF 18-19.) For purposes of this dispute, the relevant claims of the '769 Patent are as follows:

> **1.** An apparatus for supporting and transporting at least one wafer in a CVD reactor having a rotatable spindle, said apparatus comprising:
>
> > a top surface having at least one cavity for retaining said at least one wafer, and
> >
> > a bottom surface having a central recess adapted for detachably inserting an upper end of said rotatable spindle;
> >
> > said apparatus being transportable, in the normal course of operation of the CVD reactor, between a position in which said spindle is inserted into said central recess for rotation therewith and a position detached from said spindle.
>
> **2.** The apparatus of claim **1**, wherein said central recess extends from said bottom surface of said apparatus to a recess end point, which is located at a lower elevation than said top surface of said apparatus and at a higher elevation than said bottom surface of said apparatus.
>
> **3.** The apparatus of claim **2**, wherein said central recess comprises a recess wall and an end surface, said recess wall extending from said bottom surface of said apparatus toward said end surface of said central recess.
>
> **4.** The apparatus of claim **3**, wherein said recess wall terminates at said end surface.
>
> **5.** The apparatus of claim **4**, wherein said end surface contains said recess end point.
>
> **. . .**
>
> **10.** The apparatus of claim **3** having a center of gravity located below said end surface of said central recess.
>
> **. . .**
>
> **13.** The apparatus of claim **1**, wherein said top surface and said bottom surface of said apparatus are substantially parallel to each other.

14. The apparatus of claim **1**, wherein said top surface has a plurality of cavities for retaining a plurality of wafers.

15. The apparatus of claim **1** having a substantially round shape.

16. The apparatus of claim **1**, which is made of graphite.

. . .

22. A wafer-supporting assembly of a CVD reactor comprising:

a. a rotatable spindle having an upper end; and

b. a wafer carrier for transporting and providing support for at least one wafer; said wafer carrier comprising a top surface having at least one cavity for retaining said at least one wafer and a bottom surface having a central recess adapted for detachably inserting said upper end of said spindle;

wherein said wafer carrier is transportable, in the normal course of operation of the CVD reactor, between a position in which said upper end of said spindle is inserted into said central recess of said wafer carrier for rotation therewith and a position detached from said upper end of said spindle.

('769 Patent at ECF 18-19.)

III. Allegedly Invalidating Prior Art

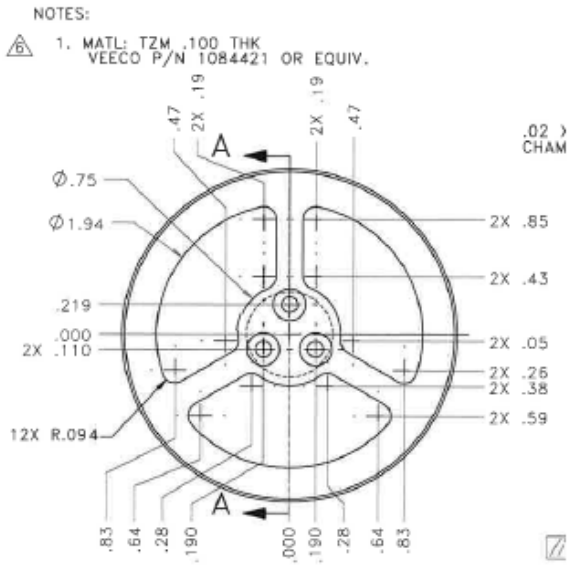
SGL Carbon asserts that two products on the market prior to Emcore's application for the '769 Patent invalidate that patent. (Def.'s Opp'n, Dkt. 36-6, at 10-17.)

A. Emcore's D-180 "Wagon Wheel"

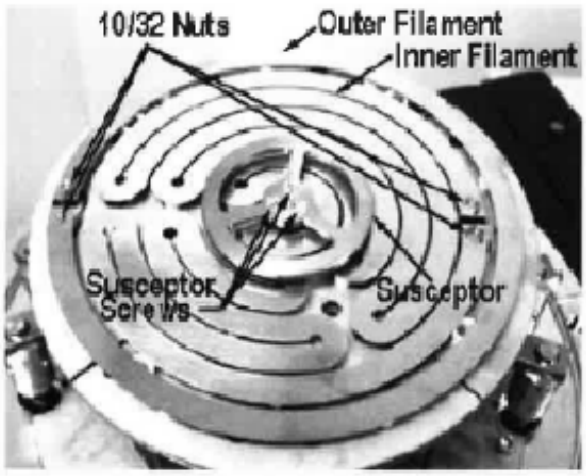
Several years before submitting the application that yielded the '769 Patent, Emcore began to manufacture and market a new model of MOCVD reactor called the D-180. (Declaration of Eric Armour ("Armour Decl."), Dkt. 42-8, ¶¶ 9, 18.)[9] For purposes of Veeco's motion, the key feature of the D-180 was a metal component in the shape of a wagon wheel—*i.e.*, a metal structure

[9] Emcore sold at least two D-180 systems in the 1999-2000 timeframe. (Armour Decl. ¶ 18.)

with an outer ring and three straight segments connecting the outer ring to a circular centerpiece, as depicted in the following schematic for the D-180:

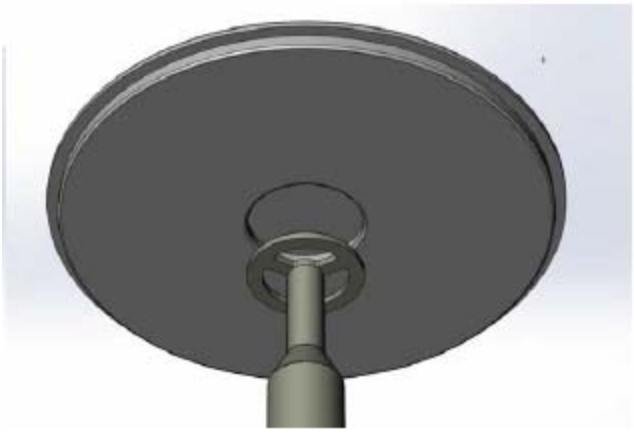


(Armour Decl., Ex. 4.) In a fully assembled D-180 reactor, this so-called wagon wheel was affixed by screws to the top of a rotatable spindle within the reactor, with the "rim" of the wagon wheel extending upward and outward over the heating coils of the reactor, as shown in the following photograph excerpted from the Operations and Maintenance Manual for the D-180 system[10]:



[10] In the photograph, the wagon wheel is labeled "Susceptor." (Armour Decl. ¶ 21.)

(Armour Decl. ¶ 21.) During the normal operation of the D-180 reactor, a graphite wafer carrier (not depicted in the photograph above) would be placed on top of the wagon wheel with the "rim" of the wagon wheel fitting into a central recess on the underside of the wafer carrier, as depicted in the following diagram prepared by SGL Carbon's expert:



(Surreply Declaration of Dr. Eric Bretschneider ("Bretschneider Surreply Decl."), Dkt. 49-4, ¶ 54; *see also* Armour Decl. ¶ 21.)[11]

Prior to Emcore's application for the '252, '769, and '774 Patents, SGL Carbon manufactured and sold graphite wafer carriers to third parties within the United States for combination with the wagon wheel in D-180 systems. (Henseler Decl. ¶¶ 29, 31, 33, 34, 38.) Each such wafer carrier had the same basic structure: an overall diameter of about 7.2 inches, a thickness of about .21 inches, six cavities on the top surface for carrying 2-inch wafers, and a circular bottom recess with a diameter of about 2.44 inches and a depth of exactly .106 inches to accommodate the rim of the D-180 wagon wheel. (*Id.*)

[11] Although the diagram prepared by SGL Carbon's expert is not drawn to scale (*see* Glew Reply Decl. ¶ 50), his measurements indicate that the wagon wheel covers about 7-12% of the bottom surface of the D-180 wafer carrier (Bretschneider Decl. ¶ 51).

B. SGL Carbon's "Hockey Puck"

According to SGL Carbon, prior to Emcore's application for the '252, '769, and '774 Patents, SGL Carbon manufactured and sold a product, called a "hockey puck," that is relevant to the present dispute. (Def.'s Opp'n at 14-15.) The documentary evidence concerning this "hockey puck" product, however, is scant, consisting of a single SGL Carbon schematic (Henseler Decl., Ex. 10), which an SGL Carbon witness identified as "[a] drawing based on a design by another SGL customer" (Henseler Decl. ¶ 37). The schematic, labeled "HOCKEY PUCK," depicts a cylindrical object with a two-inch-diameter cavity on one side and a smaller, deeper recess on the other side. (Henseler Decl., Ex. 10.) But the schematic does not contain any description of the product's intended alignment, function, or use. (Henseler Decl., Ex. 10.) SGL Carbon's expert, Dr. Bretschneider, declared his "understand[ing]" that the "hockey puck" is a wafer carrier for MOCVD reactors, but, according to his declaration, that understanding is based entirely on the SGL Carbon schematic. (*See* Bretschneider Decl. ¶¶ 145-85 (citing exclusively Henseler Decl., Ex. 10).)

According to SGL Carbon, the "hockey puck" was sold by SGL Carbon to customers in the United States as early as 1992. (Def.'s Opp'n at 14.) SGL Carbon makes this assertion based on testimony from its Vice President of Global Marketing and Sales, Christoph Henseler, who was hired by SGL Carbon in November 2008 (Henseler Decl. ¶ 2), roughly sixteen years after SGL Carbon allegedly began selling the hockey puck. Henseler testified that, based on his knowledge of SGL Carbon's conventions for the creation of product schematics, he could infer from the existence of the hockey puck schematic that "SGL was manufacturing and selling wafer carriers in accordance with the [schematic] . . . in the United States in within a year of this [schematic], thus by 1995 or 1996." (Henseler Decl. ¶ 37.)

IV. Alleged Infringement by SGL Carbon

Veeco claims that SGL Carbon's sales of wafer carriers to AMEC and AMEC's customers for combination in AMEC MOCVD reactors infringe the '769 Patent.[12]

A. SGL's Sales of Wafer Carriers for AMEC Reactors

According to Henseler, SGL Carbon's Vice President of Global Marketing and Sales, SGL Carbon has been a supplier of wafer carriers to AMEC since May 2013. (Henseler Decl. ¶ 15.) In that time, SGL Carbon has manufactured and sold two models of wafer carriers for combination in AMEC reactors—one model with a diameter of 480mm and one with a diameter of 700mm. (Henseler Dep.[13] 43:19-44:10.) SGL Carbon produces each of the models according to AMEC's exact specifications, which AMEC supplied to SGL Carbon. (Henseler Decl. ¶ 5.)[14] The record indicates, and the parties appear to agree, that the 480mm wafer carrier is designed for combination in AMEC's first-generation Prismo D-Blue MOCVD reactor, which AMEC began selling in 2013, and the 700mm wafer carrier is designed for combination in AMEC's second-generation Prismo D-Blue MOCVD reactor, which AMEC began selling in 2016. (Henseler Decl. ¶ 15; Serwin Decl. ¶ 20; Hr'g Tr. 32, 74, Oct. 12, 2017.)[15]

The record contains very little detail on the wafer carriers that SGL Carbon has been supplying to AMEC and AMEC's customers. At this early stage of litigation, Veeco has not

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[12] SGL Carbon does not manufacture or sell CVD reactors or spindles for CVD reactors. (Henseler Decl. ¶¶ 8-9; Hr'g Tr. 4:23-5:3, July 18, 2017; Pl.'s Br. at 15.)

[13] "Henseler Dep." refers to the transcript of the deposition of Christoph Henseler taken on August 30, 2017. (Dkt. 42-27.)

[14] Henseler also testified that he does not know "the mechanical design of any AMEC MOCVD reactor," and that SGL Carbon does not promote or encourage using the wafer carriers in spindle assemblies in CVD reactors. (Henseler Decl. ¶¶ 18-20.)

[15] SGL Carbon represents that the specifications for the 480mm and the 700mm wafer carrier models "have not undergone substantive technical or design changes since 2013." (Henseler Decl. ¶ 22.)

received any documents from SGL Carbon describing or depicting the wafer carriers, and none of the SGL witnesses deposed by Veeco had detailed knowledge of the characteristics of the products. In the course of briefing the pending motion, however, Veeco obtained from an unidentified source a photograph depicting the bottom surface of a 700mm wafer carrier that SGL Carbon manufactured for an AMEC reactor. (Raman Dep.[16] 315:4-316:25.)[17] The photograph depicts the bottom of a wafer carrier with a small, oval-shaped central recess, which, according to Veeco's expert, Dr. Glew, is adapted to be detachably mounted on a rotatable spindle in a CVD reactor. (Glew Reply Decl. ¶ 69.) SGL Carbon does not dispute Veeco's contention that the photograph depicts a 700mm wafer carrier for an AMEC MOCVD reactor, and SGL Carbon has not rebutted Dr. Glew's testimony that the 700mm wafer carrier contains a small central recess adapted for detachable mounting on a rotatable spindle. (*See* Hr'g Tr. 188-89, Oct. 12, 2017.)[18]

B. AMEC's MOCVD Reactors

As noted above, SGL Carbon supplies 480mm and 700mm wafer carriers for AMEC's first- and second-generation Prismo D-Blue MOCVD reactors, respectively. (Bretschneider Decl. ¶ 191; Declaration of Dr. David Radulescu ("Radulescu Decl."), Dkt. 35, Ex. 32 at 20.) Neither party, however, has submitted direct evidence of the features of either generation of AMEC's Prismo D-Blue

[16] "Raman Dep." refers to the transcript of the deposition of Sudhakar Raman taken on August 11, 2017. (Dkt. 36-9.)

[17] The record does not indicate where Veeco obtained the photograph, nor does the photograph explicitly identify the size of the wafer carrier or the brand of MOCVD reactor for which it was produced. (Raman Dep. 315:4-316:25; Glew Reply Decl. ¶ 68.)

[18] (*See also* Def.'s Opp'n to Mot. for Expedited Discovery, Dkt. 34, at 1 (taking the position that "no factual discovery [concerning the 700mm wafer carriers supplied to AMEC] is warranted at this early stage, because the factual evidence on record is sufficient for the Court [to adjudicate infringement]," and thus conceding that the 700mm wafer carriers possess the physical characteristics described in claim 1 of the '769 Patent, including the characteristic of being adapted for detachable mounting on a rotatable spindle).)

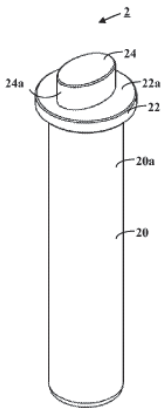
reactor. Instead, Veeco has submitted, among other things, academic articles concerning AMEC's Prismo D-Blue MOCVD technology, copies of AMEC marketing materials, a patent application submitted to the U.S. Patent Office by AMEC, and testimony by Veeco's expert, Dr. Glew, based on these materials and other evidence. (Glew Decl., Dkt. 24; Glew Reply Decl., Dkt. 42-26.) By contrast, SGL Carbon asserts that it does not know the features of AMEC's MOCVD reactors (Def.'s Opp'n at 9; Henseler Decl. ¶¶ 18-20) and has offered no evidence to rebut the circumstantial evidence introduced by Veeco, other than to argue that Veeco's evidence concerning AMEC's Prismo D-Blue reactor is limited entirely to AMEC's *first-generation* Prismo D-Blue system, which is "not relevant" to AMEC's second-generation system. (*See, e.g.*, Hr'g Tr. 140, Oct. 12, 2017.)

Together, the materials and expert testimony submitted by Veeco provide significant evidence of the characteristics of both generations of AMEC's Prismo D-Blue MOCVD reactor. As Dr. Glew explained, a 2013 academic paper concerning AMEC's Prismo D-Blue system reported that the Prismo D-Blue system uses a "high-speed rotating mechanism" for rotating wafer carriers inside its reactors. (Glew Decl. ¶ 30.) Based on other academic papers published in or around 2013, and copies of AMEC marketing materials from 2013, Dr. Glew opined that the Prismo D-Blue is an "automated system with a 'loading station' for wafer carriers," which suggests that wafer carriers in the Prismo D-Blue system "are detachable from the rotating [mechanism] and transportable in the ordinary course of operation of the reactor." (Glew Decl. ¶ 30.)

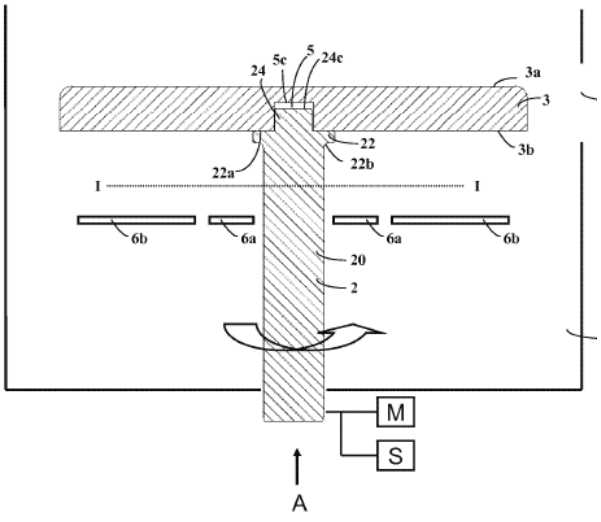
In addition, Dr. Glew reviewed U.S. Patent Application No. 13/681,768 (AMEC's '768 Application, Dkt. 25-4), which AMEC filed in 2013. (Glew Decl. ¶ 31 (citing AMEC's '768 Application).) As relevant to Plaintiff's motion, AMEC's '768 Application disclosed a "supporter" for an MOCVD reactor that "can be detachably connected to a substrate carrier, and support the substrate carrier evenly and reliably while driving the substrate carrier to rotate evenly

and reliably in substrate processing." (AMEC's '768 Application at 2; *see also* Glew Decl. ¶ 31.) AMEC's '768 Application described the proposed invention as a "holding apparatus" to improve the synchronous movement between the "substrate carrier" and the "spindle" of a CVD reactor. (Dkt. 25-4 at 1-2.) AMEC's '768 Application defines the holding apparatus as comprising "a spindle part; a supporting part connected to one end of the spindle part and extending outwardly from the periphery of the spindle part, the supporting part including a supporting surface; and at least one plug-in part connected to the spindle part and extending by a height towards the first surface of the substrate carrier," as depicted in the following diagrams:

Fig. 2B



(AMEC's '768 Application at ECF 26.)



(*Id.* at ECF 25.) Dr. Glew opined that the descriptions and illustrations in AMEC's '768 Application "further support" his opinion that AMEC's Prismo D-Blue system employs wafer carriers that are detachably mounted on spindles within the MOCVD reactor. (Glew Decl. ¶¶ 31-32.)[19]

Finally, Dr. Glew gave testimony that is probative of the features of AMEC's Prismo D-Blue reactor system when he examined a recently obtained photograph of the underside of the 700mm wafer carrier manufactured by SGL Carbon for a second-generation AMEC Prismo D-Blue reactor. (Glew Reply Decl. ¶¶ 68-69.) With respect to that wafer carrier, Dr. Glew opined that the mere structure of the wafer carrier—namely, having a small, oval-shaped central recess on its bottom side—was itself evidence that the MOCVD reactor for which the carrier was created used a spindle, which could be inserted and removed from the wafer carrier's central recess during the ordinary course of operating the reactor. (*See* Glew Reply Decl. ¶¶ 68-69.) Although Dr. Glew may not have been aware that AMEC began selling a second-generation Prismo D-Blue system in 2016 (*see* Glew Dep.[20] 412:21-414:23), his testimony about the 700mm wafer carrier nonetheless applied directly to the second-generation system, because, as SGL Carbon acknowledges, the 700mm wafer carrier was manufactured for AMEC's second-generation system. (Bretschneider Decl. ¶ 191; Radulescu Decl., Dkt. 35, Ex. 32 at 20; Hr'g Tr. 137, Oct. 12, 2017.) Based on all of the evidence he reviewed, Dr. Glew opined that "any wafer carrier used in the [Prismo D-Blue] reactor system would necessarily be detachable from the spindle." (Glew Decl. ¶ 30.)[21]

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[19] In addition, AMEC's '768 Application illustrates the prior art with a diagram, designated Figure 1, that is nearly an exact copy of an illustration of Veeco's invention in the specification of the '769 Patent. (*Compare* AMEC's '768 Application at ECF 25 (Figure 1), *with* '769 Patent at ECF 8 (Figure 6A).)

[20] "Glew Dep." refers to the transcript of the deposition of Dr. Alexander Glew taken on September 19, 2017. (Dkt. 49-6.)

[21] Certain AMEC marketing materials promoting the Prismo D-Blue system use the word "susceptor." (Glew Decl., Ex 6 at 3, 5; Glew Decl., Ex. 7 at 4-7; Glew Decl., Ex. 8 at 16.) However, read in context, these references to "susceptor" clearly refer, in substance, to CVD wafer

Dr. Glew's testimony about the features of AMEC's Prismo D-Blue system is also consistent in material respects with the testimony of SGL Carbon's own experts. In his first declaration, dated August 25, 2017, SGL Carbon's expert, Dr. Bretschneider, opined, *inter alia*, that MOCVD reactors manufactured by Tang Optoelectronics Equipment Co. ("TOPEC"), another competitor of Veeco (discussed *infra*), are "susceptorless and utilize removable wafer carriers designed for high speed rotation, similar to those used by both Veeco *and AMEC*." (Bretschneider Decl. ¶ 204 (emphasis added).) Similarly, SGL Carbon's economics expert, Dr. Serwin, stated that he understands, based on "conversations with Dr. Bretschneider," that "Veeco, *AMEC*, and TOPEC MOCVD reactors are all susceptorless and use removable wafer carriers designed for high speed rotation." (Serwin Decl. ¶ 24 (emphasis added).)

V. Relevant Markets

The parties have submitted evidence concerning the global market for MOCVD reactors and the global market for wafer carriers for MOCVD reactors.

A. Market for MOCVD Reactors

1. Manufacturers

Since 2010, the global market for MOCVD reactors has been supplied by a small group of manufacturers: Veeco, AMEC, Aixtron SE ("Aixtron"), Taiyo Nippon Sanso ("Taiyo"), and TOPEC. (Declaration of Christopher Gerardi ("Gerardi Decl."), Dkt. 26-2, ¶¶ 38-39; Serwin Decl. ¶¶ 12-21.) Broadly speaking, from 2010 through 2016, the main competitors in the market for MOCVD reactors were Aixtron, Taiyo, and Veeco, with Veeco's share of the market rising to nearly 70% in 2016 based on units sold, at the expense of gradual losses in market share by Aixtron and

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carriers that can be transported in and out of the reactor during the normal operation of the Prismo D-Blue system, and not the type of "susceptor" referenced as prior art in the '769 Patent.

Taiyo. (Gerardi Decl. ¶ 39; Serwin Decl. ¶ 27.) According to Veeco, its growing dominance in the MOCVD reactor market is attributable to the "innovative and cost-effective designs" of its MOCVD reactors—most importantly, that Veeco's reactors feature easily removable wafer carriers mounted on susceptorless wafer-supporting assemblies. According to Veeco, it is this feature, which is not embodied in the MOCVD systems offered by Aixtron and Taiyo (Raman Decl. ¶ 23), that has led customers to gradually disfavor Aixtron and Taiyo systems in recent years. (Gerardi Decl. ¶ 39; Serwin Decl. ¶ 28; Bretschneider Decl. ¶ 202.)[22]

The competitive landscape among MOCVD manufacturers appears to have changed in late 2016 and throughout 2017. In terms of the market overall, Veeco's expert, Dr. Christopher Gerardi, reports that "Wall Street analysts who closely follow the MOCVD industry appear to believe that the market is currently in the early stage of an expansion." (Gerardi Decl. ¶ 41.) With respect to competition among manufacturers, the record shows that AMEC has competed far more effectively with Veeco in 2017, winning numerous customer orders over competing bids from Veeco, particularly among Chinese customers. (Gerardi Decl. ¶¶ 36, 55-57; Raman Decl. ¶¶ 48-49.) Although the parties quibble over the exact numbers, the present record shows that AMEC's share of the MOCVD market in 2017 has increased from a relatively minor position in 2016 (less than 10% of sales[23]) to a much larger share; indeed, in a recent presentation, AMEC projected that it will eclipse Veeco as the largest seller of MOCVD reactors in 2017. (Dkt. 54-3.) In addition, there is some evidence that TOPEC has become a slightly more significant competitor in the MOCVD market in 2017. (Serwin Decl. ¶¶ 25-26.) The record strongly indicates, however,

[22] SGL Carbon does not meaningfully dispute that, since 2016, Aixtron and Taiyo have been unable to compete effectively with Veeco in the global market for MOCVD systems. (*See, e.g.*, Serwin Decl. ¶ 27.)

[23] (*See* Serwin Decl. ¶ 28.)

that TOPEC has not become anything more than a potential competitor in this market—indeed, with the exception of a single MOCVD sale by TOPEC in June 2017, the record contains no evidence that TOPEC has garnered significant market share in 2017. (*See* Gerardi Reply Decl. ¶¶ 11-23; Dkt. 54-3.)[24]

The parties give diverging explanations for the recent surge in AMEC's market share. Veeco's overall explanation for AMEC's recent success is that AMEC is competing with Veeco using Veeco's own patented technology, including wafer-supporting assemblies that infringe on Veeco's U.S. Patents, while undercutting Veeco on price due to subsidies by the Chinese government and a lower historical cost of capital. (Pl.'s Br. at 7-10; Pl.'s Reply Br., Dkt. 42-1, at 12-13.) According to Veeco, the effects of AMEC's unfair use of Veeco's technologies began to materialize in late 2016 or early 2017, and not earlier, because AMEC's MOCVD reactors were first field tested and "customer qualified" by potential customers in China in 2016. (Dkt. 26-18 (IHS Technology Q1 2017 Report); Raman Decl. ¶ 49 n.1.) It was then, Veeco asserts, that AMEC's MOCVD reactors entered the market in earnest, after which AMEC began to benefit from the ability to offer an MOCVD system that is comparable in performance to Veeco's, with the necessary, patent-infringing wafer carriers supplied by SGL Carbon. (Hr'g Tr. 56, Oct. 12, 2017; *see also* Hr'g Tr., Oct. 13, 2017.)[25]

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[24] SGL Carbon's economic expert, Dr. Serwin, contends that TOPEC is one of the "main competitors" in the MOCVD market. Indeed, a central premise of Dr. Serwin's rebuttal to Dr. Gerardi's economic opinions is that "TOPEC [can] offer a MOCVD reactor competitive with AMEC's Prismo D-Blue at a price comparable to the AMEC price." (Serwin Decl. ¶ 30 & n.50.) But the evidentiary support for that premise is limited to a single email between Veeco employees and two third-party analyst reports, which show, at most, that TOPEC is a "potential" competitor in the market and that TOPEC has managed to make a *single* MOCVD sale this year. (Serwin Decl. ¶¶ 37-40 & nn. 59-63, 66.)

[25] Neither Aixtron nor Taiyo sells an MOCVD system that employs a susceptorless wafer-supporting assembly. (Raman Decl. ¶ 23.)

Unsurprisingly, the story told by SGL Carbon focuses on factors unrelated to its wafer carriers to explain AMEC's recent advances in the market. According to SGL Carbon, AMEC's increased sales in 2016 and 2017 are attributable to advancements that AMEC made between its first- and second-generation Prismo D-Blue systems, the latter of which entered the market in late 2016. (Def.'s Surreply Br. at 1.) In essence, SGL Carbon points to a multitude of factors that purportedly drive customer demand for MOCVD reactors, arguing that those factors—not SGL Carbon's wafer carriers—have driven the recent increase in AMEC's sales.[26]

2. Customers

The customer base of the MOCVD market consists of manufacturers of LEDs and LED-based devices. (Gerardi Decl. ¶ 36; Raman Decl. ¶¶ 27-28.)[27] Although neither party has submitted direct evidence of these customers' preferences (such as survey evidence or purchaser testimony), the present record indicates that, as downstream manufacturers themselves, purchasers of MOCVD reactors are concerned primarily with the operational cost of an MOCVD reactor compared to the quality and quantity of its output.[28] The parties disagree, however, on the weight that MOCVD customers give to different factors affecting the operational cost and output of a given MOCVD system. The parties also disagree on the extent to which other, non-economic

[26] Both parties assert that AMEC receives financial support of some kind from the Chinese government. The record does not indicate the nature or extent of those alleged subsidies, however, and the Court therefore is unable to assign any legal significance to the parties' vague assertions of governmental support.

[27] The largest regional MOCVD reactor market is China, which accounts for almost half of all MOCVD reactors installed worldwide. (Gerardi Decl. ¶ 37.)

[28] The parties agree in substance on this point. In Veeco's words, "MOCVD reactor[] sales are driven by the 'cost of ownership'—a measure of the operational cost of the reactor compared to its output." (Raman Decl. ¶ 13.) In SGL Carbon's words, "[c]ustomers of MOCVD reactors seek to make the highest volume of high quality wafers manufactured over the longest time period and at the lowest price." (Bretschneider Decl. ¶ 188.)

factors drive customer demand for MOCVD systems, such as a customer's desire to have more than one supplier of MOCVD reactors or, in the case of Chinese customers, a customer's desire to purchase from a domestic manufacturer.

Veeco asserts that its patented wafer carriers are a "key driver of demand and goodwill" for Veeco's MOCVD systems. (Raman Decl. ¶ 14.)[29] According to Veeco's Vice President of Global Marketing and Sales, Veeco's patented wafer carrier design increases the throughput of its MOCVD reactors by up to 40% over reactors that do not employ the same technology. (Raman Decl. ¶ 14; *see also* Glew Reply Decl. ¶ 83.) Veeco also claims that its patented design increases the longevity of wafer carriers and decreases the cost of operating and maintaining MOCVD reactors that use wafer carriers embodying the design. (Raman Decl. ¶¶ 16-17; Pl.'s Br. at 4-5.)

In contrast, SGL Carbon downplays the significance of wafer carriers to customer demand for MOCVD systems, emphasizing that potential customers evaluate a "large number" of factors when choosing a supplier of MOCVD systems. (Bretschneider Decl. ¶ 188; *see also id.* ¶ 189 (crediting wafer carriers with only a "very small role" in driving customer demand).) SGL Carbon's experts, Dr. Bretschneider and Dr. Serwin, point to eleven factors that purportedly influence customer demand for MOCVD systems: (i) purchase price, (ii) the number of wafers a reactor can process simultaneously, (iii) the physical size of the reactor system, (iv) the size of wafers an MOCVD system can manufacture, (v) the duration of an MOCVD reactor's deposition cycle, (vi) the ability to monitor temperature and growth rates within the reactor while it is operating, (vii) the

[29] SGL Carbon argues that the Court should not consider Raman's hearsay statements concerning customer feedback and preferences. (Def.'s Opp'n at 28-29.) The Court agrees that some of Raman's statements summarizing customer feedback may be hearsay, and, as noted by record citations throughout this Order, the Court has limited its reliance on Raman's hearsay statements to those statements that, in the Court's view, qualify for consideration under the residual exception to the hearsay bar. *See* Fed. R. Evid. 807.

amount and type of maintenance required by the reactor, (viii) the reactor's efficiency in using raw materials, (ix) the ability to reliably control the flow rate of ammonia gas within the reactor, (x) the length of delay between a customer's order and the manufacturer's delivery of a reactor, and (xi) the customer's desire for a "second source" of MOCVD reactors (particularly a Chinese source, in the case of Chinese customers). (Bretschneider Decl. ¶¶ 188-200; Serwin Decl. ¶¶ 73-75.) SGL emphasizes that none of these features necessarily depends on the design of the wafer carriers used in a given reactor. (*Ibid.*; *see also* Def.'s Opp'n at 30-31.)

B. Market for Wafer Carriers

Like the market for sales of MOCVD reactors, the market for sales of MOCVD wafer carriers is limited to a small number of manufacturers. Veeco has identified three manufacturers of wafer carriers other than SGL Carbon that meet Veeco's "exacting standards" for its MOCVD reactors. (Raman Decl. ¶¶ 31-33.) SGL Carbon has identified another five manufacturers of carbon products that, according to SGL Carbon, either already manufacture wafer carriers or could adapt their processes to manufacture the wafer carriers that SGL Carbon has been supplying to AMEC. (Bretschneider Decl. ¶ 203.) According to Veeco, however, among the existing and potential manufacturers of wafer carriers that have been identified by the parties, only two manufacturers—SGL Carbon and Xycarb Ceramics ("Xycarb")—are currently capable of manufacturing 700mm wafer carriers for use in Veeco's or AMEC's 700mm MOCVD reactors. (Raman Dep. 308:18-311:18.) In addition, Veeco has submitted evidence that Xycarb, an established supplier of Veeco wafer carriers, has agreed not to supply infringing wafer carriers to AMEC or AMEC's customers. (Raman Dep. 306:5-13.) SGL Carbon has not submitted any evidence to the contrary, and, in fact, has all but conceded that if SGL Carbon were enjoined from supplying AMEC wafer carriers, it would take another manufacturer at least "one to two years" to begin supplying 700mm wafer carriers for AMEC reactors. (*See* Serwin Decl. ¶ 48; *see also* Hr'g Tr., Oct. 13, 2017.)

VI. Veeco's Alleged Injury

Veeco asserts that, as a result of SGL Carbon's supply of wafer carriers to AMEC and AMEC's customers, Veeco has suffered and will continue to suffer the following forms of injury: (i) loss of customers, orders, and market share, (ii) price erosion, (iii) loss of business opportunities, and (iv) loss of goodwill and damage to reputation. (Pl.'s Br. at 16-22; Gerardi Decl. ¶ 54.)

Loss of Customers, Orders, and Market Share. Since AMEC began selling its 700mm MOCVD reactor in 2016, multiple customers have chosen to purchase MOCVD systems from AMEC after competitive bidding and negotiations by both AMEC and Veeco. (Raman Decl. ¶¶ 48-49; Gerardi Decl. ¶¶ 56-57.) At least one former customer of Veeco decided in 2017 to purchase MOCVD reactors from AMEC and expressly informed Veeco that it planned to make all future MOCVD purchases from AMEC. (Raman Decl. ¶ 49.) Although the sales data for 2017 is incomplete, Veeco's market intelligence and third-party analyses make reasonably clear that AMEC has beaten Veeco in competitive bidding for multiple MOCVD sales (Raman Decl. ¶¶ 48-49; Gerardi Reply Decl., Ex. 2) and, according to AMEC's own analyses, may overtake Veeco as the leading seller of MOCVD systems in 2017. (Dkt. 54-3.) According to Veeco, purchasers of AMEC machines will inevitably purchase spare parts and services associated with those machines from AMEC, which will constitute additional profit losses for Veeco. (Pl.'s Br. at 19.)[30]

Price Erosion. Veeco has submitted internal correspondence and a market report showing that Veeco has reduced the prices on its MOCVD reactors in 2017 due to pressure from AMEC's 700mm reactor, which has typically sold for 50-60% of the price of Veeco's 700mm reactor.

[30] SGL Carbon does not meaningfully dispute any of the evidence Veeco has submitted related to MOCVD reactor sales in 2017, arguing instead, as discussed *infra*, that the increase in AMEC sales has not caused any losses to Veeco, and that, in any event, no alleged losses are attributable to SGL Carbon's sales of wafer carriers.

(Gerardi Reply Decl. ¶¶ 32-33 & n.54.) Veeco suggests that, in the absence of a preliminary injunction, Veeco will need to further lower the prices on its MOCVD reactors to compete with AMEC, at least in China. (Pl.'s Br. at 19-20; Gerardi Decl. ¶¶ 68, 72-73.) Veeco has also submitted evidence that, due to pricing pressure in the Chinese market, Veeco may face the same pressure in other regions, once "the new pricing leaks out." (Gerardi Reply Decl. ¶ 34 & nn. 58, 60.) Veeco asserts that, after this "price erosion," Veeco may never be able to adjust its prices back to "pre-infringement levels," because "[a]s customers become accustomed to a certain price level, or expect prices to dip further . . . it becomes difficult to raise prices again for the same product." (Gerardi Decl. ¶ 72.)

Loss of Business Opportunities. Veeco contends that, as a result of losing customers, orders, and market share, Veeco will receive product feedback from a smaller number of customers, which will hamper Veeco's ability to make improvements and modifications that are desired by its customer base. (Pl.'s Br. at 21; Gerardi Decl. ¶¶ 74-75.)

Loss of Goodwill and Injury to Reputation. Veeco contends that, as a result of losing market share to AMEC, Veeco will have a greater risk of taking "asset impairment," which "could 'materially and adversely' affect Veeco's financial condition and results of operation, which often leads to stock price decline, loss of investor confidence and customer goodwill, and injury to reputation." (Gerardi Decl. ¶¶ 76-81.)

VII. Pre-suit Negotiations and Procedural History

As noted above, SGL Carbon has been a supplier of wafer carriers for AMEC and AMEC's customers since May 2013. (Henseler Decl. ¶ 15.) The present record is unclear as to when exactly Veeco learned that SGL Carbon was supplying wafer carriers for AMEC machines.[31] In early

[31] Veeco asserts that it "discovered" SGL Carbon's infringement in 2017. (Pl.'s Br. at 17.)

2017, prior to filing its complaint in this action, Veeco informed SGL both at in-person meetings and by letter that SGL was infringing Veeco's patents by, among other things, selling infringing wafer carriers to AMEC and AMEC's customers without authorization from Veeco. (Raman Decl. ¶ 42.) Veeco requested that SGL cease those sales, but SGL continued to supply the allegedly infringing wafer carriers as discussions between Veeco and SGL continued. (Raman Decl. ¶ 42.) On April 12, 2017, Veeco filed this action, seeking both money damages and equitable relief, including "[a] preliminary injunction under 35 U.S.C. § 283 prohibiting further infringement of the [a]sserted [p]atents." (Compl., Dkt. 1, at 36 ¶ 2.)

On July 18, 2017, during a conference with the Court, Veeco informed the Court of its intention to file an amended complaint and a motion for preliminary injunction. (*See* July 18, 2017 Minute Entry.) Veeco filed its amended complaint and the instant motion for a preliminary injunction on July 21, 2017. (Dkts. 20, 23.) Veeco also filed a motion for expedited discovery, seeking an order compelling SGL Carbon to designate and produce a witness pursuant to Federal Rule of Civil Procedure 30(b)(6), and to respond to a limited set of discovery requests, to enable Veeco to further develop the record for its motion for a preliminary injunction. (Dkt. 21.)

Between July 21 and October 11, 2017, Veeco and SGL Carbon conducted limited discovery directed to the issues raised by Veeco's motion for a preliminary injunction. The parties exchanged limited categories of documents, exchanged declarations from fact and expert witnesses, and took depositions of each other's declarants. On October 12 and 13, 2017, the Court held a hearing and oral argument on Veeco's motion for a preliminary injunction, during which counsel for the parties presented the evidence contained in the record.[32]

[32] By stipulation between the parties, no live testimony was taken during the hearing on October 12 and 13, 2017. (*See* Dkt. 47.)

LEGAL STANDARD

"A plaintiff seeking a preliminary injunction must establish [1] that he is likely to succeed on the merits, [2] that he is likely to suffer irreparable harm in the absence of preliminary relief, [3] that the balance of equities tips in his favor, and [4] that an injunction is in the public interest." *Winter v. Nat. Res. Def. Council, Inc.*, 555 U.S. 7, 20 (2008). No single factor is determinative; rather, "[t]he court must balance these factors against one another and against the extent of the relief sought." *Jack Guttman, Inc. v. Kopykake Enters.*, 302 F.3d 1352, 1363 (Fed Cir. 2002).[33] The decision whether to grant a preliminary injunction is within the discretion of the trial court. *Titan Tire Corp. v. Case New Holland, Inc.*, 566 F.3d 1372, 1375 (Fed. Cir. 2009).

DISCUSSION

I. Likelihood of Success on the Merits

To show a likelihood of success on the merits, a patentee "must show that it will likely prove infringement, and that it will likely withstand challenges, if any, to the validity of the patent." *Titan Tire*, 566 F.3d at 1376. "A party may establish a likelihood of success by showing that at least one valid and enforceable patent claim is likely to be infringed." *Metalcraft of Mayville, Inc. v. The Toro Co.*, 848 F.3d 1358, 1368 (Fed. Cir. 2017). "An accused infringer 'can defeat a showing of likelihood of success on the merits by demonstrating a substantial question of validity

[33] "[A] preliminary injunction enjoining patent infringement pursuant to 35 U.S.C. § 283 'involves substantive matters unique to patent law and, therefore, is governed by the law of [the Federal Circuit].'" *Revision Military, Inc. v. Balboa Mfg. Co.*, 700 F.3d 524, 525 (Fed Cir. 2012) (quoting *Hybritech Inc. v. Abbott Labs.*, 849 F.2d 1446, 1451 n.12 (Fed. Cir. 1988)). In particular, a party seeking a preliminary injunction enjoining patent infringement "need not meet the Second Circuit's heightened 'clear or substantial likelihood' standard, but rather the Federal Circuit's standard of whether success is more likely than not." *Id.* at 526; *compare id., with, e.g., N.Y.C. Civil Liberties Union v. N.Y.C. Transit Auth.*, 684 F.3d 286, 294 (2d Cir. 2012) (In the Second Circuit, "[f]or mandatory injunctions, which 'alter rather than maintain the status quo, . . . the movant must show a clear or substantial likelihood of success' on the merits." (quoting *Bronx Household of Faith v. Bd. of Educ.*, 331 F.3d 342, 349 (2d Cir. 2003) (internal quotation marks omitted))).

or infringement.'" *Tinnus Enters., LLC v. Telebrands Corp.*, 846 F.3d 1190, 1202 (Fed. Cir. 2017) (quoting *Trebro Mfg., Inc. v. Firefly Equip., LLC*, 748 F.3d 1159, 1165 (Fed. Cir. 2014)).

A. Infringement

Veeco's motion for a preliminary injunction is based on (1) a claim of direct infringement under 35 U.S.C. § 271(a), and (2) a claim of indirect infringement under 35 U.S.C. § 271(f)(2).

1. Direct Infringement under 35 U.S.C. § 271(a)

To prove a claim of direct infringement under 35 U.S.C. § 271(a), a patentee "must establish by a preponderance of the evidence that one or more claims of the patent read on the accused device literally or under the doctrine of equivalents." *Cross Med. Prods., Inc. v. Medtronic Sofamor Danek, Inc.*, 424 F.3d 1293, 1310 (Fed. Cir. 2005).[34] To evaluate the likelihood that Veeco will prove infringement under 35 U.S.C. § 271(a), the Court must first construe the relevant claims of the '769 Patent, and second compare the properly-construed claims to the allegedly infringing product. *See Pfizer, Inc. v. Teva Pharm., USA, Inc.*, 429 F.3d 1364, 1372 (Fed. Cir. 2005) ("Determining the likelihood of infringement requires two steps, first claim construction and second a comparison of the properly construed claims to the accused product."). For purposes of Veeco's claim under 35 U.S.C. § 271(a), the parties agree that the relevant claims of the '769 Patent are claims 1-5, 10, and 13-16. (Pl.'s Br. at 13-14; Def.'s Opp'n at 3-4.) The parties also agree that, given the uncontested facts concerning the wafer carriers that SGL Carbon has been supplying to AMEC and AMEC's customers, the single dispositive issue, for purposes of direct infringement under Section 271(a), is whether, as Veeco argues, claim 1 of the '769 Patent

[34] 35 U.S.C. § 271(a) provides: "Except as otherwise provided in this title, whoever without authority makes, uses, offers to sell, or sells any patented invention, within the United States or imports into the United States any patented invention during the term of the patent therefor, infringes the patent."

is directed solely to a wafer carrier, or, as SGL Carbon argues, claim 1 is directed to an assembly comprising a wafer carrier and a spindle, or an assembly comprising a wafer carrier, a spindle, and an MOCVD reactor.[35] In keeping with Federal Circuit guidance, the Court performs its claim construction with a view to resolving this limited question. *See Nidec Motor Corp. v. Zhongshan Broad Ocean Motor Co.*, 868 F.3d 1013, 1017 (Fed. Cir. 2017) ("[The court] need only construe terms 'that are in controversy, and only to the extent necessary to resolve the controversy.'" (quoting *Vivid Techs., Inc. v. Am. Sci. & Eng'g, Inc.*, 200 F.3d 795, 803 (Fed. Cir. 1999))).

a) Claim Construction

The overarching goal of claim construction is to "determin[e] the meaning and scope of the patent claims asserted to be infringed." *Advanced Fiber Techs. (AFT) Tr. v. J & L Fiber Servs., Inc.*, 674 F.3d 1365, 1374 (Fed. Cir. 2012) (quoting *Markman v. Westview Instr., Inc.*, 52 F.3d 967, 976 (Fed. Cir. 1995), *aff'd*, 517 U.S. 370 (1996)). To that end, a court should draw on "those sources available to the public that show what a person of skill in the [relevant] art would have understood [the] disputed claim language to mean [at the time of the invention]." *Phillips v. AWH Corp.*, 415 F.3d 1303, 1314 (Fed. Cir. 2005) (quoting *Innova/Pure Water, Inc. v. Safari Water Filtration Sys., Inc.*, 381 F.3d 1111, 1116 (Fed. Cir. 2004)). Those sources include "intrinsic evidence" comprising "the words of the claims themselves, the remainder of the specification, [and] the [patent] prosecution history," as well as "extrinsic evidence" concerning "relevant scientific principles, the meaning of technical terms, and the state of the art." *Id.* at 1317, 1319 (quoting *Innova*, 381 F.3d at 1116). Importantly, however, although extrinsic evidence "can shed useful light on the relevant art," the Federal Circuit has repeatedly held that extrinsic evidence is "less significant

[35] SGL Carbon argues that, if claim 1 of the '769 requires the presence of a CVD reactor or a spindle, then SGL Carbon cannot be found to have directly infringed the '769 Patent, because SGL Carbon produces only wafer carriers; it does not produce spindles or reactors.

than the intrinsic record in determining 'the legally operative meaning of claim language.'" *Id.* at 1317 (quoting *C.R. Bard, Inc. v. U.S. Surgical Corp.*, 388 F.3d 858, 862 (Fed. Cir. 2004)).

The Federal Circuit has offered extensive guidance to district courts on how to properly examine the intrinsic evidence of a patent claim. *See, e.g.*, *Phillips*, 415 F.3d at 1311-24. Crucially, a court must examine the patent's claims and its specification together, viewing them as "part of 'a fully integrated written instrument,' consisting principally of a specification that concludes with the claims." *Id.* at 1315 (quoting *Markman*, 52 F.3d at 978). In other words, "claims 'must be read in view of the specification, of which they are part.'" *Id.* (quoting *Markman*, 52 F.3d at 979); *see also Vitronics*, 90 F.3d 1576, 1582 (Fed. Cir. 1996) ("[The specification] is always highly relevant to the claim construction analysis. Usually, it is dispositive; it is the single best guide to the meaning of a disputed term."). In addition, although a patent's prosecution history often "lacks the clarity of the specification and thus is less useful for claim construction purposes," a court nonetheless "should also consider the . . . prosecution history" as part of the intrinsic evidence, "if [the prosecution history] is in [the record]." *Phillips*, 415 F.3d at 1317.

The first step in claim construction is to examine the patent's claims, with a view to determining their "ordinary and customary meaning . . . to a person of ordinary skill in the art in question at the time of the invention, i.e., as of the effective filing date of the patent application." *Phillips*, 415 F.3d at 1312-13. This "inquiry into how a person of ordinary skill in the art understands a claim term provides an objective baseline from which to begin claim interpretation." *Id.* at 1313. Of course, "the person of ordinary skill in the art is deemed to read the claim term not

only in the context of the particular claim in which the disputed term appears, but in the context of the entire patent, including the specification." *Id.*[36]

In addition, the Federal Circuit has articulated additional principles to "guide the [Court's] inquiry" into whether to treat a claim's preamble as a limitation. *Am. Med. Sys., Inc. v. Biolitec, Inc.*, 618 F.3d 1354, 1358 (Fed. Cir. 2010).[37] First and foremost, "[g]enerally, the preamble does not limit the claims." *Georgetown Rail Equip. Co. v. Holland L.P.*, 867 F.3d 1229, 1236 (Fed. Cir. 2017) (quoting *Allen Eng'g Corp. v. Bartell Indus., Inc.*, 299 F.3d 1336, 1346 (Fed. Cir. 2002)). "However, a preamble may be limiting if. . . [1] 'it recites essential structure or steps'; [2] claims 'depend on a particular disputed preamble phrase for antecedent basis'; [3] the preamble 'is essential to understand limitations or terms in the claim body'; [4] the preamble 'recites additional structure or steps underscored as important by the specification'; or [5] there was 'clear reliance on the preamble during prosecution to distinguish the claimed invention from the prior art.'" *Georgetown Rail*, 867 F.3d at 1236 (quoting *Catalina Mktg. Int'l, Inc. v. Coolsavings.com, Inc.*, 289 F.3d 801, 808 (Fed. Cir. 2002)). That said, "[t]he reverse is also true"—namely, "[a] preamble is not a claim limitation if the claim body 'defines a structurally complete invention . . . and uses the preamble only to state a purpose or intended use for the invention.'" *Id.* (quoting *Rowe v. Dror*, 112 F.3d 473, 478 (Fed. Cir. 1997)).

Here, the parties dispute whether claim 1 of the '769 Patent is limited by a spindle or a CVD reactor, or both. (Def.'s Opp'n at 4-7; Pl.'s Reply Br. at 2-5.) In full, claim 1 states:

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[36] *See also Medrad, Inc. v. MRI Devices Corp.*, 401 F.3d 1313, 1319 (Fed. Cir. 2005) ("We cannot look at the ordinary meaning of the term . . . in a vacuum. Rather, we must look at the ordinary meaning in the context of the written description and the prosecution history.").

[37] Broadly speaking, a court should determine whether a preamble is limiting based on "the facts of each case in light of the overall form of the claim, and the invention as described in the specification and illuminated in the prosecution history." *Applied Materials, Inc. v. Adv. Semiconductor Materials Am., Inc.*, 98 F.3d 1563, 1572-73 (Fed. Cir. 1996).

> **1.** An apparatus for supporting and transporting at least one wafer in a CVD reactor having a rotatable spindle, said apparatus comprising:
>
> > a top surface having at least one cavity for retaining said at least one wafer, and
> >
> > a bottom surface having a central recess adapted for detachably inserting an upper end of said rotatable spindle;
> >
> > said apparatus being transportable, in the normal course of operation of the CVD reactor, between a position in which said spindle is inserted into said central recess for rotation therewith and a position detached from said spindle.

('769 Patent at ECF 18.) Veeco contends that the phrase "in a CVD reactor having a rotatable spindle" does not limit the claim, but rather states "the intended use" and "the environment" of the wafer carrier apparatus disclosed in claim 1. (Pl.'s Reply Br. at 2-3.) SGL Carbon argues that the phrase "in a CVD reactor having a rotatable spindle" does limit the claim, which would mean that, to show infringement, Veeco would need to show that SGL Carbon manufactures not only a wafer carrier meeting the specifications of claim 1, but also a "spindle" and a "CVD reactor." (Def.'s Opp'n at 4-7; Def.'s Surreply Br. at 2-3.)

The Court begins by examining the words used in the patent's claims, with a view to determining their "ordinary and customary meaning . . . to a person of ordinary skill in the art in question at the time of the invention, i.e., as of the effective filing date of the patent application." *Phillips*, 415 F.3d at 1312-13. As a first step in construction, the Court observes that claim 1 is directed to "an apparatus . . . *comprising*" certain structural features. ('769 Patent 13:59-14:5 (emphasis added).) In claim construction, the word "'comprising' is a term of art that means 'including but not limited to.'" *Server Tech., Inc. v. Am. Power Conversion Corp.*, 657 F. App'x 1030, 1034 (Fed. Cir. 2016) (quoting *CIAS, Inc. v. Alliance Gaming Corp.*, 504 F.3d 1356, 1360 (Fed. Cir. 2007)). Accordingly, the fact that claim 1 describes an apparatus "comprising" two

surfaces ('769 Patent 13:59-67) is not dispositive evidence of whether the apparatus of claim 1 also encompasses a spindle or a CVD reactor. The Court notes, however, that in the preamble of claim 1 itself, the term "apparatus" is distinct from the terms "a CVD reactor" and "a rotatable spindle," suggesting that the "apparatus" of claim 1 is physically distinct from, and does not comprise, a CVD reactor or a spindle. (*See id.*) Similarly, the third paragraph of claim 1, which refers to "said apparatus being transportable, in the normal course of operation of the CVD reactor," clearly makes a distinction between the "apparatus," on one hand, and "the CVD reactor," on the other hand, which reinforces the idea that the "apparatus" of claim 1 is physically distinct from, and does not include, a CVD reactor. (*See id.*)

The Court next considers claims 2 through 16 of the '769 Patent, each of which is dependent on claim 1. As an initial matter, the Court observes that claims 2 through 16 all describe variants of "the apparatus" of claim 1,[38] and none of them describes features of a multi-part assembly consisting of a wafer carrier and a spindle, or consisting of a wafer carrier, a spindle, and a CVD reactor. Rather, the dependent claims all describe the top and bottom "surfaces" of the apparatus, "recesses" of the apparatus, or, in the case of claim 16, the material composition of the apparatus ("graphite"). In addition, the Court notes that claim 12 contemplates that "the apparatus" would be "retained on said spindle for rotation," which, like the preamble of claim 1, suggests a distinction between "the apparatus" disclosed in claim 1 and a "spindle" on which the apparatus is retained.

The Court next considers the specification of the '769 Patent, as it relates to the limitations of claim 1. At the outset, the '769 Patent specification describes "the present invention" as "a

[38] Some of the dependent claims refer explicitly to "[t]he apparatus of claim 1," while others refer indirectly to the apparatus of claim 1 by making reference to the apparatus of another dependent claim of claim 1, which is itself a variant of the apparatus of claim 1. (*See* '769 Patent 13:59-14:48.)

novel CVD reactor in which the wafer carrier is placed on the rotatable spindle without a susceptor, and a related method of growing epitaxial layers in a CVD reactor." ('769 Patent 4:8-12.) SGL Carbon makes much of the specification's use of the phrase "the present invention" to refer to a novel CVD reactor, emphasizing that "[w]hen an inventor consistently uses phrases like 'the present invention' to describe an invention, then the 'public is entitled to take the patentee at his word.'" (Def.'s Opp'n at 5.)[39] But the specification's use of the phrase "the present invention" and similar phrases is not singularly dispositive of the scope of a patent's claims. *See Absolute Software, Inc. v. Stealth Signal, Inc.*, 659 F.3d 1121, 1136 (Fed. Cir. 2011). Reading the specification as a whole, the Court finds that the tentative construction of claim 1 suggested by the language of the claims—*i.e.*, a singular object not comprising a spindle or CVD reactor—is arguably supported, and certainly is not contradicted, by the specification's use of the phrase "the present invention" or similar phrases. The '769 Patent is a continuation of the '252 Patent, which is directed to a multi-part assembly consisting of a reaction chamber, a rotatable spindle, a wafer carrier, and a heating element. Thus, although the '769 Patent in some places refers to "the present invention" as a CVD reactor, a person having ordinary skill in the art[40] would understand that the phrase "the present invention" was being used in the specification—which is shared by the '769 Patent, the '252 Patent, and the '774 Patent—to encompass the inventions disclosed in all three of those patents, not to impose a limitation on their respective claims. *See Broadcom*, 543 F.3d at 689-90. Furthermore, although the specification uses the phrase "the present invention" to

[39] Similarly, SGL Carbon emphasized during oral argument that the title and abstract of the '769 Patent were clearly directed to a novel CVD reactor, and not directed to a wafer carrier. (Hr'g Tr. 31-32, Oct. 12, 2017.)

[40] As explained in the specification, the '769 Patent is directed to technologies for chemical vapor deposition ("CVD"). A person having ordinary skill in the art is someone who would have two or three years of work experience in semiconductor equipment design, semiconductor fabrication, or CVD systems. (Bretschneider Decl. ¶ 41; Glew Reply Decl. ¶ 5.)

refer to the CVD reactor in some places, the specification later distinguishes between different aspects of the invention, including "[t]he wafer carrier of the invention," which "may include a top surface and a bottom surface" with certain characteristics. ('769 Patent 5:1-10.) Indeed, the specification's description of "the wafer carrier of the invention" not only undermines the notion that the "invention" is limited to a CVD reactor, but also provides a term of art—*i.e.*, the term "wafer carrier"—to correspond to "the apparatus" described in claim 1. In short, although SGL Carbon's argument based on the phrase "the present invention" has some initial appeal, the Court ultimately concludes that the specification supports, and certainly does not contradict, the claim language suggesting that "the apparatus" in claim 1 refers only to a wafer carrier that meets the specifications of claim 1 and does not include a CVD reactor or a spindle. *See Broadcom*, 543 F.3d at 689-90 (holding that when the claim of one patent addresses "only some of the features disclosed" in a specification shared among continuation patents, "it is improper to limit the claim to other, unclaimed features" described in the shared specification).

Finally, the Court considers extrinsic evidence submitted by the parties.[41] In brief summary, the parties submitted competing opinions from their technical experts, with SGL Carbon's expert opining that claim 1 requires a CVD reactor and a spindle, and Veeco's expert opining that claim 1 does not require those elements. (Bretschneider Decl. ¶¶ 19-24, 74-92; Glew

[41] As discussed, in construing a patent claim, "district courts [may] rely on extrinsic evidence, which 'consists of all evidence external to the patent and prosecution history, including expert and inventor testimony, dictionaries, and learned treatises.'" *Phillips*, 415 F.3d at 1317 (quoting *Markman*, 52 F.3d at 980). However, because extrinsic evidence "is 'less significant than the intrinsic record in determining the legally operative meaning of claim language,'" *id.* (quoting *C.R. Bard*, 388 F.3d at 862) (internal quotation marks omitted), the district court has wide discretion in deciding what extrinsic evidence to consider in construing a patent claim, *id.* at 1319. "[I]n exercising that discretion, and in weighing all the evidence bearing on claim construction, the court should keep in mind the flaws inherent in each type of evidence"—especially extrinsic evidence—"and assess that evidence accordingly." *Id.* at 1319.

Reply Decl. ¶¶ 12-17.) Both experts were deposed and gave testimony that somewhat undermined their respective opinions. (*See* Glew Decl. ¶¶ 12-17.) Ultimately, the Court gives relatively little weight to either expert's testimony, because, in rendering their opinions on the proper construction of claim 1, both experts merely interpreted the plain language of the '769 Patent, and neither expert identified any special knowledge, known to them as persons having skill in the art, that would suggest an interpretation of the claims or specification of the '769 Patent that is different than the Court's interpretation based on the plain language of the claims and the specification. (Bretschneider Decl. ¶¶ 19-24, 74-92; Glew Reply Decl. ¶¶ 12-17.) In short, neither expert supplied persuasive evidence as to whether the preamble of claim 1 is limiting.

As further guidance on its construction of claim 1, the Court has considered several Federal Circuit decisions cited by the parties. Veeco relies on the Federal Circuit's decisions in *Advanced Software Design Corp. v. Fiserv Inc.*, 641 F.3d 1368, 1373 (Fed. Cir. 2011), and *Uniloc USA, Inc. v. Microsoft Corp.*, 632 F.3d 1292, 1297 (Fed. Cir. 2011). SGL Carbon relies on the Federal Circuit's decisions in *Pacing Techs., LLC v. Garmin Int'l, Inc.*, 778 F.3d 1021, 1024 (Fed. Cir. 2015), *NTP Inc. v. Research in Motion*, 418 F.3d 1282, 1306 (Fed. Cir. 2005), *Electro Sci. Indus. v. Dynamic Details, Inc.*, 307 F.3d 1343, 1348 (Fed. Cir. 2002), *Catalina Mktg. Int'l, Inc. v. Coolsavings.com, Inc.*, 289 F.3d 801, 808 (Fed. Cir. 2002), *Reagents of Univ. of Minn. v. AGA Med. Corp.*, 717 F.3d 929, 936 (Fed. Cir. 2013), and *Honeywell Int'l, Inc. v. ITT Indus., Inc.*, 452 F.3d 1312, 1318 (Fed. Cir. 2006). In considering these decisions, the Court bears in mind that a court should determine whether a preamble is limiting based on "the facts of each case in light of the overall form of the claim, and the invention as described in the specification and illuminated in the prosecution history." *Applied Materials, Inc. v. Adv. Semiconductor Materials Am., Inc.*, 98 F.3d 1563, 1572-73 (Fed. Cir. 1996). With this principle in mind, the Court finds that, although

these cases illustrate the general principles of construing a claim's preamble, none of the cases cited by the parties provides a clear answer to the exact question before the Court. Whereas the claims at issue in this case relate to a tangible apparatus (a wafer carrier) that is "adapted for" combination with another tangible apparatus (a spindle), the claims under review in most of the parties' cases relate to patents for methods, processes, and systems.[42] The remaining cases did not require the court to construe a claim's preamble to determine whether multiple structures referenced in the preamble limited the scope of the apparatus claimed.[43] Consequently, the cases cited by the parties give little indication of how the Federal Circuit would rule regarding the patent at issue here based on the "facts of [this] case . . . and the invention described in the specification." *Applied Materials*, 98 F.3d at 1572.

The Court does find relevant guidance, however, in the Federal Circuit's decision in *Bicon, Inc. v. Straumann Co.*, 441 F.3d 945, 949-53 (Fed. Cir. 2006).[44] In *Bicon*, the Federal Circuit considered a claim covering components of a dental implant. In relevant part, the claim disclosed:

> An emergence cuff member[,] for use in preserving the [subject's gums] during the procedure of placing an abutment on a root member implanted in the alveolar bone of a patient in which [a] the abutment has a frustro-spherical basal surface portion

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[42] *See Fiserv*, 641 F.3d at 1373 (method and system for guarding against check fraud); *Uniloc*, 632 F.3d at 1297 (software system for preventing software piracy); *Pacing Techs.*, 778 F.3d at 1024 (computerized playback system for pacing users during exercise); *NTP*, 418 F.3d at 1306 (system enabling receipt of email over wireless network via radio frequency), *Electro Sci. Indus.*, 307 F.3d at 1348 (system for accurately drilling small holes in circuit boards), *Catalina Mktg.*, 289 F.3d at 808 (system for dispensing discount coupons). These cases are not especially helpful to the Court because the relationships among different steps in a method or process, or among different components in a system, are not easily analogized to the relationships among physical structures that are at issue in this case.

[43] *See AGA Med. Corp.*, 717 F.3d at 935-36 (resolving whether the phrase "[a] septal defect closure comprising first and second occluding disks" required two discrete disks); *Honeywell Int'l*, 452 F.3d at 1318 (resolving, based on the patent's specification and prosecution history, whether the phrase "fuel injection system component" was limited to the sole embodiment set forth in the specification).

[44] Neither party discussed *Bicon* in its briefing.

> and [b] a conical surface portion having a selected height therefrom[,] comprising . . . . [various structural features, including] . . . [e] a bore . . . having a taper generally matching that of the canonical surface portion of the abutment . . . .

Bicon, 441 F.3d at 948.

In a suit for patent infringement, the patent holder in *Bicon* argued that the claimed invention was "[a]n emergence cuff," and that the preamble of the claim—*i.e.*, everything between the phrase "an emergence cuff" and the word "comprising"—did not limit the claim because it merely "set[] forth the purpose or use of the emergence cuff." *Id.* at 949-50. The Federal Circuit rejected the patent holder's argument for two reasons. First, the Federal Circuit found that, if the abutment were not treated as a limitation on the claim, "the requirement [in the preamble] that the . . . abutment have 'a frustro-spherical basal surface portion' would have no meaning," which would violate the principle that "claims are interpreted with an eye toward giving effect to all terms in the claim." *Id.* at 950. Second, the Federal Circuit found that, if the abutment were not treated as a limitation on the claim, then "the requirement that the bore of the emergence cuff have a taper 'generally matching that of the conical surface portion of the abutment' would be meaningless," because "an abutment could always be hypothesized that would have a taper matching the taper of the bore of any emergence cuff." *Id.* at 951. As a result, "[t]he 'matching taper' limitation [of the emergence cuff] would therefore be reduced to requiring only that the bore of the emergence cuff have a taper." *Id.* In other words, the abutment of the apparatus imposed a structural limitation on the emergence cuff, in part because the claim "defines the emergence cuff in a way that depends on [the] physical characteristics [of the abutment], [such that] the invention that is recited in [the claim] and described in its supporting specification can only be understood as being limited by the abutment recited in the claim." *Id.* at 950.

As applied here, the Federal Circuit's reasoning in *Bicon* compels the conclusion that claim 1 of the '769 Patent, and its dependent claims, are all limited by the requirement of a spindle. To be sure, the claim presented here is partially distinguishable from *Bicon*—unlike the claim reviewed in *Bicon*, claim 1 of the '769 Patent does not include "a detailed description" of the CVD reactor's or the spindle's "physical characteristics." *Compare* '769 Patent 13:59-67 (referring generically in preamble to "a CVD reactor having a rotatable spindle"), *with Bicon*, 441 F.3d at 948 (referring in preamble to an abutment with a "frustro-spherical basal surface portion and . . . a conical surface portion having a selected height therefrom"). Crucially, however, in defining the apparatus of claim 1 as "having a central recess *adapted for* detachably inserting an upper end of said rotatable spindle" ('769 Patent 13:65-66 (emphasis added)), the '769 Patent defines the physical characteristics of the patented wafer carrier "in a way that depends on [the] physical characteristics" of the spindle. *Bicon*, 441 F.3d at 951.[45] As a result, the wafer carrier disclosed in claim 1 derives its physical structure, in part, from the structure of the rotatable spindle for which it must be "adapted," such that "the invention that is recited in [the claim] and described in its supporting specification can only be understood as being limited by the [spindle] recited in the claim." *Bicon*, 441 F.3d at 950.

Weighing all of the evidence bearing on the issue, the Court finds that, under the reasoning of *Bicon*, claim 1 of the '769 Patent, and each of its dependent claims, is limited by the requirement of a rotatable spindle, though not by the requirement of a CVD reactor. In other words, claim 1 encompasses a wafer-supporting assembly that consists of a rotatable spindle and

[45] Indeed, if the spindle were not treated as a limitation on claim 1, then claim 1's requirement that the central recess on the bottom side of the wafer carrier must be "*adapted for* detachably inserting an upper end of [a] rotatable spindle" ('769 Patent 13:65-66 (emphasis added)) would be meaningless, because a spindle "could always be hypothesized" that would insert detachably into the bottom of any wafer carrier with a central recess. *Bicon*, 441 F.3d at 951.

a wafer carrier comprising a top surface having at least one cavity for retaining at least one wafer, and a bottom surface having a central recess "adapted for" detachably inserting an upper end of said rotatable spindle.[46]

b) Comparison to the Accused Products

The parties agree that, if claim 1 is limited by either a spindle or a CVD reactor, then SGL Carbon is not liable for direct infringement under 35 U.S.C. § 271(a), because SGL Carbon does not manufacture or sell CVD reactors or spindles for CVD reactors. (Henseler Decl. ¶¶ 8-9; Hr'g Tr. 4:23-5:3, July 18, 2017; Pl.'s Br. at 15.)[47] Accordingly, having ruled that claim 1 is limited by the requirement of a spindle, the Court finds that Veeco will not succeed on its claim of direct infringement under 35 U.S.C. § 271(a).

2. Infringement under 35 U.S.C. § 271(f)(2)

Congress enacted 35 U.S.C. § 271(f) to "'expand the definition of [patent] infringement to include supplying from the United States a patented invention's components,' as outlined in subsections (f)(1) and (f)(2)." *Life Techs. Corp. v. Promega Corp.*, 137 S. Ct. 734, 742-43 (2017) (quoting *Microsoft Corp. v. AT&T Corp.*, 550 U.S. 437, 444-45 (2007)). To establish a claim under § 271(f)(2), a patentee must show that a defendant "[i] supplie[d] or cause[d] to be supplied in or from the United States any component of a patented invention that is especially made or especially adapted for use in the invention and [ii] not a staple article or commodity of commerce suitable for substantial noninfringing use, . . . [iii] knowing that such component is so made or

[46] To be clear, based on the analysis set forth in this section, the Court finds that claim 1 is not limited by the requirement of a CVD reactor, which, unlike the spindle mentioned in claim 1, does not supply essential structure to the apparatus of claim 1.

[47] Technically, direct infringement extends not only to someone who makes or sells a patented product, but also to anyone who "uses" or "offers to sell" a patented product. 35 U.S.C. § 271(a). However, Veeco does not argue, and there is no evidence in the record suggesting, that SGL Carbon "uses" or "offers to sell" CVD reactors or spindles for CVD reactors.

adapted and intending that such component will be combined outside of the United States in a manner that would infringe the patent if such combination occurred within the United States." 35 U.S.C. § 271(f)(2).[48]

a) Supply of a Specially Adapted Component for a Patented Invention

The first element of Veeco's claim under § 271(f)(2) requires a showing that AMEC's 700mm MOCVD reactors comprise a patented invention, and that SGL Carbon's 700mm wafer carriers are "especially made" or "especially adapted" for use in the invention. To determine whether AMEC's 700mm MOCVD reactors comprise a patented invention, the inquiry, under the foregoing Court's claim construction, is whether the 700mm MOCVD system features a susceptorless wafer-supporting assembly consisting of a rotatable spindle and a wafer carrier comprising a top surface having at least one cavity for retaining at least one wafer, and a bottom surface having a central recess "adapted for" detachably inserting an upper end of said rotatable spindle. This inquiry, in turn, requires the Court to construe the terms "susceptor," "spindle," and "retaining means" within the meaning of the '769 Patent.

(1) *Meaning of "Susceptor"*

In describing the prior art, the '769 Patent specification delineates the defining features of a "susceptor" as that term is used in the patent. ('769 Patent 2:57-3:65.) A susceptor is permanently mounted in the reactor, typically on top of a spindle, and supports the wafer carrier of the reactor. The susceptor is large enough in diameter to extend above the heating apparatus of the reactor, thus creating two thermal interfaces—one between the susceptor and the heating apparatus (below the susceptor), and one between the susceptor and the wafer carrier. A susceptor is made of highly

[48] A plaintiff need not show "actual assembly" of the infringing product abroad to establish a claim under 35 U.S.C. § 271(f)(2). *Waymark Corp. v. Porta Sys. Corp.*, 245 F.3d 1364, 1368 (Fed. Cir. 2001).

durable, heat transferring material, most typically a molybdenum alloy. A susceptor can be removed from the reactor only when the deposition cycle is interrupted, creates a significant thermal interface with the wafer carrier, and adds significant mass. (*Id.*)

SGL Carbon contends that an object is not a "susceptor" within the meaning of the '769 Patent unless it is the "principal transfer mechanism for heat to the wafer carrier." (Def.'s Surreply Br. at 4.) In pressing this definition, SGL Carbon relies primarily on the declaration of Dr. Bretschneider. (Def.'s Opp'n at 4.) According to Dr. Bretschneider, this definition "is the only meaning consistent with the specification of the '769 Patent." (Bretschneider Reply Decl. ¶ 27.) The Court disagrees. Although the specification makes clear that a susceptor is mounted above the heating apparatus and creates two significant thermal interfaces, the specification does not require that the susceptor is the "principal" or "primary" mechanism for transferring heat to the wafer carrier. ('769 Patent 2:57-3:65.)

(2) *Meaning of "Spindle"*

The '769 Patent specification also clarifies the meaning of the term "spindle" as used in the claims at issue. The spindle is part of the wafer-supporting assembly in both the prior art and the patented CVD reactor. Unlike the susceptor, the spindle is not located above the heating apparatus of the reactor and does not transfer any significant heat to the wafer carrier. Unlike the susceptor, a spindle is a heat sink that draws heat away from the wafer carrier. In all embodiments, the spindle has a substantially cylindrical shape and an axis of rotation. In one preferred embodiment, the spindle narrows at the top end, where it fits into the central recess on the bottom side of the wafer carrier. In short, the specification makes clear that the spindle is a substantially cylindrical object—like an axle—that rotates on an axis, draws heat away from the wafer carrier,

and remains substantially cylindrical or narrows toward its top end, where it fits into the central recess on the bottom side of the wafer carrier. ('769 Patent at ECF 12-17.)[49]

(3) *Meaning of "Retaining Means"*

The '769 Patent specification contemplates the possibility of a "retaining means" in the wafer-supporting assembly. ('769 Patent 8:60-67, 11:42-61.) The retaining means could be integrated with the spindle or could be an intermediate element between the spindle and the wafer carrier, "such as rings, retainers, and the like." The specification does not exhaustively define the scope of the phrase "retaining means," but, given the overarching purpose of the '769 Patent, the fair inference is that a "retaining means" must be integrated with, or affixed to, the spindle in a manner that improves the support or friction provided by the spindle to the wafer carrier, but without having characteristics that meet the definition of a susceptor—otherwise the benefits of the susceptorless system would be negated—and without changing the fundamental properties of the spindle—otherwise there would be no "spindle" within the meaning of the specification. In other words, a "retaining means" as defined by the '769 Patent is a physical structure affixed to, or integrated with, the spindle that assists in retaining the wafer carrier, but that (i) does not change the fundamentally cylindrical, "spindly" structure of the spindle, and (ii) does not meet the definition of a susceptor within the meaning of the '769 Patent. ('769 Patent 8:60-67, 11:42-61.)

(4) *Application to AMEC's 700mm MOCVD Reactor*

Under these definitions of "susceptor," "spindle," and "retaining means," Veeco has submitted persuasive evidence that AMEC's 700mm reactors are susceptorless MOCVD reactors

[49] Both technical experts confirmed that a person having ordinary skill in the art would understand the term "spindle" as referring to a substantially cylindrical object akin to an axle or a rod. (Glew 2nd Dep. 353:17-21; Bretschneider Dep. 55:10-12.) Nothing in the '769 Patent suggests that a "spindle" could have a shape other than a substantially cylindrical shape.

that feature a wafer-supporting assembly consisting of a rotatable spindle with a retaining means and a wafer carrier adapted for detachable mounting on said rotatable spindle with a retaining means. Among the evidence concerning the features of AMEC's Prismo D-Blue reactor system, which is set forth in detail *supra*, the Court finds Dr. Glew's expert testimony and the substance of AMEC's '768 Application especially persuasive evidence that AMEC's 700mm reactors comprise a wafer-supporting assembly covered by the '769 Patent, as construed in this Order. The testimony from SGL Carbon's experts, Dr. Bretschneider and Dr. Serwin, that AMEC's reactors are "susceptorless and utilize removable wafer carriers designed for high speed rotation," further reinforces this conclusion. In short, the record indicates that AMEC's 700mm MOCVD reactors comprise a "patented invention" within the meaning of § 271(f)(2)—namely, a wafer-supporting assembly that infringes claims 1 and 22 of the '769 Patent.[50] The record also shows that the 700mm wafer carriers supplied by SGL Carbon to AMEC and AMEC's customers were "especially made" and "especially adapted" for use in that specific assembly.[51] Accordingly, Veeco is more likely than not to establish that SGL Carbon has "supplied . . . from the United States [a] component of a patented invention that is especially made or especially adapted for use in the invention." 35 U.S.C. § 271(f)(2).

[50] In its amended complaint and motion for a preliminary injunction, Veeco predicated its (f)(2) claim on alleged infringement of claim 22 of the '769 Patent, which expressly encompasses a wafer-supporting assembling consisting of a wafer carrier and a rotatable spindle. In light of the Court's holding, *supra*, that claim 1 of the '769 Patent is likewise limited by the requirement of a spindle, the Court construes Veeco's claim under § 271(f)(2) as predicated not only on claim 22 of the '769 Patent, but also on claim 1 and its dependent claims, as those claims have been construed in this Order.

[51] SGL Carbon produces each of the models according to AMEC's exact specifications, which AMEC supplied to SGL Carbon. (Henseler Decl. ¶ 5; Henseler Dep. 117:12-118:8.)

b) No Substantial Non-Infringing Uses

To prevail on a claim under 35 U.S.C. § 271(f)(2), the patentee has the burden to prove the lack of substantial non-infringing uses for the exported component. *See Toshiba Corp. v. Imation Corp.*, 681 F.3d 1358, 1363 (Fed. Cir. 2012). To prove that a component has no "substantial noninfringing use," a patentee must show that the potential non-infringing uses of the component are "unusual, far-fetched, illusory, impractical, occasional, aberrant, or experimental." *Vita-Mix Corp. v. Basic Holding, Inc.*, 581 F.3d 1317, 1327 (Fed. Cir. 2009). In assessing this issue, the factfinder may consider "not only the use's frequency, but also the use's practicality, the invention's intended purpose, and the intended market." *i4i Ltd. P'ship v. Microsoft Corp.*, 598 F.3d 831, 851 (Fed. Cir. 2010), *aff'd*, 564 U.S. 91 (2011).

Here, Veeco has submitted persuasive evidence that the 700mm wafer carriers that SGL Carbon supplies to AMEC and AMEC's customers are not a staple article of commerce suitable for substantial non-infringing use.[52] The present record indicates that only two companies in the global market for graphite wafer carriers are currently capable of manufacturing commercially viable 700mm graphite wafer carriers. (Raman Dep. 308:18-311:18.) The first company, Xycarb, supplies those wafer carriers only for Veeco's 700mm MOCVD reactor, which meets the limitations of claim 1 and claim 22 of the '769 Patent and therefore is not a non-infringing use. The other company, SGL Carbon, supplies 700mm wafer carriers only for AMEC's Prismo D-Blue reactor, which, as noted above, likely uses a wafer-supporting assembly meeting the limitations of claim 1 and claim 22 of the '769 Patent. If there were a market for 700mm wafer carriers for some

[52] Veeco's motion for a preliminary injunction is based on the irreparable harm it has suffered as a result of SGL Carbon's sales of 700mm wafer carriers for AMEC's second-generation Prismo D-Blue system. Therefore, the Court defers the question of whether the 480mm wafer carriers that SGL Carbon has historically supplied to AMEC and AMEC's customers have a substantial non-infringing use.

purpose other than incorporation in an infringing assembly—such as a CVD reactor with a susceptor, as SGL Carbon suggests (Def.'s Opp'n at 10)—then such a market would necessarily be purchasing those wafer carriers from either Xycarb or SGL Carbon, the only two companies currently capable of manufacturing such a product. Yet there is no indication that such a market exists; indeed, the record evidence indicates that it does not. Furthermore, given the obvious and compelling benefits of a susceptorless CVD system as compared to a CVD system using a susceptor, the record evidence of which is voluminous, the Court finds that it would be impractical, if not completely far-fetched, for a purchaser of wafer carriers designed to be detachably mounted on a spindle without a susceptor, to negate the benefits of a susceptorless wafer carrier by mounting it on a susceptor, as SGL Carbon surmises a hypothetical customer might do (Bretschneider Decl. ¶¶ 44, 186).[53] Accordingly, the Court finds that Veeco is more likely than not to establish that the 700mm wafer carriers that SGL Carbon supplies to AMEC and AMEC's customers have no substantial non-infringing use.

c) Knowledge and Intent

Neither the Federal Circuit nor the Supreme Court has definitively construed the knowledge and intent requirement under 35 U.S.C. § 271(f)(2).[54] To construe the knowledge and

[53] Dr. Glew testified that the AMEC wafer carriers could, hypothetically, be placed on a susceptor, but he did not testify that any such application would be practical. (Glew Dep. 71:17-72:5.)

[54] Both courts have recognized the textual difference between 35 U.S.C. § 271(f)(2), which requires a showing that a defendant acted in a manner that was "knowing" and "intending," and 35 U.S.C. § 271(f)(1), which requires a showing of "active[] induce[ment]" by the defendant. *See Life Techs.*, 137 S. Ct. at 742 n.8 (assuming without deciding "that subsection (f)(1)'s 'active inducement' requirement is different from subsection (f)(2)'s 'knowing' and 'intending' element"); *WesternGeco LLC v. ION Geophysical Corp.*, 791 F.3d 1340, 1343 (Fed. Cir. 2015) ("*WesternGeco*"), *cert. granted, judgment vacated*, 136 S. Ct. 2486 (2016), *reinstated on relevant ground*, 837 F.3d 1358 (Fed. Cir. 2016), *petition for cert. filed*, No. 16-1011 (U.S. 2016). In addition, the Federal Circuit recently cited without criticism a district court's jury instruction on the intent element of a claim under 35 U.S.C. § 271(f)(2). *See WesternGeco*, 791 F.3d at 1344

intent requirements of § 271(f)(2), the Court considers the plain language of the provision in light of the surrounding provisions of § 271, which address different variations of direct and indirect infringement. *See ACLU v. Clapper*, 804 F.3d 617, 623 (2d Cir. 2015) (instructing courts to enforce statutory provisions "according to [their] terms," reading the provisions "in their context and with a view to their place in the overall statutory scheme," and "striv[ing] to avoid interpretations . . . that would render any phrase or provision superfluous" (citations omitted)).

Three provisions of 35 U.S.C. § 271, other than § 271(f)(2), provide guideposts for understanding the knowledge and intent requirement of § 271(f)(2). Section 271(b) describes a defendant that "actively induces infringement" of a patent. Similarly, Section 271(f)(1), which was modeled on Section 271(b), *see Zoltek Corp. v. United States*, 672 F.3d 1309, 1334 n.6 (Fed. Cir. 2012), describes a defendant that "actively induce[s]" the combination of components into an infringing assembly. Section 271(c), often described as the "contributory infringement" provision, *see Commil USA, LLC v. Cisco Systems, Inc.*, 135 S. Ct. 1920, 1928 (2015), describes a defendant who offers to sell or sells a component within the United States "knowing the same to be especially made or especially adapted for use in an infringement of such patent."

The provision in question here, 35 U.S.C. § 271(f)(2), does not perfectly parallel any of the other infringement provisions of 35 U.S.C. § 271 with respect to knowledge or intent. Most obviously, subsection (f)(2) does not use the phrase "active inducement" that appears in subsections (b) and (f)(1). Although subsection (f)(2) and subsection (c) both require that a defendant supply a component "knowing" that the component is adapted for combination into an infringing assembly, subsection (f)(2) then goes beyond the knowledge requirement of

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(quoting the jury instructions given in *WesternGeco LLC v. ION Geophysical Corp.*, 953 F. Supp. 2d 731, 749 (S.D. Tex. 2013), but also noting that "there was no contention raised before the district court that the (f)(2) instruction as to the standard of intent was erroneous").

subsection (c), requiring that a defendant supply a component "intending that such component will be combined" into an infringing assembly outside the United States.

Presuming that Congress used different words in different subsections of 35 U.S.C. § 271 to convey different meanings, *see Mary Jo C. v. N.Y. State and Local Ret. Sys.*, 707 F.3d 144, 156 (2d Cir. 2013), the Court construes the knowledge and intent requirement under Section 271(f)(2) as requiring more than mere "knowledge," as required under subsection (c), but something short of "active inducement," as required under subsections (b) and (f)(1). With these structural features in mind, and giving the words used in subsection (f)(2) their ordinary meaning, the Court agrees with the interpretation of the knowledge and intent element of 35 U.S.C. § 271(f)(2) adopted by the district court in *WesternGeco LLC v. ION Geophysical Corp.*, which requires a showing that the defendant (i) intended the combination of components to occur outside the United States, (ii) knew that the combination it intended was covered by a United States patent, and (iii) knew that the combination it intended would be infringing if it occurred in the United States. 953 F. Supp. 2d 731, 749 (S.D. Tex. 2013), *aff'd*, 791 F.3d 1340, 1344 (Fed. Cir. 2015), *cert. granted, judgment vacated*, 136 S. Ct. 2486 (2016), *reinstated on relevant ground*, 837 F.3d 1358 (Fed. Cir. 2016).

Applying this standard here, the Court finds that Veeco is likely to establish that SGL Carbon has supplied and is continuing to supply 700mm wafer carriers to AMEC with the requisite knowledge and intent, at least as of October 2017. First, whether or not SGL Carbon intended at the outset of its supplier relationship with AMEC to cause AMEC and its customers to combine the 700mm wafer carriers with a rotatable spindle in an MOCVD reactor, that intent has become clear over the course of its litigation before this Court, during which SGL Carbon has continued to supply wafer carriers to AMEC and AMEC's customers even though SGL Carbon has been repeatedly put on notice by Veeco's complaint, witness declarations and deposition testimony that

the actual use, and the only practical use, for the 700mm wafer carriers is an assembly that violates the '769 Patent. Second, whether or not SGL Carbon knew at the outset of this litigation that the combination it intended for the 700mm wafer carriers was patented, SGL Carbon certainly knows that now, given the discovery taken by the parties and the Court's entry of this Order, which holds that an assembly comprising the 700mm wafer carrier and a corresponding spindle is covered by claims 1-5, 10, 13-16, and 22 of the '769 Patent. *See supra*. Third, whether or not SGL Carbon knew at the outset that AMEC and AMEC's customers would combine the wafer carriers into an assembly that would be infringing if it occurred in the United States, SGL Carbon must know that now, again in light of the discovery in this case and this Order. Accordingly, the Court finds that Veeco is likely to succeed in proving that SGL Carbon has the requisite knowledge and intent to support a claim under 35 U.S.C. § 271(f)(2).[55]

In sum, the Court finds that Veeco has shown a clear likelihood of success on its claim of indirect infringement under 35 U.S.C. § 271(f)(2), so long as one of the claims on which it is based—*i.e.*, any of claims 1-5, 10-13, 16, or 22[56]—is valid. *See Titan Tire*, 566 F.3d 1372 at 1376 (To show a likelihood of success on the merits, a patentee "must show that it will likely prove infringement, *and that it will likely withstand challenges, if any, to the validity of the patent*." (emphasis added)).

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[55] SGL Carbon's apparent belief that the '769 Patent is unenforceable due to invalidity (*see* Def.'s Opp'n (arguing invalidity)) does not negate the scienter element of indirect infringement under § 271(f)(2). *See Commil USA, LLC v. Cisco Systems, Inc.*, 135 S. Ct. 1920, 1928 (2015) (holding that "a defendant's belief regarding patent validity" is no defense to a claim under § 271(b), because "[t]he scienter element for induced infringement concerns infringement; that is a different issue than validity").

[56] SGL Carbon did not rebut Dr. Glew's infringement analysis showing that SGL Carbon's wafer carriers meet all of the physical characteristics of claims 2-5, 10, and 13-16 of the '769 Patent, except for the requirement of a spindle. (Glew Decl., Ex. 2.) Thus, to the extent Veeco is likely to succeed in showing (f)(2) infringement based on claim 1 of the '769 Patent, Veeco is also likely to succeed in showing (f)(2) infringement based on claims 2-5, 10, and 13-16.

B. Alleged Invalidity of the '769 Patent

"[A]n issued patent comes with a statutory presumption of validity under 35 U.S.C. § 282." *Titan Tire*, 566 F.3d at 1376. At the preliminary injunction stage, "the patentee . . . must persuade the court that, despite the challenge presented to validity, the patentee nevertheless is likely to succeed at trial on the validity issue." *Titan Tire*, 566 F.3d at 1377. "An accused infringer 'can defeat a showing of likelihood of success on the merits by demonstrating a substantial question of validity or infringement.'" *Tinnus*, 846 F.3d at 1202 (quoting *Trebro*, 748 F.3d at 1165); *see also Altana Pharma AG v. Teva Pharmaceuticals USA, Inc.*, 566 F.3d 999, 1006 (Fed. Cir. 2009) ("Vulnerability is the issue at the preliminary injunction stage, while validity is the issue at trial.").

Under 35 U.S.C. § 102(b), if a claimed invention was on sale in the United States more than one year before the effective filing date of the patent in question, the sale constitutes prior art and renders the patent invalid. *See Pfaff v. Wells Elecs.*, 525 U.S. 55, 57 (1998). The application for the '769 Patent was filed on February 7, 2011, which makes February 7, 2000 the critical date for purposes of the on-sale bar. SGL Carbon argues that the '769 Patent is invalid due to prior sales of two products: (1) Emcore's D-180 "wagon wheel" product, which was sold to multiple customers in the United States in the 1998-1999 timeframe, and (2) SGL Carbon's "hockey puck" product, which, according to SGL Carbon, was sold in the United States as early as 1992. (Def.'s Opp'n at 10-17.) SGL Carbon also argues that the '769 Patent is invalid due to Emcore's "inequitable conduct" in obtaining the patent. (Def.'s Opp'n at 17-19.)

1. Emcore's D-180 Wagon Wheel

As described above, the D-180 wagon wheel, a component of Emcore's D-180 MOCVD reactor, was a metal structure that was affixed to the spindle of the D-180 reactor and fitted into a central recess on the bottom of the wafer carriers used in the D-180 reactor. *See supra*. To show invalidity based on the D-180 wagon wheel assembly, SGL Carbon argues that the wagon wheel

is a "spindle" within the meaning of the '769 Patent, and not, as Veeco argues, a "susceptor." (Def.'s Opp'n at 12; Pl.'s Reply Br. at 7-10; *see also* Bretschneider Decl. ¶¶ 93-97 (describing the wagon wheel as a "spindle").) From that premise, SGL Carbon argues that an assembly comprising a D-180 wagon wheel and a wagon-wheel-adapted wafer carrier meets the limitations of, and therefore anticipates, all claims of the '769 Patent on which Veeco's motion is based. (Def.'s Opp'n at 12-13.)[57] Because these arguments all extend from the premise that the wagon wheel is a "spindle," and not a "susceptor," the resolution of SGL Carbon's arguments based on the D-180 wagon wheel is dictated by the Court's interpretation of those terms, as set forth above.

Under those interpretations, the D-180 wagon wheel is a susceptor within the meaning of the '769 Patent. Although the D-180 wagon wheel is not the primary transfer mechanism for heat to the wafer carrier (Bretschneider Surreply Decl. ¶ 29; Armour Dep.[58] 107:16-21), the D-180 wagon wheel meets the definition of susceptor that is established in the specification. The wagon wheel is permanently mounted in the reactor, on top of a spindle, and transfers heat to, and supports, the wafer carrier of the reactor.[59] The wagon wheel is large enough in diameter to extend above the heating apparatus of the reactor—albeit only to a modest degree—and thus creates two

[57] SGL Carbon also argues that, to the extent claims 1-5, 10, and 13-16 are not limited by a spindle or a CVD reactor, wafer carriers for the D-180 wagon wheel anticipated those claims of the '769 Patent. (Def.'s Opp'n at 12-13.) But that argument was premised on the Court agreeing with Veeco that those claims are not limited by the requirement of a spindle or a CVD reactor. (*See id.*) In light of the holding that claims 1-5, 10, and 13-16 require a spindle, the Court construes SGL Carbon's invalidity arguments as to claim 22 as being directed also to claims 1-5, 10, and 13-16, as those claims have been construed in this Order.

[58] "Armour Dep." refers to the transcript of the deposition of Eric Armour taken on September 21, 2017. (Dkt. 49-7.)

[59] Dr. Armour's testimony suggesting that the D-180 wagon wheel was a "heat sink" is contrary to the overwhelming evidence in the record that the D-180 wagon wheel transferred at least *some* heat to the wafer carrier, albeit less than a larger susceptor may have transferred. (Bretschneider Decl. ¶ 51.)

thermal interfaces. The wagon wheel is made of molybdenum alloy, is removable from the reactor only when the deposition cycle is interrupted, and adds significant thermal and inertial mass to the wafer-supporting assembly. For these same reasons, the wagon wheel is neither a "spindle" nor a "retaining means" within the meaning of the '769 Patent.[60] Accordingly, wafer-supporting assemblies for the D-180 wagon wheel do not anticipate any of the claims in the '769 Patent because they do not comprise a rotatable spindle and a wafer carrier adapted for detachable mounting on said rotatable spindle.[61]

As a fallback argument, SGL Carbon contends that if the D-180 wagon wheel is a "susceptor," then so must be the wafer-supporting assembly described in the AMEC patent application on which Dr. Glew partially relied in rendering his opinion of infringement. The Court disagrees. As explained above, under the Court's construction of the relevant claims and terms, the wafer-supporting assembly described in AMEC's '768 Application is a spindle with a retaining means, bringing it squarely within the scope of the '769 Patent.

2. SGL Carbon's "Hockey Puck"

As described above, SGL Carbon has submitted a written schematic of a product labeled "hockey puck," which depicts a cylindrical object with a two-inch cavity on one side and a narrower, deeper recess on the other side. (Henseler Decl., Ex. 10.) SGL Carbon asserts that the "hockey puck" is a wafer carrier for a CVD reactor and asserts, in its legal memoranda, that the "hockey puck wafer carrier" was sold to customers in the United States as early as 1992. (Def.'s Opp'n at 14.) As noted above, however, SGL Carbon has not submitted documentary evidence

[60] The conclusion that the D-180 wagon wheel is a "susceptor" within the meaning of the '769 Patent—and not a "spindle"—is also consistent with contemporaneous documentation by Emcore. (*See* Armour Decl., Exs. 5, 13.)

[61] In light of this holding, the Court need not consider Dr. Bretschneider's claim-by-claim comparison of the '769 Patent to the wagon wheel. (Bretschneider Decl. ¶¶ 98-144.)

showing that a product meeting the description of the "hockey puck" schematic was ever sold in the United States. Instead, SGL Carbon submitted testimony from its Vice President of Global Marketing and Sales, Christoph Henseler, who was hired by SGL Carbon in November 2008 (Henseler Decl. ¶ 2), roughly sixteen years after SGL Carbon allegedly began selling the hockey puck. Henseler testified that, based on his knowledge of SGL Carbon's conventions for the creation of product schematics, he could tell from the hockey puck schematic that "SGL was manufacturing and selling wafer carriers in accordance with the [schematic] . . . in the United States in within a year of this [schematic], thus by 1995 or 1996." (Henseler Decl. ¶ 37.)

Based on the present record, the Court finds that SGL Carbon's evidence of prior sales of the "hockey puck" does not show sufficient vulnerability of the '769 Patent to preclude injunctive relief. The record does not indicate what exactly the hockey puck was, even assuming it was ever manufactured, let alone whether the hockey puck was "adapted for" and actually combined with a rotatable spindle. (*See* Glew Reply Decl. ¶ 58.)[62] Indeed, further discovery may well reveal, for example, that no product conforming to the "hockey puck" schematic was ever sold, that it was not sold in the United States, or that the product sold pursuant to the schematic had features that distinguished it from the limitations of the '769 Patent.[63] Accordingly, on the present record, the Court finds that SGL Carbon's hockey puck argument deserves little weight in the evaluation of Veeco's likelihood of success on the merits.

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[62] Furthermore, the one SGL Carbon witness who gave testimony suggesting sales of the hockey puck, Cristoph Henseler, gave deposition testimony that deeply undercut his own prior statements about SGL Carbon's alleged sales of the hockey puck. (*See* Henseler Dep. 210:6-12; 226:23-227:3.)

[63] Similarly, although SGL Carbon alludes to an "equivalent" of the hockey puck that was produced by Emcore (*see* Armour Dep. 121:15-127:11 (discussing Emcore's "75 system")), SGL Carbon has not articulated or presented evidence creating a substantial question of whether any such "equivalent" system invalidates the '769 Patent. SGL Carbon may explore the "75 system" in discovery.

Moreover, there are two additional reasons that SGL Carbon's "hockey puck" arguments do not raise a substantial question of invalidity. First, SGL Carbon's argument based on the "hockey puck" was premised on the Court's adoption of Veeco's construction of claim 1 of the '769 Patent, which the Court rejected in this Order. (*See* Opp'n at 15 (arguing invalidity "[u]nder Veeco's infringement theory").) Second, even if SGL Carbon could prove that the hockey puck was sold more than one year before the application date, was "adapted for" detachably mounting on a spindle, and was actually combined into a wafer-supporting assembly, SGL Carbon would nonetheless need to prove by clear and convincing evidence that claim 14 of the '769 Patent, as construed in this Order, would be obvious to a person of ordinary skill in the art, because claim 14 discloses a wafer-supporting assembly in which the wafer carrier supports multiple wafers, whereas the purported "hockey puck" could support only one. (*See* Bretschneider Decl. ¶¶ 169-70.)[64]

3. Inequitable Conduct

SGL Carbon contends that the '769 Patent is invalid because it was obtained through inequitable conduct. (Def.'s Opp'n at 17-19.) According to SGL Carbon, the inventors of the '769 Patent, who, the record shows, were also involved in the development of the D-180 wagon wheel, deliberately omitted the D-180 wagon wheel from the '769 Patent application to deceive the examiner into believing the patented invention was novel. (Def.'s Opp'n at 18-19.)

The remedy for inequitable conduct is the "atomic bomb of patent law . . . . Unlike validity defenses, which are claim specific, inequitable conduct regarding any single claim renders the

[64] Although discovery on this question of obviousness may be warranted as this case advances, the Court notes that the present record weighs in favor of Veeco, for the reasons stated by Veeco's expert, Dr. Glew. (*See* Glew Reply Decl. ¶ 65); *see also* 35 U.S.C. § 282(a) ("[D]ependent or multiple dependent claims shall be presumed valid even though dependent upon an invalid claim."); *Scanner Techs. Corp. v. ICOS Vision Sys. Corp. N.V.*, 528 F.3d 1365, 1383 (Fed. Cir. 2008) ("[It is] black letter law that a finding of invalidity of an independent claim does not determine the validity of claims that depend from it.").

entire patent unenforceable." *Therasense, Inc. v. Becton, Dickinson & Co.*, 649 F.3d 1276, 1288 (Fed. Cir. 2011) (internal citations and quotation marks omitted). "To prevail on a claim of inequitable conduct, the accused infringer must prove that the patentee acted with the specific intent to deceive the PTO." *Id.* at 1290. "In other words," to show inequitable conduct, "the accused infringer must prove by clear and convincing evidence that the applicant knew of the reference, knew that it was material, and made a deliberate decision to withhold it." *Id.*

Contrary to SGL Carbon's contentions, the Court finds, based on the present record, that Veeco will likely defeat SGL Carbon's defense of inequitable conduct. Most significantly, the Court has ruled that the D-180 wagon wheel is a "susceptor" as that term is used in the '769 Patent. Thus, the Court finds that the D-180 wagon wheel was substantially disclosed in the '769 Patent, along with any other susceptor-based CVD systems meeting the description of the prior art in the '769 Patent. Given this substantial disclosure, the Court finds no basis to infer, based merely on the features of the D-180 wagon wheel and the text of the '769 Patent, that the inventors of the '769 "acted with the specific intent to deceive the PTO." *Therasense*, 649 F.3d at 1290. Furthermore, SGL Carbon has not submitted any direct evidence of fraud by the inventors of the '769 Patent. Accordingly, Veeco is likely to defeat SGL Carbon's defense of inequitable conduct.

* * * * *

In summary, based on the present record and for the reasons stated above, the Court finds that Veeco will not succeed on its claim under 35 U.S.C. § 271(a), but Veeco is more likely than not to succeed on its claim under 35 U.S.C. § 271(f)(2).[65]

[65] In addition, the Court finds that even if Veeco were required to satisfy the Second Circuit's requirement of a "clear or substantial likelihood" of success, *see N.Y.C. Civ. Liberties Union*, 684 F.3d at 294, Veeco has done so.

II. Irreparable Harm

To show irreparable harm, "a patentee must establish both of the following requirements: 1) that absent an injunction, it will suffer irreparable harm, and 2) that a sufficiently strong causal nexus relates the alleged harm to the alleged infringement." *Apple Inc. v. Samsung Elecs.*, 695 F.3d 1370, 1374 (Fed. Cir. 2012) ("*Apple II*"). "Evidence showing that no amount of monetary damages, however great, could address the harm tends to show it is an irreparable harm." *Metalcraft*, 848 F.3d at 1368.[66]

As summarized above, Veeco alleges that as a result of SGL Carbon's continuing supply of infringing wafer carriers to AMEC and AMEC's customers, Veeco has suffered and will continue to suffer the following forms of irreparable harm: (i) loss of customers, orders, and market share, (ii) price erosion, (iii) loss of business opportunities, and (iv) loss of goodwill and damage to reputation. (Pl.'s Br. at 16-22; Gerardi Decl. ¶ 54.) In seeking a preliminary injunction, Veeco asserts that it will continue to sustain each of these forms of harm in the absence of a preliminary injunction, and that post-trial money damages will not be an adequate remedy. (Pl.'s Br. at 16-22.) In opposition, SGL Carbon argues, first, that none of the alleged harm on which Veeco bases its motion for preliminary injunction was or will be caused by SGL Carbon's alleged infringement, and, second, that even if some or all of Veeco's alleged harm was caused by SGL Carbon, the harm is all quantifiable to a reasonable degree of certainty and, therefore, can be remedied through an award of money damages. (Def.'s Opp'n at 19-33.) In addition, through supplemental briefing, SGL Carbon argues, based on the presumption against extraterritoriality, that Veeco cannot show irreparable harm as a matter of law because all of

[66] The irreparable harm element is the same for both preliminary and permanent injunctions. *See Apple, Inc. v. Samsung Elecs. Co.*, 735 F.3d 1352, 1361 (Fed. Cir. 2013) ("*Apple III*").

Veeco's alleged "harms" arise from AMEC's sales of MOCVD reactors outside the United States. (Def.'s Supp. Br., Dkt. 64-2.)[67]

A. Cognizable Forms of Irreparable Harm

The Federal Circuit has recognized that irreparable harm can come in many different forms and is not limited to harms that have an immediate pecuniary effect on the patent holder. *See Douglas Dynamics, LLC v. Buyers Prod. Co.*, 717 F.3d 1336, 1344 (Fed. Cir. 2013) ("Irreparable injury encompasses different types of losses that are often difficult to quantify, including lost sales and erosion in reputation and brand distinction."); *Celsis In Vitro, Inc. v. CellzDirect, Inc.*, 664 F.3d 922, 930 (Fed. Cir. 2012) ("Price erosion, loss of goodwill, damage to reputation, and loss of business opportunities are all valid grounds for finding irreparable harm.").

Here, the forms of irreparable harm that Veeco asserts are all cognizable for purposes of a preliminary injunction, if supported by sound evidence. Loss of customers, orders, and market share is a common ground on which to find irreparable harm. *See Trebro Mfg., Inc. v. Firefly Equip., LLC*, 748 F.3d 1159, 1170 (Fed. Cir. 2014); *Douglas Dynamics*, 717 F.3d at 1344-45. The Federal Circuit has also held that irreversible price erosion may constitute irreparable harm, if it is unlikely to be quantifiable with requisite certainty after the fact. *See Celsis*, 664 F.3d at 930. Beyond these pecuniary harms, there is also precedent for a finding of irreparable harm based on non-pecuniary harm to a patent holder's competitive position in a relevant market, including loss of future business opportunities, damage to brand distinctiveness, loss of reputation as an innovator

[67] After the preliminary injunction hearing, the Court asked the parties to submit supplemental briefing on the question of whether the Federal Circuit's caselaw concerning extraterritorial damages, *see, e.g.*, *Power Integrations, Inc. v. Fairchild Semiconductor Int'l, Inc.*, 711 F.3d 1348 (Fed. Cir. 2013)—which neither party raised in its initial briefing—has any bearing on the Court's evaluation of the irreparable harm element of Veeco's motion for a preliminary injunction. (*See* October 19, 2017 Docket Entry.)

in the market, and loss of network effects and customer lock-in effects in downstream markets. *See ActiveVideo Networks, Inc. v. Verizon Commc'ns, Inc.*, 694 F.3d 1312, 1340 (Fed. Cir. 2012) ("[l]oss of business opportunities"); *Douglas Dynamics, LLC*, 717 F.3d at 1344 ("erosion in reputation and brand distinction"); *Tinnus Enters.*, 846 F.3d at 1208 (harm to "status as the innovator in the market"); *Apple Inc. v. Samsung Elecs. Co.*, 809 F.3d 633, 645 (Fed. Cir. 2015) ("*Apple IV*") ("downstream" losses and "network effect" losses); *Trebro Mfg.*, 748 F.3d at 1165 ("loss of market share and customers" and having "to lay people off"). The additional forms of harm that Veeco asserts—*i.e.*, loss of valuable customer feedback, loss of sales in the aftermarket for MOCVD parts and services, erosion of its product distinctiveness and reputation in the market, and loss of goodwill—all fit squarely within these precedents.

B. Adequacy of Money Damages

SGL Carbon argues that any alleged harm to Veeco as a result of AMEC's sales of MOCVD reactors incorporating SGL Carbon wafer carriers that infringe the '769 Patent are quantifiable and can be remedied through an award of money damages. (Def.'s Opp'n at 21-23.) SGL Carbon's expert, Dr. Serwin, testified in his declaration that claimed lost sales and price erosion could be calculated to a reasonable degree of economic certainty at trial in this action. (Serwin Decl. ¶¶ 55-65.)

Contrary to SGL Carbon's arguments, the Court finds that Veeco has shown a clear likelihood of irreparable harm. Although Veeco may be able to prove with requisite certainty its losses due to lost sales, lost customers, or price erosion in the past or near-term future (*see* Serwin Decl. ¶¶ 55-65), the long-term and second-order effects of SGL Carbon's infringement and Veeco's resulting lost sales, lost customers, and price erosion are not likely to be quantifiable with a requisite degree of certainty. Indeed, Veeco has submitted evidence showing a likelihood of irreparable harm in numerous forms. Veeco's loss of customer feedback will hamper its ability to

continue innovating its MOCVD designs to remain competitive in the MOCVD market (Gerardi Decl. ¶¶ 74-75), which supports a finding of irreparable harm, *see Mylan Inst. LLC v. Aurobindo Pharma Ltd.*, 857 F.3d 858, 872 (Fed. Cir. 2017). Veeco's loss of revenue in the near term, combined with asset impairments and other potential losses of goodwill and market share, will impair Veeco's ability to invest in research and development (Raman Decl. ¶ 55), which the Federal Circuit has recognized as a form of irreparable harm, *see Mylan Inst. LLC*, 857 F.3d at 872. Due to the incumbency effects of the MOCVD market, Veeco's lost sales in the near term will hamper its ability to obtain further sales from the same customer going forward (Raman Decl. ¶29; Gerardi Decl. ¶ 62), yet those future sales will be extremely difficult to determine with the certainty required to obtain money damages. *See Robert Bosch LLC*, 659 F.3d at 1154; *Metalcraft of Mayville, Inc. v. The Toro Co.*, 848 F.3d 1358, 1368-69 (Fed. Cir. 2017). In addition, the medium- and long-term effects of Veeco's lost market share and other competitive harms will be especially difficult to quantify at trial because the MOCVD reactor market is entering an expansionary period, making historical market data less predictive of future results. (Gerardi Decl. ¶ 41.) For each of these reasons, the Court finds that Veeco has established a likelihood of irreparable harm due to AMEC's sale of MOCVD reactors that incorporate SGL Carbon wafer carriers that infringe on the '769 Patent.

Moreover, Veeco has submitted evidence that Veeco and AMEC are the only two manufacturers of susceptorless MOCVD reactors with 700mm wafer carrier carriers, which pits Veeco and AMEC in two-player competition for at least the 700mm segment of the market, which represents a substantial segment of the global MOCVD reactor market as a whole, as well

as the expanding future market for MOCVD reactors. (Dkt. 54-3.)[68] This situation—where Veeco is forced into direct competition, in a limited market with few potential customers, with a product embodying its own patented design—reinforces the Court's conclusion that Veeco has established a likelihood of irreparable harm. *See Trebro*, 748 F.3d at 1170; *Douglas Dynamics, LLC*, 717 F.3d at 1344-45.

C. Causal Nexus

The Court next considers whether Veeco has shown an adequate causal nexus between SGL Carbon's sales of 700mm wafer carriers and Veeco's irreparable harm. *See Apple, Inc. v. Samsung Elecs. Co.*, 678 F.3d 1314, 1324 (Fed. Cir. 2012) ("*Apple I*") ("We hold that the district court was correct to require a showing of some causal nexus between [the defendant's] infringement and the alleged harm to [the patent holder] as part of the showing of irreparable harm."). The Federal Circuit has made clear that a "causal nexus," for purposes of injunctive relief, requires only a showing that "there is 'some connection' between the patented features and the demand for [the infringing rival's] products." *Apple IV*, 809 F.3d at 642. The patented features of the product need not be the "sole" cause of the irreparable harm, nor even the "predominant" cause. *Id.* at 641-42. Rather, the patent owner need only show that the patented feature had a significant "impact [on] consumers' decisions to purchase" the product incorporating the infringing feature. *Id.* at 642 (reaffirming that "causal nexus can be shown with evidence that 'a patented feature is one of several features that cause consumers to make their purchasing decisions'" (quoting *Apple III*, 735 F.3d at 1364)).

[68] SGL Carbon asserts that another Chinese MOCVD manufacturer, TOPEC, is a third viable competitor in the Chinese MOCVD market. As discussed above, however, the record indicates that TOPEC does not sell a susceptorless MOCVD reactor with 700mm wafer carriers, and the preliminary sales data for 2017 indicates that TOPEC does not have a product that is competitive with Veeco's or AMEC's 700mm systems. (*See* Gerardi Reply Decl. ¶¶ 11-23; Dkt. 54-3.)

Here, at least for purposes of a preliminary injunction, Veeco has established the requisite causal nexus between SGL Carbon's sales of 700mm wafer carriers for AMEC's MOCVD systems and Veeco's likely irreparable harm. Most significantly, the record shows that, in 2016 and 2017, the market for MOCVD reactors has been dominated by susceptorless MOCVD systems that incorporate spindle-mounted wafer carriers. (Gerardi Decl. ¶ 39; Serwin Decl. ¶ 27; Dkt. 54-3.) The record shows that MOCVD systems that have not incorporated the spindle-mounted design have been all but eliminated from the market in recent years. (Gerardi Decl. ¶ 39; Serwin Decl. ¶ 28; Bretschneider Decl. ¶ 202.) In addition, undisputed testimony indicates that spindle-mounted wafer carriers substantially increase the throughput of an MOCVD reactor, in some cases by up to 40%, which undeniably would have an impact on customer demand for the MOCVD reactor—indeed, as SGL Carbon concedes, "[c]ustomers of MOCVD reactors seek to make the highest volume of high quality wafers manufactured over the longest time period and at the lowest price" (Bretschneider Decl. ¶ 188), which implicitly concedes that a design component that boosts production volume would significantly influence customer demand. (*See also* Glew Decl., Exs. 1, 6 (AMEC marketing materials advertising benefits of its Prismo D-Blue system, which correspond to the benefits of Veeco's patented wafer-supporting assemblies).) In short, although the parties may disagree about the exact weight that customers give to different features of an MOCVD system, there is no real dispute that the patented wafer-supporting assembly has a significant impact on customer demand, even if the wafer-supporting assembly is just "one of several features that cause consumers to make their purchasing decisions." *Apple IV*, 809 F.3d at 642 (quoting *Apple III*, 735 F.3d at 1364).

In opposition, SGL Carbon gives six reasons that the Court should not find a "causal nexus" between SGL Carbon's wafer carrier sales and Veeco's alleged irreparable harm. (Def.'s Opp'n at 27-32; Def.'s Surreply Br. at 1, 5-7.) The Court addresses each of these arguments in turn.

First, SGL Carbon argues that Veeco's theory of infringement and theory of irreparable harm are "directed to different products." (Def.'s Surreply Br. at 1.) According to SGL Carbon, all of Veeco's evidence of infringement relates to AMEC's first-generation Prismo D-Blue system, which uses 480mm wafer carriers, whereas Veeco's theory of irreparable harm is based entirely on AMEC's second-generation Prismo D-Blue system, which uses 700mm wafer carriers. (*Id.*) The Court disagrees. As explained above, the Court finds based on the present record that Veeco is more likely than not to establish infringement with respect to the 700mm wafer carrier for AMEC's second-generation system. Thus, SGL Carbon's arguments about distinctions between AMEC's first- and second-generation reactors are beside the point.

Second, SGL Carbon argues that its sales of wafer carriers for AMEC's MOCVD systems could not possibly have a causal nexus to Veeco's irreparable harm because SGL Carbon began selling wafer carriers to AMEC in 2013, more than three years before AMEC's market share began to surge in 2017. (Def.'s Opp'n at 30.) According to SGL Carbon's arguments in the hearing, if SGL Carbon's wafer carriers were the cause of AMEC's market success, AMEC would have increased its sales in 2013. (*See* Hr'g Tr. 144, Oct. 12, 2017; *see also* Hr'g Tr., Oct. 13, 2017.) The Court rejects this line of reasoning. Contrary to SGL Carbon's argument, the only inference that can be drawn about SGL Carbon's wafer carriers, based on AMEC's poor market performance before 2017, is that SGL Carbon's wafer carriers were not *sufficient* to cause customers to purchase AMEC's MOCVD reactors before 2017. But the fact that SGL Carbon's wafer carriers were not sufficient to boost AMEC's sales before 2017 does not say anything about how necessary or important those wafer carriers are now to AMEC's ability to offer a MOCVD system that competes with Veeco's. In other words, AMEC's poor market performance before 2017 gives no information about the importance of SGL Carbon's wafer carriers to AMEC's recent increase in market share.

Third, SGL Carbon argues that, if AMEC were unable to compete in the MOCVD market, TOPEC would take over all of AMEC's MOCVD reactor sales and Veeco would still suffer all of the alleged harms. (Def.'s Opp'n at 31.) The Court finds this argument unpersuasive based on the present record. With the exception of a single MOCVD sale by TOPEC in June 2017, there is no evidence that TOPEC offers a product that can compete with Veeco or AMEC, which, according to the present record, are the only two major competitors in the current MOCVD market. Moreover, the record shows that TOPEC does not manufacture an MOCVD reactor that uses 700mm spindle-mounted wafer carriers, and there is no evidence that TOPEC's MOCVD reactor, whatever its design or size, has the same advantages in throughput and efficiency as the spindle-mounted design of Veeco's and AMEC's 700mm models. (Gerardi Reply Decl. ¶¶ 11-23; Dkt. 54-3)[69] In short, the Court finds that AMEC's ability to offer a 700mm susceptorless MOCVD reactor—the only model on the market other than Veeco's 700mm system—will, more likely than not, divert *at least some* sales away from Veeco's systems, even if some of those sales would have otherwise been obtained by TOPEC.[70]

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[69] SGL Carbon's assertion that TOPEC manufactures a susceptorless MOCVD reactor is based on Dr. Bretschneider's review of TOPEC patents and patent applications. (*See* Bretschneider Decl. ¶ 204; Serwin Dep. 44:23-45:5; Bretschneider Dep. 290:17-292:4.) Although those patents and patent applications are some evidence of the products TOPEC manufactures, the testimony of Veeco's Vice President of Marketing, combined with TOPEC's inability to win market share thus far in 2017, overwhelmingly outweighs Dr. Bretschneider's inferential reasoning. Moreover, even if TOPEC could manufacture a susceptorless MOCVD reactor, the record shows that TOPEC would be unable to market a 700mm reactor—the highest-throughput reactor on the market—because the only suppliers of that size of wafer carrier, at least for the near term, are Xycarb, a company that has agreed not to produce or sell infringing wafer carriers, and SGL Carbon. *See supra.* There is also no evidence that TOPEC has the inventory or manufacturing capacity to capture *all* of the sales that would be diverted from AMEC in the event of an injunction. (Gerardi Reply Decl. ¶ 22.)

[70] SGL Carbon's expert basically conceded that TOPEC would not capture all of AMEC's sales if this Court issues an injunction (*see* Serwin Decl. ¶¶ 36, 45-46), which, in effect, confirms that at least some sales would go to Veeco, the only other company that is competing meaningfully for the market in question. Thus, the Court agrees with Dr. Gerardi that Dr. Serwin did not rebut Dr.

Fourth, SGL Carbon argues that Veeco has failed to show that "if SGL is enjoined from supplying AMEC with wafer carriers, AMEC would not be able to find a replacement supplier in short order." (Def.'s Opp'n at 31-32.) This argument is directly contradicted by the record, which shows that, other than SGL Carbon, the only manufacturer that is capable of supplying 700mm wafer carriers for AMEC's MOCVD reactor is Xycarb, which has already agreed not to supply infringing wafer carriers to AMEC or AMEC's customers. (Raman Dep. 306:5-13, 308:18-311:18.) SGL Carbon has not submitted any evidence to the contrary, and, in fact, has all but conceded that if SGL Carbon were enjoined from supplying AMEC wafer carriers, it would take another manufacturer "one to two years" to begin supplying 700mm wafer carriers for AMEC reactors. (*See* Serwin Decl. ¶ 48; *see also* Hr'g Tr., Oct. 13, 2017.) Thus, the most that SGL Carbon can argue is that the benefits of an injunction would be transitory; SGL Carbon has not shown, however, that the injunction would fail to prevent irreparable harm in at least the next "one or two years," if not longer.

Fifth, SGL Carbon argues that Veeco has failed to prove that customer demand is driven in part by the patented wafer carriers. (Def.'s Opp'n at 30-31.) The Court disagrees. As discussed at length above, the record evidence shows that the throughput of an MOCVD system has a significant impact on customer demand and that the patented invention provides a substantial boost to throughput, among other benefits, compared to MOCVD systems that do not embody the patented invention. *See supra.* Customers may be indifferent, in some sense, to the choice between a susceptor system and system embodying the patented invention, but they are not indifferent to the advantages conferred by the patented invention, which is what matters in this context.[71]

Gerardi's conclusion that "in the absence of AMEC, Veeco would make [at least] some . . . of the sales that would otherwise have been made by AMEC." (Gerardi Reply Decl. ¶ 10.)

[71] In addition, the Court is not persuaded that the eleven purported drivers of demand identified by Dr. Bretschneider (Bretschneider Decl. ¶¶ 188-200) negate or overwhelm the importance of the wafer-supporting assembly used in an MOCVD reactor. In positing these eleven

Sixth, SGL Carbon argues that "Veeco's own documents indicate that pricing, not the patent, is the primary reason customers buy AMEC's . . . products over Veeco's." (Def.'s Surreply Br. at 6.) But, even if that is true, those customers are in the position to choose between Veeco and AMEC based on price only because AMEC is able to offer a comparable MOCVD reactor that incorporates Veeco's patented technology. The fact that customers want to pay as little as possible for an MOCVD reactor with the capabilities of Veeco's patented invention does not mean that the customers do not place significance on the patented invention when making purchasing decisions. And, in any event, even if pricing were the "primary" driver of demand, that would not preclude the Court from finding, as it has, that SGL Carbon's supply of wafer carriers has a significant impact on customers' purchasing decisions.

D. Veeco's Alleged Delay

SGL Carbon argues that Veeco has failed to prove irreparable harm in part because Veeco delayed an unreasonable amount of time before seeking a preliminary injunction. (Def.'s Opp'n at 32-33.) The Court disagrees. Regardless of when Veeco knew that SGL Carbon was supplying infringing wafer carriers to AMEC, the record is clear that Veeco could not have obtained a preliminary injunction until sometime in 2017, when AMEC's sale of MOCVD reactors arguably

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factors, Dr. Bretschneider does not identify which manufacturer, as between Veeco or AMEC, has the advantage with respect to each of the factors. Without that information, the Court cannot begin to assess the extent to which customers may be selecting AMEC's reactors due to the factors identified by Dr. Bretschneider, and not simply because, as Veeco has shown is likely, AMEC is offering Veeco's wafer-supporting assembly at a steep discount. Furthermore, several of the factors listed by Dr. Bretschneider are themselves influenced by the type of wafer-supporting assembly used, such as thermal uniformity, thermal and rotational inertia, and maintenance costs. (*See* Glew Reply Decl. ¶ 23.) Finally, even if customers do in fact care about each of the eleven factors that SGL Carbon has articulated, there is no reason to believe, at least based on the present record, that the customers would therefore *not* care about the wafer-supporting assembly of the reactor, especially when the evidence suggests that such an assembly is material to the reactor's output quality and efficiency, two things that customers undeniably care about.

began to cause Veeco harm. The Court declines to punish Veeco for electing not to file a premature motion for a preliminary injunction, and instead filing the motion only after sustaining and marshaling evidence of irreparable harm and after failing to reach a negotiated resolution to the infringement with SGL Carbon.

E. Extraterritoriality

SGL Carbon argues that Veeco cannot show irreparable harm as a matter of law because all of Veeco's alleged "harms" arise from AMEC's sales of MOCVD reactors outside the United States. (Def.'s Supp. Br., Dkt. 64-2, at 1.) SGL Carbon's argument is based on recent decisions by the Federal Circuit applying the "presumption against extraterritoriality" to foreclose U.S. patent holders from recovering money damages arising from certain lost sales in foreign markets. *See Power Integrations, Inc. v. Fairchild Semiconductor Int'l, Inc.*, 711 F.3d 1348 (Fed. Cir. 2013); *Carnegie Mellon Univ. v. Marvell Tech. Grp., Ltd.*, 807 F.3d 1283 (Fed. Cir. 2015); *WesternGeco LLC v. ION Geophysical Corp.*, 791 F.3d 1340 (Fed. Cir. 2015) ("*WesternGeco*"), *cert. granted, judgment vacated*, 136 S. Ct. 2486 (2016), *reinstated in relevant part*, 837 F.3d 1358 (Fed. Cir. 2016). Having considered these decisions and the parties' supplemental submissions, the Court holds that the arguably extraterritorial nature of Veeco's irreparable harm does not prevent Veeco from obtaining a preliminary injunction in the specific circumstances of this case.

In *Power Integrations*, the Federal Circuit held that, under 35 U.S.C. § 271(a), a U.S. patent holder could not recover lost profits arising from a competitor's sale of a patented product where the product was produced, sold, and used "entirely" outside the United States, even if those lost profits "were the direct, foreseeable result of [the defendant's] domestic infringement." 711 F.3d at 1371-72. The Federal Circuit explained that, "the entirely extraterritorial production, use, or sale of an invention patented in the United States is an independent, intervening act that, under

almost all circumstances, cuts off the chain of causation initiated by an act of domestic infringement." *Id.* (citing *Morrison v. Nat'l Australia Bank Ltd.*, 561 U.S. 247 (2010)).

In *Carnegie Mellon*, the Federal Circuit held that, under 35 U.S.C. § 271(a), a U.S. patent holder could not recover a reasonable royalty based on units of a patented product that were manufactured and sold entirely outside the United States. 807 F.3d at 1305-06 (remanding for determination of which units of the patented product "can fairly be said to have been sold here" in the United States).

In *WesternGeco*, the Federal Circuit considered whether, under 35 U.S.C. § 271(f)(2), a U.S. patent holder could recover "lost profits resulting from lost contracts for services to be performed abroad," where the rival company that won the contracts was using an infringing device that had been exported from the United States. 791 F.3d at 1343-44. The Federal Circuit held that those "foreign" lost profits were not recoverable from the domestic exporter of the infringing product, because "[35 U.S.C.] § 271(f) was designed to put domestic entities who export components to be assembled into a final product in a similar position to domestic manufacturers who sell the final product domestically or export the final product." *Id.* at 1351. Thus, "[j]ust as the United States seller or exporter of a final product cannot be liable for its use abroad, so too the United States exporter of the component parts cannot be liable for use of the infringing article abroad." *Id.* at 1351.

Contrary to SGL Carbon's arguments, none of the Federal Circuit's recent extraterritoriality decisions forecloses Veeco from recovering lost profits based on its claim under 35 U.S.C. § 271(f)(2).[72] The decisions in *Power Integrations* and *Carnegie Mellon* are easily distinguishable: those cases addressed claims of direct infringement under 35 U.S.C. § 271(a),

[72] As noted above, the Court's construction of claim 1 of the '769 Patent precludes Veeco's claim for direct infringement under 35 U.S.C. § 271(a).

where the alleged damages arose from foreign sales of products manufactured "entirely" outside the United States. Neither decision addressed the situation present in this case, where the defendant domestically manufactures a component in violation of 35 U.S.C. § 271(f)(2).

This case also falls outside the holding of *WesternGeco*. In contrast to *WesternGeco*, where the alleged lost profits arose from "lost contracts for services," Veeco's alleged lost profits in this case arise from the sale of a product that incorporates a component manufactured in the United States in violation of 35 U.S.C. § 271(f)(2). This distinction is significant—indeed, the majority opinion in *WesternGeco* repeatedly emphasized that the alleged lost profits in that case arose from a foreign rival's extraterritorial *use* of a patented invention in the performance of services. *See* 791 F.3d at 1350-51. Indeed, *WesternGeco* indicates that the presumption against extraterritoriality is no bar to Veeco's alleged lost profits in this case. According to *WesternGeco*, 35 U.S.C. § 271(f) "was designed to put domestic entities who export components to be assembled into a final product in a similar position to domestic manufacturers who sell the final product domestically or export the final product." *Id.* at 1351. Thus, to determine Veeco's available remedies for infringement in this case, the Court should treat SGL Carbon as having "export[ed] the final product" into which its component was combined. *Id.* In other words, under *WesternGeco*, Veeco's alleged lost profits are recoverable to the extent that they would be recoverable if SGL Carbon exported "the final product"—*i.e.*, an MOCVD reactor incorporating the patented wafer-supporting assembly. *Id.* Accordingly, all of Veeco's alleged lost profits are recoverable from SGL Carbon irrespective of the location of purchasers of the "final product," so long as Veeco establishes the factual and legal predicates for those lost profits. *See WesternGeco*,

791 F.3d at 1351; *see also Goulds' Mfg. Co. v. Cowing*, 105 U.S. 253, 256-58 (1881) (awarding lost profits for exports of infringing products to Canada).[73]

For these reasons, the Court finds that the arguably extraterritorial nature of Veeco's irreparable harm is no bar to a preliminary injunction.

III. Balance of Hardships

A patentee seeking a preliminary injunction must establish that the balance of equities tips in its favor. *Luminara*, 814 F.3d 1343, 1352 (Fed. Cir. 2016). When balancing the equities, "[t]he district court must weigh the harm to the [patentee] if the injunction is not granted against the harm to the [alleged infringer] if the injunction is granted." *Metalcraft*, 848 F.3d at 1368 (citing *Hybritech*, 849 F.2d at 1457). At the preliminary injunction stage, "[t]he balance of hardships asks which of the two parties would suffer most grievously if the preliminary injunction motion were wrongly decided." *Goldman, Sachs & Co. v. Golden Empire Schs. Fin. Auth.*, 922 F. Supp. 2d 435, 444 (S.D.N.Y. 2013) (quoting *Tradescape.com v. Shivaram*, 77 F. Supp. 2d 408, 411 (S.D.N.Y. 1999)).[74]

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[73] Veeco advances two additional grounds on which to hold that the presumption against extraterritoriality poses no obstacle to the entry of a preliminary injunction here. First, Veeco argues that, even if the foreign lost profits at issue in this case are not compensable through money damages, the Court may nonetheless consider the forms of irreparable harm that Veeco asserts in support of its motion for a preliminary injunction, because injunctive relief has a "more expansive role" than money damages. (Pl.'s Supp. Br., Dkt. 63, at 7-8.) Second, Veeco argues that, if its foreign lost profits are not recoverable in this case, then there is no "adequate remedy at law" for SGL Carbon's infringement, which means the only adequate remedy is an equitable one—here, an injunction. (Pl.'s Supp. Br. at 9-10.) Having held that Veeco's alleged lost profits are recoverable under the interpretation of 35 U.S.C. § 271(f)(2) set forth in *WesternGeco*, the Court need not address these additional arguments.

[74] Veeco argues that the balance of hardships tips decidedly in its favor because "one who elects to build a business on a product found to infringe cannot be heard to complain if an injunction against continuing infringement destroys the business so elected." (Pl.'s Br. at 24); *see also Merial Ltd. v. Cipla Ltd.*, 681 F.3d 1283, 1306 (Fed. Cir. 2012). But that argument presumes that the accused product is, in fact, infringing, which has not been finally determined at this stage of the proceedings. Indeed, if the balance-of-hardships inquiry were predicated solely on a finding of infringement, the balance of hardships would *always* tip in favor of a movant that shows a likelihood of success, which would render the third element of the preliminary-injunction inquiry superfluous.

The hardship that Veeco will face in the event of a wrongly denied preliminary injunction is compelling. Forced to compete against a product embodying its patented technology, Veeco will likely continue to suffer lost sales, customers, and market share, as well as the other forms of irreparable harm described above. Furthermore, the hardship of these losses will be particularly severe for Veeco as a company, given the percentage of Veeco's revenue that comes from its MOCVD business.

At the same time, the hardship that SGL Carbon will face in the event of a wrongly granted preliminary injunction, though less compelling, is significant. According to SGL Carbon, a wrongly issued preliminary injunction will cause SGL Carbon to lose revenue, tarnish SGL Carbon's reputation as a reliable supplier, "erode customers' trust in SGL's corporate integrity," and damage SGL Carbon's reputation with its Chinese customers, which SGL Carbon took years to develop. (Henseler Decl. ¶¶ 24-27.) SGL Carbon also contends that an injunction would hurt its build-to-print business in other sectors. (*Id.*)

Ultimately, the Court finds that the balance of hardships tips in favor of Veeco. The Court gives little weight to SGL Carbon's claim that its reputation or corporate integrity will be tarnished by a preliminary injunction from this Court. It would be unreasonable for any customer of SGL Carbon to draw an adverse inference concerning SGL Carbon's reliability or corporate integrity based on this Order.[75] The Court gives some weight to SGL Carbon's claim that it will lose revenues, and presumably profit, if the Court wrongly enters a preliminary injunction.

[75] In this Order, the Court does not hold that SGL Carbon knew, when it first started supplying wafer carriers to AMEC, that it was infringing any of Veeco's Patents. Nor does the Court find that SGL Carbon designed the infringing wafer carriers at the outset with an intent to create a new market for the infringing wafer carriers. Rather, the Court finds that SGL Carbon must stop supplying wafer carriers to AMEC and AMEC's customers, now that Veeco has made the requisite showing of infringement (and the other factors) in a formal legal proceeding before this Court.

Nonetheless, that hardship is substantially outweighed by the hardship that would befall Veeco if this Court wrongly denies its motion for preliminary injunction, particularly in light of the relative significance of the preliminary injunction to the parties' respective businesses.[76]

IV. Public Interest

"In considering whether the public interest favors the grant of an injunction, the district court should focus on whether a critical public interest would be injured by the grant of injunctive relief." *Metalcraft*, 848 F.3d at 1369. SGL Carbon argues that a preliminary injunction would disserve the public interest "because it necessarily imposes a restraint on competition." (Def.'s Opp'n at 34.) The Court disagrees. Valid patent rights, by design, restrain others from competition; yet, the public has chosen to accept that restraint in order to encourage the development and disclosure of useful inventions. Here, the public interest in enforcing patent rights weighs in favor of Veeco. *See Pfizer, Inc. v. Teva Pharm., USA, Inc.*, 429 F.3d 1364, 1382 (Fed. Cir. 2005) ("[A] preliminary injunction that enforces a valid patent against an infringer does no more than further public policy inherent in the patent laws designed to encourage useful inventions by rewarding the inventor with a limited period of market exclusivity." (quotation marks omitted)).

V. Balancing of Preliminary Injunction Factors

Ultimately, the Court's decision to grant or deny Veeco's motion for a preliminary injunction must be made based on a balancing of the four factors analyzed above: (1) likelihood of success on the merits, (2) likelihood of irreparable harm, (3) balance of the equities, and (4) public interest. *See Tinnus Enters.*, 846 F.3d at 1202; *Jack Guttman*, 302 F.3d at 1363.

[76] SGL Carbon's sales to AMEC account for a very small percentage of the revenue of its build-to-print business, which is itself just one of SGL Carbon's business divisions. (Henseler Dep. 138:5-19.) By contrast, Veeco's sales of MOCVD reactors accounts for a very large portion of Veeco's annual revenue. (Gerardi Decl. ¶ 13.)

As explained above, based on the present record, the Court finds that Veeco is more likely than not to establish infringement under 35 U.S.C. § 271(f)(2). With respect to validity, the Court finds that SGL Carbon has not raised a substantial question of invalidity. As for irreparable harm, the balance of hardships, and the public interest, these factors all weigh strongly in favor of granting a preliminary injunction for the reasons stated above. Accordingly, in consideration of all four factors of a preliminary injunction, the scope of the proposed injunction, and all of the evidence in the present record, the Court finds that a preliminary injunction should issue.

CONCLUSION

For the reasons stated above, the Court grants Veeco's motion for a preliminary injunction and denies Veeco's motion for expedited discovery as moot. **SGL Carbon is hereby enjoined from supplying to any third party the following products without Veeco's express authorization: (1) the 700mm wafer carriers that SGL Carbon has previously sold to AMEC and AMEC's customers; (2) any wafer carriers meeting the specifications of the 700mm models of wafer carriers that SGL Carbon has previously sold to AMEC and AMEC's customers; and (3) any other wafer carriers the export of which would infringe the claims of the '769 Patent, as recited and construed in the body of this Order.** This preliminary injunction shall become effective immediately upon the issuance of this Order and shall continue through and until the entry of a final judgment in this action, unless the injunction is vacated by this Court *sua sponte* or on a party's motion, or by a reviewing court on appeal.

SO ORDERED.

/s/ Pamela K. Chen
Pamela K. Chen
United States District Judge

Dated: November 2, 2017
Brooklyn, New York