

United States District Court,
N.D. California.

NIKON CORPORATION and Nikon Precision, Inc,
Plaintiffs.

v.
ASM LITHOGRAPHY B.V. and ASM Lithography, Inc,
Defendants.

Nos. C 01-5031 MHP, C 02-5081 MHP, C 02-5601 MHP

March 11, 2004.

Background: Manufacturers of photolithographic and microlithographic machines used in manufacturing integrated circuit chips brought patent infringement action against competing manufacturers, and competing manufacturers asserted counterclaims based in part on plaintiff manufacturers' alleged infringement of patent held by competing manufacturers that pertained to photolithographic machinery.

Holdings: In construing claims, the District Court, Patel, Chief Judge, held that:

- (1) terms contained in patent for transferring fine pattern from mask to substrate through photolithographic exposure were construed;
- (2) terms contained in patent concerning particular photolithographic apparatus were construed;
- (3) terms contained in patent for off-axis illumination system for photolithographic apparatus were construed;
- (4) terms contained in patent of precision motion stage mechanism relating to photolithographic apparatus were construed; and
- (5) terms contained in patent for use of laser interferometer positioning in photolithographic process were construed.

Claims construed.

5,801,832, 6,008,500, 6,233,041, 6,377,336, 6,392,740. Construed.

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Claim Construction Memorandum and Order for United States Patent Numbers 6,233,041, 6,377,336, 6,392,740, 6,008,500, and 5,810,832

PATEL, Chief Judge.

On December 21, 2001, plaintiffs Nikon Corporation and Nikon Precision, Inc. (collectively "Nikon" or "plaintiffs") brought a patent infringement action against defendants ASM Lithography B.V. and ASM Lithography, Inc. (collectively "ASML" or "defendants"). FN1 Among other things, plaintiffs' complaint alleges infringement of four patents: United States Patent Number 6,233,041 ("the '041 patent"), United States Patent Number 6,377,336 ("the '336 patent"), United States Patent Number 6,392,740 ("the '740 patent"), and United States Patent Number 6,008,500 ("the '500 patent"). All four patents pertain to photolithographic and microlithographic machines used in the manufacture of integrated circuits.

FN1. On March 22, 2002, plaintiffs filed an amended complaint.

Defendants timely answered plaintiffs' complaint, later asserting inequitable conduct and antitrust counterclaims. Some of these counterclaims grew from plaintiffs' alleged infringement of United States Patent Number 5,801,832 ("the '832 patent"), an ASML-held patent also pertaining to photolithographic machinery. Nikon then filed a motion to dismiss defendants' counterclaims. On July 19, 2002, the court denied without prejudice plaintiffs' motion to dismiss. Now before the court are the parties' memoranda regarding claim construction of the disputed patent terms. The court has considered fully the parties' arguments and submissions, and for the reasons set forth below, the court enters the following memorandum and order.

BACKGROUND

Both plaintiffs FN2 and defendants FN3 develop and produce systems and components used in photo- and micro-lithography. Used to manufacture semiconductor integrated circuits, lithographic machines create extremely small and precise patterns of electronic circuitry on integrated circuit chips. A subset of photolithographic technology, microlithographic machines FN4 transfer minute FN5 pattern features to a substrate-e.g., a silicon wafer-and are the only machines capable of creating the kind of integrated circuit chips needed in the construction of electronic equipment.FN6 Nikon, ASML, and Canon are the only manufacturers of microlithographic machines.

FN2. Organized under the laws of Japan, plaintiff Nikon Corporation maintains its principal place of business in Japan. Plaintiff Nikon Precision, Inc., a wholly-owned subsidiary of Nikon Corporation, is organized under California law; Nikon Precision identifies California as its principal place of business.

FN3. ASM Lithography B.V., a Dutch corporation, maintains its principal place of business in the Netherlands. ASM Lithography, Inc. is organized under Delaware law and maintains a place of business in California.

FN4. Microlithographic machines are a subcategory of photolithographic machines.

FN5. These features are often no wider than 100 nanometers.

FN6. Integrated circuit chips are used in a variety of electronic devices. Cellular phones, computers, and stereo systems, for example, all depend on integrated circuit chips.

To construct a working integrated circuit chip, a microlithographic machine prints a circuitry pattern on each layer of a circuit chip. This printing process often utilizes projection lithography, a type of lithographic patterning that relies on a light source and a pair of optical systems to transfer circuitry patterns. At the start of a projection lithography process, a light-sensitive covering (a "photoresist") is applied to a "wafer" (or "substrate"), a grouping of thin layers of circuitry situated on a base of silicon.FN7 Also at the start of the process, a transparent piece of glass or quartz (a "mask" or "reticle") is coated partially with chrome such that a pattern of opaque and transparent features emerges. Both the mask and the wafer are then placed in a projection exposure apparatus, the wafer deposited on a "wafer stage," the mask on a "mask stage." Using an optical illumination system, light is then cast onto the mask. Light shines through the transparent portions of the mask into a projection optical system. This projection optical system-which is made up, in pertinent part, of a precision lens-focuses the pattern of light features onto the wafer, leaving an image of the pattern in the photoresist layer. The process is repeated for each chip-and each layer of a chip-on the wafer.

FN7. Typically starting in a circular shape, the wafer is eventually cut into rectangular pieces.

Photolithography machines are complex and expensive devices, but they do not embody entirely new technology. Pioneered in the 1950s and 1960s, photolithography devices are the subject of numerous inventions and a comparable number of patents. Some of these inventions and patents address the "periodic structure" of mask patterns-i.e., the size and series of the transparent and opaque spaces along a mask. When light is projected onto a mask, some light passes through the surface of a mask without diffraction, creating "zero-order diffracted" light; as light is shined onto a mask, other light (viz., "non-zero-order diffracted" light) changes path after contact with the edges of the opaque portions of the mask. As the periodic structure of a pattern grows increasingly fine, two things occur: first, non-zero-order diffracted light exits the mask at increasingly large angles; second, more light traveling along the optical axis will strike the mask perpendicularly, diffracting at such large angles that it cannot be captured by the projection optical system.

"Off-axis" illumination attempts to address this loss of light. In off-axis illumination, light strikes the mask at a non-perpendicular angle, i.e., from a direction set-off from the optical axis itself. In this way, zero-order diffracted light is inclined to a degree between the zero-order and first-order diffraction, permitting more of both types of light to enter the projection optical system than would be possible through "on-axis" illumination. Per wavelength of illuminating light, then, off-axis illumination produces greater diffraction and allows the use of finer mask patterns.

Even with off-axis illumination, a photolithographic machine requires thousands of components and parts to

function properly. The machines require, *inter alia*, an adequate light source, an illumination optic assembly (including, e.g., lenses, mirrors, and the like), a projection optic system to focus the light pattern, and a system or technique to limit the vibrations that occur as a consequence of wafer and mask movement. The five patents at issue in this action address putative advances on a number of these machine components; four of these patents are held by Nikon, and one is held by ASML.

I. The Nikon Patents

A. The '041 Patent

Titled "Exposure Method Utilizing Diffracted Light Having Different Orders of Diffraction," the '041 patent was issued on May 15, 2001. *See* '041 Patent at 1. Put generally, the '041 patent addresses a particularized method of transferring a fine pattern from a mask to a substrate through photolithographic projection exposure. Nikon describes the '041 patent as a marked and distinct advance in preceding off-axis technology, technology that used "annular illumination" (that is, illumination in the shape of a complete ring) centered on the optical axis. The '041 patent, Nikon details, uses symmetrical, off-axis pairs of higher-illumination intensity areas in lieu of full ring illumination, adjusting the pair-spacing to suit particular mask patterns. *See id.* at 14:48-16:36.

The parties dispute the meaning of terms in two independent '041 claims (*viz.*, claim 1 and claim 12) and in six dependent '041 claims (*viz.*, claims 2, 3, 4, 7, 8, and 13).FN8 In an "Initial Determination on Violation of Section 337 and Recommended Determination on Remedy and Bond," the United States International Trade Commission ("ITC") addressed some, but not all, of the '041 claims raised here. *See In the Matter of Certain Microlithographic Machines and Components Thereof*, Investigation No. 337-TA-468 (January 29, 2003) (Bullock, A.L.J.).

FN8. In its claim construction memorandum, defendants also contest the validity of plaintiff's '041 patent. To defendants, the photolithographic system contemplated by the '041 patent proves identical to prior art in all but one way, *viz.*, the use of a "spatial filter" defined by holes distributed throughout the plane, not the single ring-shaped hole used in prior art. To defendants, moreover, plaintiffs use a hole-placement method anticipated by a defendant-held patent. Whether or not defendants' assertions are true, consideration of such arguments falls outside the scope of this claim construction order.

B. The '336 Patent

Labeled "Projection Exposure Apparatus," the '336 patent was registered on April 23, 2002. *See* Patent '336 at 1. Building on the '041 patent, the '336 patent concerns a particular photolithographic apparatus that uses, *inter alia*, an irradiation optical system, "fly-eye" optical integrators, and a Fourier transform plane. *Id.* The parties dispute the meaning of particular terms in four independent '336 claims (*viz.*, claim 1, claim 14, claim 17, and claim 25) and in three dependent '336 claims (*viz.*, claim 2, claim 8, and claim 18). The parties agree that the same meaning and construction should apply to terms shared by the '041 and '336 patents.

C. The '740 Patent

Like the '336 patent, the '740 patent is titled "Projection Exposure Apparatus." *See* '740 Patent at 1. Also like the '336 patent, the '740 patent covers an off-axis illumination system that uses prisms and lenses to redirect

light into pairs of intensely lit, symmetrically-spaced areas. Through adjustment of both annular and multipole illumination, the '336 and '740 apparatuses both work to achieve the optimal angle of illumination for particular patterns. Terms used in four independent (viz., claim 3, claim 6, claim 8, and claim 10) and two dependent (viz., claim 7 and claim 9) '740 claims are disputed by the parties. The parties agree that terms used in the '041, in the '336, and in the '740 patents should be construed in the same manner in each patent.

D. *The '500 Patent*

The '500 patent, titled "Exposure Apparatus Having Dynamically Isolated Reaction Frame," was registered on December 28, 1999. *See* Patent '500 at 1. Focused on the vibrations caused by acceleration and deceleration of the wafer and mask stages, the '500 patent depicts a "reaction frame" constructed to receive reaction forces generated by the mask stage drive. In two embodiments in the '500 patent, the reaction frame is shown FN9 somehow isolated from the frame in which the core photolithography apparatus sits. The parties dispute terms used in three '500 claims: claim 1, claim 4, and claim 6.

FN9. One of the embodiments reflects an apparatus first disclosed as a part of U.S. Patent No. 5,528,118 ("the '118 patent"). The '500 patent incorporates the '118 patent by reference. *See, e.g.,* '500 Patent at 3:13-21.

II. *The ASML Patent*

One of the many challenges in the photolithographic process is achieving proper alignment of the mask pattern relative to particular substrate layers. For many years, lithography machines relied on a process of "global alignment" to achieve adequate mapping; the process of "global alignment" sought to align in one step the entire mask pattern with the entire substrate plane.

As related aspects (e.g., reduction lens systems) of photolithographic technology evolved, "global alignment" proved an unsatisfactory alignment alternative; it took too long, for example, and it inadequately accommodated the myriad, often miniscule, variations along a large wafer surface. For a time, a process of "field-by-field leveling" replaced "global alignment"; "field-by-field" alignment permitted recalibration and realignment for each discrete substrate sub-area, thus eliminating some-but not all-of the minute discrepancies overlooked in the "global alignment" process. In some ways, "field-by-field leveling" proved a market improvement over "global alignment" methods, but this type of "field-by-field leveling" was not without flaw. Repositioning of the substrate demands time and space, both precious commodities in the circuit-chip manufacture process; put another way, "field-by-field leveling" left room for technological advances regarding both cost and time of production.

The '832 patent aimed to improve the relatively slow and costly "field-by-field" alignment method. Like prior art, the invention covered by the '832 patent sought to permit accurate exposure of a mask pattern on a substrate. Unlike the prior art, however, the '832 patent art employed precise laser interferometer positioning to do so. Rather than by mapping mask marks and (substrate) sub-area marks during the exposure process, the '832 patent art uses of a system of lasers and mirrors-which, together, constitute "interferometers"-to achieve sufficient alignment and to correct for infinitesimal tilts in the surface of the substrate sub-area. "Interferometers" measure substrate displacement along five separate axes (i.e., directions) of movement.FN10 Through this kind of interferometer-based positioning, both the space and time loss incident to "global" and "field-by-field" alignment would be better minimized.

FN10. In the patent, three axes are represented spatially: standard "X" and "Y" axes and a vertical axes, represented in the patent as the "Z" direction.

The parties dispute terms used in six '832 patent claims: Claim 1, claim 5, claim 8, claim 15, claim 16, and claim 17.

LEGAL STANDARD

I. Claim Construction

[1] [2] [3] [4] [5] [6] [7] Under *Markman v. Westview Instruments, Inc.*, 52 F.3d 967, 979 (Fed.Cir.1995), *aff'd* 517 U.S. 370, 116 S.Ct. 1384, 134 L.Ed.2d 577 (1996), the court "has the power and obligation to construe as a matter of law the meaning of language used in the patent claim." When determining the meaning of claim language, the court principally considers three types of intrinsic evidence: the language of the claim, the patent specification, and the relevant prosecution history. *See, e.g.*, *Vitronics Corp. v. Conceptronic, Inc.*, 90 F.3d 1576, 39 U.S.P.Q.2d 1573 (Fed.Cir.1996). These three types of intrinsic evidence provide the foundation for-and a kind of order of operations in-claim construction generally. In construing the meaning of claim language, the court looks first at the language of the claims themselves; where the claim language is not sufficiently instructive, courts may then refer to the relevant patent specifications, turning, if necessary, to the prosecution history, if in evidence. *Id.* at 1582-83. Where claim language is "clear on its face," the court's "consideration of the rest of the intrinsic evidence is restricted to determining if a deviation from the clear language of the claims is specified," *Interactive Gift Exp., Inc. v. Compuserve Inc.*, 256 F.3d 1323, 1331 (Fed.Cir.2001), and Federal Circuit doctrine directs courts to construe disputed claim language according to "an objective test of what one of ordinary skill in the art at the time of the invention would have understood the term to mean." *Markman*, 52 F.3d at 986; *see also* *Teleflex, Inc. v. Ficoso N. America Corp.*, 299 F.3d 1313, 1324 (Fed.Cir.2002) ("The words used in the claims are interpreted in light of the intrinsic record, including the written description, the drawings, and the prosecution history, if in evidence."); *Bell Communications Research, Inc. v. Vitalink Communications Corp.*, 55 F.3d 615, 620 (Fed.Cir.1995) (noting that the words of the claims themselves drive construction of claims). Unless a patentee invests a particular claim term with a different definition, patent language is understood to convey its ordinary meaning to one skilled in the art. *See* *Intellicall, Inc. v. Phonometrics, Inc.*, 952 F.2d 1384, 1387 (Fed.Cir.1992). When courts look to the specifications for clarification of ambiguous claim terms, courts must still avoid reading "limitations appearing in the specification ... into [the] claims." *Intervet Am., Inc. v. Kee-Vet Lab., Inc.*, 887 F.2d 1050, 1053 (Fed.Cir.1989).

[8] [9] [10] In most cases, intrinsic evidence will be sufficient to resolve ambiguities and to determine the meaning of the claim terms. *Vitronics*, 90 F.3d at 1583. Only when intrinsic evidence proves inadequate may the court refer to extrinsic evidence, e.g., expert testimony and germane textbooks. Even then, courts must use extrinsic evidence only as an aid in "coming to the proper understanding of the claims" and the underlying technology, *id.*, and only to the extent the evidence helps illuminate the language of the patent documents. *Markman*, 52 F.3d at 979-81. And even when "enlightened by [] extrinsic evidence," "[t]he district court's claim construction ... [must] still [be] based upon the patent and prosecution history." *Id.* at 981 (noting that courts may not use extrinsic evidence to vary or to contradict claim language). When considering extrinsic evidence, the Federal Circuit has evinced a preference for dictionaries and prior art documents, generally eschewing reliance on expert testimony except as a last resort. *Id.* at 1585.

II. Burdens of Proof

[11] [12] In an action for patent infringement, claim construction is the first part of a two-part analysis. *See* Intellectual Property Development, Inc. v. UA-Columbia Cablevision of Westchester, Inc., 336 F.3d 1308, 1313 (Fed.Cir.2003). The second part of this test is the determination of whether the accused device or method infringes the claims at issue. *Id.* On this second step, the burden of proof typically rests on the party claiming that its patent has been infringed, *see* Wilson Sporting Goods v. David Geoffrey & Assoc., 904 F.2d 677, 685 (Fed.Cir.), *cert. denied*, 498 U.S. 992, 111 S.Ct. 537, 112 L.Ed.2d 547 (1990), though only the infringement portion of the action is tried to a jury or to a finder of fact. Claim construction issues are questions of law, *see* Markman v. Westview Instruments Inc., 517 U.S. 370, 389-90, 116 S.Ct. 1384, 134 L.Ed.2d 577 (1996), and are not subject to traditional burdens of proof. The duty of the court is to consider all appropriate evidence-regardless of who produced it-when assessing the proper interpretation of claims.FN11 *See* Vitronics, 90 F.3d at 1576.

FN11. Since a district court's claim construction is reviewed *de novo*, Vitronics, 90 F.3d at 1582, a burden of proof approach would likewise make no sense.

DISCUSSION

I. The '041 Patent

The parties dispute a host of terms used in the '041 patent claims. The court addresses each of these claims, and discrete claim terms, below.

A. Claim 1

The parties dispute the meaning of seven terms used in claim 1:(1) "pattern"; (2) "mask"; (3) "projection optical system"; (4) "illuminating the pattern with at least a first light beam and a second light beam from different directions"; (5) "a first light beam and a second light beam"; (6) "0-order" and "non-0-order" diffracted beams; and (7) "substrate." FN12 Each term is assessed separately below.

FN12. For context, independent claim 1 reads:

A method of exposing a substrate with a pattern of a mask through a projection optical system, comprising: illuminating the pattern with at least a first light beam and a second light beam from different directions so that a 0-order diffracted beam produced from the pattern by the irradiation of said first light beam passes through a same optical path of said projection optical system as a non-0-order diffracted beam produced from the pattern by the irradiation of said second light beam; and projecting the 0-order and non-0-order diffracted beams onto the substrate to form an image of the pattern.

See '041 Patent at 18:15-26.

1. "a pattern"

[13] The parties agree that the word "pattern" has a well-established "ordinary meaning," Vitronics, 90 F.3d at 1582-specifically, "an arrangement of lines or shapes; a design according to which something is to be made"-and the parties appear to agree that the use of the indefinite article "a" connotes "one or more." *See* Crystal Semiconductor Corp. v. TriTech Microelectronics Int'l, Inc., 246 F.3d 1336, 1347 (Fed.Cir.2001);

Pall Corp. v. Micron Separations, Inc., 66 F.3d 1211, 1216 (Fed.Cir.1995). The parties do not agree, however, about how the ordinary meaning of "pattern" fits within the context of claim 1.

[14] Plain language suggests that "pattern" denotes a design or series of marks in a semiconductor integrated circuit that is to be transferred to a photoresist layer of a substrate. In the relevant art, the term "pattern" signifies a series-often of a particular design or repetition-of circuit features in a semiconductor integrated circuit to be transferred to a photoresist layer of a substrate, and when it uses "pattern," the claim language depicts the exposure of a particular kind of pattern-viz., a circuitry pattern-onto a mask or circuitry chip. *See* Pitney Bowes, Inc. v. Hewlett-Packard Co., 182 F.3d 1298, 1311 (Fed.Cir.1999) (requiring each "term [to] be read to correspond to the only plausible meaning in each context"). Specification language, in turn, references the "patterns" imposed on semiconductor memory devices and liquid crystal components through the process of photoresist-based photolithographic projection. *See, e.g.,* '041 Patent at 1:19-24. As it is used in the relevant claim and specification language, then, "pattern" possesses specified meaning, not by virtue of improperly imported limitations, *cf. N. Telecom Ltd. v. Samsung Elecs. Co., Ltd.*, 215 F.3d 1281, 1290 (Fed.Cir.2000), but through claim and specification language itself. *See* Pall Corp., 66 F.3d at 1216. The term "pattern" is used to denote **"a design or series of marks in a semiconductor integrated circuit that is to be transferred to a photoresist layer of a substrate."** Neither party offers a more appropriate construction, and the court thus construes "pattern" accordingly.FN13

FN13. Because neither party listed the term "pattern" in the lists of proposed terms and claim elements for construction, *see* Local Patent Rule 4-1, ASML objects to the late identification of this term for construction. The court notes ASML's objection, but the court will not refrain from construing the "pattern" term. ASML itself included "pattern" in its catalog of to-be-construed terms, and both parties attempted to define the term in their Local Patent Rule 4-2 preliminary proposed construction memoranda.

2. "mask"

[15] Construction of the term "mask" follows similar lines. As with "pattern," the parties agree that the word "mask" has an established meaning in both common and scientific idioms. Read as a part of claim 1, in fact, "mask" carries a specific and well-established meaning: It denotes an item containing a circuit pattern in a semiconductor integrated circuit. *See, e.g.,* '041 Patent at 1:19-24. Both the context of the claim, *see* Pitney Bowes, 182 F.3d at 1311, and the specification language buttress this construction. *See* '041 Patent at 3:15-37 (discussing the manufacture of semiconductor and liquid crystal devices). By comparison to the parties' over- and under-generalized definitions, the court's construction better captures the meaning of "mask" while leaving related-but distinct-claim terms, purposes, and connotations outside the definition of this oft-used term. The court construes "mask" to mean **"an item, in a semiconductor integrated circuit, on which a circuit pattern is placed."** *Id.*

3. "projection optical system"

[16] During previous stages of this litigation, the parties did not dispute the meaning of the term "projection optical system"; indeed, they apparently stipulated before the ITC that the term should be construed as "a lens system or other component or components that project or expose a pattern onto an object." Before this court, ASML still favors this construction, but Nikon now proposes an alternative, asking the court to read the term to mean "a collection of optical components for forming an image of a pattern onto a photo resist layer on a substrate."

Neither party disputes that the "projection optical system" constitutes part of the larger lithographic exposure apparatus. *See* Patent '041 at 5:29-37. Nor does either party dispute that the role of the "projection optical system" is to project an image of a pattern onto a specific substrate. *Id.* But by comparison to this limited (and particularized) role, the parties' proposed constructions either overspecify or overgeneralize the operation of the relevant art. *Cf. id.*; *see also id.* at 3:17-37 & 11:60-12:45 (discussing the image formation process). Nonetheless, without resort to the parties' imprecise definitions, the court can construe the claim term by reference to the words' ordinary meaning and by reference to the intrinsic evidence. As the claim phrase itself suggests, a "projection optical system" is "a component or combination of components that projects (i.e., transfer) a mask pattern onto a substrate." The specification language, in turn, repeatedly refers to "projection optical system" as the mechanism by which mask patterns are translated to a substrate. *See, e.g., id.* at 12:55-13:62; 15:42-16:53. Consistent with plain meaning and the lessons of the specification language, the court construes the term "projection optical system" to mean **"a component or combination of components that transfers or translates a mask pattern onto a substrate."**

4. *"illuminating the pattern with at least a first light beam and a second light beam from different directions"*

Because the court has construed the term "pattern," the court need only construe two portions of the phrase "illuminating the pattern with at least a first light beam and a second light beam from different directions"; one, "first ... and [] second light beam"; and, two, "from different directions." The court addresses the two in turn below.

a. *"first ... and [] second light beam"*

[17] In the photolithographic pattern-transfer process, two light beams (*viz.*, the "first light beam" and the "second light beam") illuminate a pattern from no fewer than twelve different directions. Upon contact with the pattern, the two beams are diffracted into distinct orders of diffracted beams; these diffracted beams, in turn, travel through the projection optical system along a shared optical path. To differentiate between these two beams, the claim refers to "first" and "second" "light beams." According to Nikon, the "first ... and [] second light beam" claim language should be construed to denote "beams of light that are, at least during some portion of their paths, separate and discrete." ASML does not contest inclusion of the concluding phrase of Nikon's construction, but ASML offers a substantially more specific alternative; according to ASML, the court should construe "first" and "second light beams" to mean "separate and discrete beams, as are produced by the disclosed spatial filter, emanating from discrete areas on the Fourier transform plane (like holes in the spatial filter)." FN14

FN14. Aware that courts are, in general, not permitted to import exogenous limitations into a claim, ASML posits its construction as an illustrative one, using the word "like" to suggest that the limit is simply an example of the type of beams the claim language contemplates. According to ASML, in fact, its construction best comports with the '041 patent specification because the specification denotes the "spatial filter" as part of the underlying "invention."

The court does not disagree with ASML's presentation of the relevant technology; the beams do indeed emanate from discrete areas, interacting at a point with spatial filters. But the court cannot adopt ASML's expansive reading of "first ... and [] second light beam" to mean "[s]eparate and discrete beams, as are produced by the disclosed spatial filter, emanating from discrete areas on the Fourier transform plane (like holes in the spatial filter)." As the court understands the intrinsic record and the claim language, all that is at

issue is two separate light beams that are, for at least part of their lengths, separate. *See, e.g.*, '041 Patent at 13:55-14:17. Nothing in the patent specifications undercuts the thrust of this understanding, and the court thus construes "first ... and [] second light beam" to mean **"two beams of light that are, for some portion of their paths, separate and discrete."**

b. "from different directions"

[18] The parties agree that the court's construction of the term "from different directions" should begin with the phrase "[t]he 'first light beam' and the 'second light beam' illuminate the 'pattern' at different angles of incidence." The parties do not agree, however, regarding where the definition of the claim should end: ASML believes that "at different angles of incidence" itself offers a sufficient construction of the claim term; Nikon, by contrast, asks the court to detail the kind of different angles of incidence at issue, appending the apparently non-exhaustive example, "which include angles having the same magnitude but different directions." *Cf. In the Matter of Certain Microlithographic Machines and Components Thereof*, Investigation No. 337-TA-468 at 285 (rejecting a similar, though notably different, Nikon-proffered construction).

[19] As the court reads them, the parties' constructions are not mutually exclusive, whether linguistically or logically. The term "different angles of incidence," if understood as an incorporative category, undoubtedly includes some angles "having the same magnitude but different directions," so what Nikon seeks to add plainly falls within the technological capacity of the invention, if only as an example. But the limitation Nikon seeks to import is unsupported by the claim text and the relevant specification language. *See* '041 Patent at 3:31-3:50 & 12:13-45. Where claim language conduces to ready explication, the Federal Circuit has long reminded, courts should construe claim terms to mean precisely what they say. *See Vitronics*, 90 F.3d at 1582. However innocuous (and *technologically* valid) Nikon's proposed illustration, there is no reason to venture from the plain meaning of the claim terminology here. The claim expressly discusses beams emerging "from different directions"-i.e., from distinct and unshared angles of incidence. *Cf. Teleflex, Inc. v. Ficosa North America Corp.*, 299 F.3d 1313, 1328 (Fed.Cir.2002) ("We have 'cautioned against limiting the claimed invention to preferred embodiments or specific examples in the specification.' ") (citation omitted). Nothing in the intrinsic evidence controverts this claim language, and Nikon posits no compelling reason to read into the claim an example (*viz.*, "which include angles having the same magnitude") of something the claim's language already-if implicitly-embraces. Consistent with the intrinsic evidence, the court construes "from different directions" to mean **"at distinct and unshared angles of incidence."**

5. "0-order" and "non-0-order" diffracted beams

[20] [21] In the photolithographic process, when the "first" and "second light beams" strike a mask pattern, some light diffracts directly back along the same axis; some does not. Claim 1 places these different types of diffracted light into two categories-*viz.*, "0-order diffracted beams" and "non-0-order diffracted beams"-noting what role these beams play in the microlithographic projection procedure. Claim 1 does not otherwise define the "0-order diffracted beam" and "non-0-order diffracted beam" terms, and Nikon now asks the court to construe the "0-order diffracted" and "non-0-order diffracted" terms to mean "light beams, rays or components formed when light from respective localized areas of relatively higher light intensity diffracted by a mask pattern." Before the ITC, Nikon offered an identical construction, and, at that time, ASML apparently acceded to it.

Before this court, however, it appears that ASML has altered its position, asking the court to define "0-order

diffracted beams" and "non-0-order diffracted beams" as nothing more than "0-order diffracted ray[s] of light and other higher order diffracted rays of light such as the 1st-order, 2nd-order," and the like. The court is mindful that the "0-order diffracted" and "non-0-order diffracted" terms carry, in certain contexts, purely descriptive, adjectival meaning, though not necessarily the circular meaning ASML suggests. In reference to a light beam, for example, "0-order diffracted" means simply that the beam is not diffracted to a particular (or any) order of magnitude. Since "diffraction" has a readily ascertainable meaning in the art (namely, the phenomenon exhibited by wave fronts that, passing the edge of an opaque body, are modulated, thereby causing a redistribution of energy), it follows that a "0-order diffracted beam" is a beam in which the energy has been modulated and redistributed to the "0-order." In the context of claim 1, moreover, the "0-order diffracted" and "non-0-order diffracted" modifiers are used only vis-a-vis specific light beams, specifically those formed when light from localized areas of higher-intensity light is diffracted by a mask pattern. *See* '041 Patent at 18:21-26.

Specification language buttresses this understanding of the claim terms, and it allows the court to avoid resort to ASML's largely tautological approach. *See* '041 Patent at 3:31-50 & 9:32-41. "0-order diffracted beams" and "non-0-order diffracted beams" have specific meaning in the context of the claim, and the court must construe the terms to this end. *See* Pitney Bowes, 182 F.3d at 1311. For these reasons, the court construes "0-order diffracted beam" to mean **"a light beam or ray formed when a mask pattern diffracts light back directly along the illumination axis"**; in turn, "non-0-order diffracted beam" means **"a light beam or ray formed when a mask pattern diffracts light off the illumination axis."**

6. "substrate"

[22] As with "pattern" and "mask," the parties agree that the word "substrate" has an established meaning in scientific parlance. *See, e.g., McGraw-Hill Dictionary of Scientific and Technical Terms* (defining "substrate" as, *inter alia*, "the physical material on which [a] microcircuit is fabricated"). As with "pattern" and "mask," though, the parties disagree regarding the breadth the construction of "substrate" should take. ASML contends, and the court does not disagree entirely, that "substrate" signifies "an item such as a photosensitive member that is exposed with a pattern." But however initially valid ASML's broad phrasing, the term "substrate" does more than signify a purely generic type of device. "Substrate," as it is used in claim 1, denotes an item (e.g., a wafer) to which a photoresist layer is affixed; the transfer of the pattern through the photolithographic exposure process has nothing to do with the meaning of the bare "substrate" term. A narrower, more particularized usage comports with ordinary meaning of the term and with the specification language, *see* '041 Patent at 1:19-24, two things the court plainly cannot ignore. *See* Vitronics, 90 F.3d at 1582.

When construing the "substrate" term, moreover, the court need not articulate a definition that reiterates the meaning of an entire claim or that revisits the function of an entire invention. To a significant degree, Nikon's attempt to affix "during a lithographic operation" as a modifier to its definition-like its "exposed with a pattern" addition-aims to fold a general description of the lithographic process into the meaning of the unadorned "substrate" term, spurring unnecessary redundancy in the name of claim construction. The claim language suggests that a "substrate" is an item on which a photosensitive layer is placed, and the specification language supports this simple understanding. *See, e.g.,* '041 Patent at 1:19-24 & 3:15-37. Nothing more need be added. Thus, consistent with this intrinsic evidence, the court construes "substrate" to mean **"an item on which a photosensitive layer or pattern is formed or placed."**

B. Claims 2, 3, 4, 7, and 8

The parties dispute the meaning of three terms found in dependent claims 2, 3, 4, 7, and 8: one, "Fourier transform plane"; two, "illumination optical system"; FN15 and, three, "fineness of said pattern." The court addresses the terms seriatim.

FN15. Language nearly identical to that in claim 7 appears in claim 12 as well.

1. "*Fourier transform plane*"

[23] The parties appear to agree that the term "Fourier transform plane"-itself a term of art-has a plain and ordinary meaning: The mathematically calculable grouping of points generally corresponding to or substantially near the pupil plane of a projection optical system. The patent discusses a Fourier transform plane in both spatial and functional ways, noting both where such a plane might lie and what purpose such a plane may serve in the lithographic process. *Id.*

As Nikon correctly suggests, of course, the relevant specifications discuss more than the Fourier transform plane when delineating the construction of the optical system. "[O]ptical paths," the specifications teach, are placed "substantially equidistant from the optical axis of the projection optical system at *or in the vicinity of* the Fourier transform plane," *see* '041 Patent at 3:42-46 (emphasis added); *see also* *id.* at 4:45-48 ("... equal distance from the optical axis of the projection optical system at or in the vicinity of the Fourier transform plane"), and "a spatial filter" is "arranged at the Fourier transform plane or the illumination optical system *or in the vicinity of* the exit end of the integrator element." *Id.* at 11:3-11 (emphasis added). With these lessons in mind, the court cannot doubt that the specification language contemplates both a Fourier transform plane and a plane conjugate to the pupil plane, adding that planes optically conjugate to particular Fourier transform planes operate analogously to the Fourier transform plane in the photolithographic process. Were the court required to assess the *operation* of the Fourier transform plane and all of its functional equivalents, then, Nikon would be correct that any definition of the "Fourier transform plane" term should embrace the appendix "or a plane conjugate to the pupil plane."

But it is not for the court to evaluate the lithographic function of the Fourier transform plane and all of its operational equivalents. Rather, the court's task is to define "Fourier transform plane" as a distinct and independent claim term.FN16 *See* *SRI Int'l v. Matsushita Elec. Corp.*, 775 F.2d 1107, 1121 (Fed.Cir.1985) (en banc); *see also* *DeMarini Sports, Inc. v. Worth, Inc.*, 239 F.3d 1314, 1314 (Fed.Cir.2001). "Fourier transform plane," as noted, has long been understood to denote a mathematically calculable plane generally corresponding to or substantially near the pupil plane of a projection optical system.FN17 Nothing in the specification contravenes or expands this plain definition of "Fourier transform plane," *see* '041 Patent at 14:25-36; 15:23-30, and nothing in the intrinsic record suggests that, as a discrete phrase, "Fourier transform plane" includes distinct planes, whether optically conjugate to the pupil plane or not. Bounded by the scope of the parties' dispute, the court thus construes "Fourier transform plane" to mean "**a mathematically calculable plane generally corresponding to or substantially near the pupil plane of a projection optical system.**" That the plane is so calculable does not require that the finder of fact perform the complex calculation, nor does it mean that such a plane is not measurable optically; it only attaches to the term the standard, widely-accepted definition of "Fourier transform plane."

FN16. Claim 2 reads in full:

A method according to claim 1, wherein: said optical path is spaced from the optical axis of said projection optical system on the Fourier transform plane in said projection optical system with respect to said pattern.

Id. at 18:27-31.

FN17. This construction applies to the use of "Fourier transform plane" in claims 3, 4, 5, 7, 9, 12, and 15 as well.

2. "*illumination optical system*" FN18

FN18. Claim 3 notes:

A method according to claim 2, wherein: said at least first and second light beams are inclined at a substantially same angle determined in accordance with fineness of said pattern with respect to an optical axis of an illumination optical system through which said at least first and second light beams pass.

Id. at 18:32-37. Claim 4 reads:

A method according to claim 3, wherein: said angle is determined so that non-0-order diffracted beams produced from said pattern by the irradiation of said first light beam pass apart from the optical axis of said projection optical system on said Fourier transform plane.

Id. at 18:38-43. Claim 7 continues:

According to claim 5, wherein: said at least first and second light beams are generated from portions apart from an optical axis of said illumination optical system on the Fourier transform plane in said illumination optical system with respect to said pattern.

Id. at 18:54-59. Claim 8, in turn, reads:

A method according to claim 7, wherein: said portions include $2n$ portions of which distance from the optical axis of said illumination optical system is substantially same (where n is a natural number).

Id. at 18:60-63.

[24] ASML and Nikon agree that the definition of the term "illumination optical system" should denote, in some way, a system constituting a component, or group of components, that directs or otherwise acts on an illumination beam. The parties' disagree, however, about the generality with which this definition should be posited. ASML favors a broad construction of the term; Nikon advocates a narrow one.

Specification language refers to-and details-collections of tangible optical components, many of which work on light from an illumination source such that they produce a region of illumination light having a particular distribution at the mask-pattern surface. *See* Patent '041 at 10:51-11:12; *see id.* at 1:26-3:37. To the extent Nikon says as much in its description of the operation of an "illumination optical system," the court agrees. But to the extent Nikon seeks to fold this language into a construction of the relevant term, the court cannot agree; that the system should function properly is inherent to the invention itself-whether in the form of an "illumination optical system" or any other-and the court need not include as much in its construction of the "illumination optical system" term. All the court need determine is what an "illumination optical system" *is*.

The "best mode" description for the '041 patent makes clear that an "illumination optical system" includes a host of component parts-e.g., an ellipsoidal mirror, a relay lens, and a condenser lens-all organized such that light is directed toward a mask. *See id.* at 10:64-11:12. When construing the "illumination optical system" phrase, the court need not venture beyond what the claim says and what the specification language teaches. As the claim language says and the specifications teach, an "illumination optical system" is "**an optical component, or combination of optical components, that directs light from a light source onto and through a mask pattern.**" The court construes "illumination optical system" to mean precisely that.

3. "*fineness of said pattern*"

According to the parties' claim construction memoranda, ASML and Nikon now agree on a construction of this term. As a result, the court need not construe this phrase.

C. *Claim 12*

The parties dispute the meaning of two terms in claim 12:(1) "defining an intensity distribution of the illumination light on the Fourier transform plane in the illumination optical system with respect to a pattern on the mask to have increased intensity portions apart from an optical axis"; and (2) "determining the position of the increased intensity portions." FN19

FN19. Claim 12 reads in full:

A method of exposing a substrate through a projection optical system with an illumination light irradiated on a mask by an illumination optical system, comprising: defining an intensity distribution of the illumination light on the Fourier transform plane in the illumination optical system with respect to a pattern on the mask to have increased intensity portions apart from an optical axis of the illumination optical system relative to a portion between the increased intensity portions; and determining positions of increased intensity portions in accordance with the pattern so that a first diffracted light produced from the pattern by irradiation of light from a first one of the increased intensity portions and a second diffracted light, of which order is different from that of the first diffracted light, produced from the pattern by irradiation of light from a second one of the increased intensity portions different from the first one pass through a same area apart from an optical axis of the projection optical system on the Fourier transform plane in the projection optical system with respect to the pattern.

Id. at 19:14-20:3.

1. "*defining an intensity distribution of the illumination light on the Fourier transform plane in the illumination optical system with respect to a pattern on the mask to have increased intensity portions apart from an optical axis*"

[25] Distilled to its essence, the parties' disagreement over this prolix claim term centers on two words: "defining" and "on." ASML reads "on" to modify "defining" such that the phrase "defining an intensity distribution of the illumination light on the Fourier transform plane" necessarily places the act of defining "on" the Fourier transform plane itself; for its part, Nikon argues that the claim language demands no such placement, connoting only the existence of "an intensity distribution of the illumination light on the Fourier transform plane in the illumination optical system."

[26] At least in part, basic principles of grammar FN20 contradict Nikon's parsing of the claim text. The claim language's use of a gerund-form verb (*viz.*, "defining") unequivocally implies an act. *See Anhydrides*

& Chemicals, Inc. v. United States, 130 F.3d 1481, 1483 (Fed.Cir.1997) (applying the basic rules of grammar when evaluating a statute); Gen. Foods Corp. v. Studiengesellschaft Kohle mbH, 972 F.2d 1272, 1274 (Fed.Cir.1992) ("[E]ach claim is an entity that must be considered as a whole."). When claim 12 uses the word "defining," it denotes the act of assigning a definition to an intensity distribution of an illumination light; Nikon cannot construe the claim such that this act does not occur.

FN20. These principles are abided, if stretched, in the claim drafting (and construction) context.

Yet precisely *where* this act of "defining" occurs presents a substantially more difficult question. In its proposed construction, ASML asks the court to place the act of "defining" directly on the "Fourier transform plane," arguing that the location of a particular prepositional phrase (viz., "on the Fourier") in the claim text compels the court to place the act on the relative position of the plane between the pattern and the light source. As the court reads claim 12, however, the pivotal prepositional phrase could be read to modify the act of "defining" (as ASML suggests), *or* it could be read to modify the occurrence of the illumination light, but not necessarily one, the other, or both. *See* '041 Patent at 19:14-20:3 ("... defining [] an intensity distribution of the illumination light on the Fourier transform plane"). It is simply not clear that the act must occur where ASML says it does, nor that it ever does.

In fact, intrinsic evidence and the core technology suggest that it does not, i.e., that the prepositional phrase modifies the illumination light, not the act of defining alone. Indeed, much in the intrinsic record suggests that the Fourier transform plane functions as a location at which light may exhibit particular characteristics, not that it is where the "defining" must take place. *See, e.g.,* '041 Patent at 3:30-40 & 4:20-5:11. And to say as much does not exclude the embodiment in figure 2; the disclosed embodiment is sufficiently incorporated through a definition denoting the core act itself. Consistent with the claim text and the lessons of the intrinsic record, the court construes "defining an intensity distribution of the illumination light on the Fourier transform plane in the illumination optical system with respect to a pattern on the mask to have increased intensity portions apart from an optical axis" to mean "**quantifying or shaping of increased intensity portions of the illumination light, as those portions appear on the Fourier transform plane, in the illumination optical system.**"

2. "*determining positions of the increased intensity portions*"

[27] Much of the foregoing explication of the "defining ... axis" term applies to this claim term as well. Like "defining," "determining" connotes an act; like "defining," "determining" must occur at some location; and like "defining," "determining" is not hitched to a particular physical location, including the Fourier transform plane. The plain language of claim 12 requires only that positions of increased intensity portions be determined in accordance with the mask pattern such that a first- and second-diffracted light passes through a common area of the projection optical system. In this, claim 12's focus is largely spatial, articulating, *inter alia*, a general structure of planes and portions and patterns. But the claim does not demand that the "determining" occur at any particular location. *See, e.g.,* '041 Patent at 3:52-4:17; *id.* at 13:55-14:43; *see also id.* at figs. 2-4. Where no limitations exist in the claim language, and where no limitations are otherwise required to construe a claim properly, the court is reluctant to import claim-text limits. For this reason, the court will not import the "on the Fourier transform plane" language ASML sets forth. Instead, adhering to the plain meaning of the claim term, the court construes "determining the position of the increased intensity portions" to mean "**setting or ascertaining the spatial arrangement of increased intensity portions of light.**"

D. *Dependent Claim 13: "substantially conjugated"* FN21

FN21. Claim 13 notes:

A method according to claim 12, wherein: said area is substantially conjugated with one of said first and second of the increased intensity portions.

Id. at 20:4-6.

[28] The parties seem to agree that "substantially conjugated" possesses meaning customary to those of ordinary skilled in the art, viz., the near-complete mapping of the points of one plane in an optical system to a second plane. As the court reads their proposed constructions, moreover, the parties generally agree that, in the context of claim 13, "substantially conjugated" denotes the relation of a given plane to the first or second portion of increased light intensity. All that remains, then, is semantics, with ASML asserting that "substantially conjugated" should be read in one detailed manner, Nikon arguing that the term should be read in another, equally detailed manner.

Despite the parties' attempts to fill "substantially conjugated" with overflowing detail, neither party offers a construction that readily fits the context in which the term is used. In the relevant claim context, "substantially" denotes the degree to which two locations or positions are conjugated; that is, as claim 13 uses the term, to be "substantially conjugated" is to be conjugated to a significant degree. *Cf.* *Cordis Corp. v. Medtronic Ave, Inc.*, 339 F.3d 1352, 1360 (Fed.Cir.2003) (discussing the meaning of "substantially"); *Epcos Gas Sys., Inc. v. Bauer Compressors, Inc.*, 279 F.3d 1022, 1031 (Fed.Cir.2002) (same). In the relevant claim context, in turn, "conjugated" describes any pair of locations positioned such that points of the first map-or are amenable to mapping or imaging-to the neighboring points of the second. The teachings of the specification language are in accord. *See* '041 Patent at 11:60-12:11. Under the terms of claim 13, it is an "area" that to be "substantially conjugated," so "conjugated" denotes an "area" positioned such that its points map the neighboring points of "one of ... the increased in intensity portions." Taking the definitions of "substantially" and "conjugated" together, the term "substantially conjugated" means **"positioned such that the area's points map or image to a significant degree to the corresponding points of another area or plane."** FN22 Nikon's proposed appendix concerning "all light rays" is simply extraneous to the relevant term.

FN22. Fit into the terms of claim 13, then, an "area" is "substantially conjugated" when it is positioned such that the area's points map substantially the corresponding points of another area or plane.

II. *The '336 Patent*

As with the '041 patent, the parties dispute the meaning of a myriad of terms used in the '336 patent claims. The court addresses each claim separately.

A. *Claim 1* FN23

FN23. Claim 1 states:

An exposure apparatus which exposes a substrate with an illumination beam irradiated on a mask, comprising: an illumination optical system disposed on an optical path along which the illumination beam passes to illuminate the mask with the illumination beam of which an intensity distribution, on a Fourier

transform plane with respect to a pattern surface of the mask, is determined in accordance with a pattern to be transferred on the substrate, the illumination optical system forming the intensity distribution with an increased intensity portion apart from an optical system relative to a portion of the intensity distribution optical axis; and a plurality of prisms of which at least one is movable along the optical axis, arranged on the optical axis in said illumination optical system to adjust a positional relationship between the increased intensity portion and the optical axis by moving the [sic] at least one prism along the optical axis.

See '336 Patent at 44:20-38.

At issue in claim 1 of the '336 patent are nine terms: (1) "exposure apparatus"; (2) a number of terms construed vis-a-vis the '041 patent; (3) an illumination optical system disposed on an optical path along which the illumination beam passes to illuminate the mask with the illumination beam of which an intensity distribution, on a Fourier transform plane with respect to a pattern surface of the mask, is determined in accordance with a pattern to be transferred on the substrate; (4) "illumination beam of which an intensity distribution, on a Fourier transform plane with respect to a pattern surface of the mask, is determined in accordance with a pattern to be transferred on the substrate"; (5) "intensity distribution"; (6) "pattern to be transferred to a substrate"; (7) "illumination optical system forming the intensity distribution"; (8) "the intensity distribution with an increased intensity portion apart from an optical system relative to a portion of the intensity distribution optical axis"; and (9) "prisms."

1. "*exposure apparatus*"

[29] The patent specifications note that the '336 patent "invention relates to a projection exposure apparatus for use to form a pattern of a semiconductor integrated circuit, or a liquid crystal device, or the like." See Patent '336 at 1:17-21. Throughout the '336 patent specifications, the "exposure apparatus" is described as an entity that forms a pattern of a semiconductor integrated circuit, liquid crystal device, or the like on a substrate. See, e.g., '041 Patent at 1:17-21; 12:10-14:14; 26:52-28:13; 40:59-42:6. Nothing persuades the court to ignore this teaching, and much in the caselaw of the Federal Circuit counsels reliance on it. See, e.g., Vitronics, 90 F.3d at 1582; Bell Atlantic Network Services, Inc. v. Covad Communications Group, Inc., 262 F.3d 1258, 1268 (Fed.Cir.2001) (noting that specification language can "act as a dictionary when it expressly defines terms used in the claims or when it defines terms by implication") (internal quotation marks and citation omitted). Neither ASML's entirely pleonastic construction nor Nikon's elliptical alternative persuade the court otherwise; thus, the court construes "exposure apparatus" to mean "**a structure used in the photolithographic projection processes to form or to transfer a pattern of a semiconductor integrated circuit, or a liquid crystal device, or the like onto a substrate.**"

2. *Terms Shared with* the '041 patent

The parties agree that the court's constructions of "substrate," "mask," "illumination optical system," "projection optical system," and "on a Fourier transform plane with respect to a pattern surface of the mask" should be the same for all relevant patents. For the '336 patent, the court adopts the constructions set forth above.

3. "*an illumination optical system disposed on an optical path along which the illumination beam passes to illuminate the mask with the illumination beam of which an intensity distribution, on a Fourier transform plane with respect to a pattern surface of the mask, is determined in accordance with a pattern to be transferred on the substrate*"

An element in a claim for a combination may be expressed as a means or step for performing a specified function without the recital of structure, material, or acts in support thereof, and such claim shall be construed to cover the corresponding structure, material, or acts described in the specification and equivalents thereof.

35 U.S.C. s. 112, para. 6 (2000). Known as "means-plus-function" or "step-plus-function" limitations, the limitations section 112 expresses permit patent applicants to "claim an element of a combination functionally, without reciting structures for performing those functions." *Apex Inc. v. Raritan Computer, Inc.*, 325 F.3d 1364, 1374 (Fed.Cir.2003) (citation omitted); *see also Enviroco Corp. v. Clestra Cleanroom, Inc.*, 209 F.3d 1360, 1364 (Fed.Cir.2000).

[31] [32] [33] [34] To determine if a section 112-based limitation applies, the court must evaluate a pair of rebuttable presumptions. If, on the one hand, a claim limitation expressly uses the word "means," there arises a rebuttable presumption that section 112, para. 6 applies. *See Personalized Media Communications, LLC v. Int'l Trade Comm'n*, 161 F.3d 696, 703-04 (Fed.Cir.1998) ("[T]he term 'means' is central to the analysis."). If, on the other hand, a claim term does not use the word "means," there arises a rebuttable presumption that section 112, para. 6 does not apply. *Id.* at 704; *see generally CCS Fitness, Inc. v. Brunswick Corp.*, 288 F.3d 1359, 1369 (Fed.Cir.2002); *Rodime PLC v. Seagate Tech., Inc.*, 174 F.3d 1294, 1302 (Fed.Cir.1999) ("[A] claim element that uses the word 'means' but recites no function corresponding to the means does not invoke s. 112, para. 6."). To rebut a presumption that the section does not apply, a party must "demonstrate[] that the claim term fails to 'recite sufficiently definite structure' or else recites a 'function without reciting sufficient structure for performing that function.'" *Apex Inc.*, 325 F.3d at 1374 (adding that the presumption "does not shift to such party the burden of proof in the sense of the risk of nonpersuasion") (citations omitted); *see also A.C. Aukerman Co. v. R.L. Chaides Constr. Co.*, 960 F.2d 1020, 1045 (Fed.Cir.1992) (noting that the applicable burden of proof is preponderance of the evidence). If this party fails to proffer sufficient evidence to this end, the presumption "prevails." *Apex Inc.*, 325 F.3d at 1374-75.

[35] [36] Since claim 1 of the '336 does not use the word "means," a presumption of section 112-inapplicability governs the relevant text. *Cf. Apex Inc.*, 325 F.3d at 1371-72 (citations omitted). A burden thus falls on ASML to demonstrate that the term is "drafted as a function to be performed rather than [as] definite structure or materials," *Mas-Hamilton Group v. LaGard, Inc.*, 156 F.3d 1206, 1213 (Fed.Cir.1998); *see also Micro Chem., Inc. v. Great Plains Chem. Co.*, 194 F.3d 1250, 1257 (Fed.Cir.1999), and, to this end, ASML argues that the relevant term lacks ordinary meaning in the art and that the term fails to posit the kind of necessary "definite" or "specific" structure.

The court cannot agree. For one, the relevant claim language possesses meaning accessible to those of typical skill in the art. *Cf. Greenberg v. Ethicon Endo-Surgery, Inc.*, 91 F.3d 1580, 1583 (Fed.Cir.1996). To be sure, the disputed passage is neither recited verbatim elsewhere in the patent text nor explicated as a whole in the patent specifications. *Cf. '336 Patent at 5:8-10:41*. But the unusual-and long-nature of the disputed claim language does not divest the phrase of meaning accessible to those knowledgeable in the art. Indeed, there is no single component of the term that lacks ordinary meaning: e.g., an "illumination optical system" is well-understood to be a collection of mirrors, lenses, prisms, and the like configured to reflect, disperse, and otherwise act on light; a "mask" is well-understood to be a reticle in an optical system; and a "substrate" is well-understood to be the object on which a pattern is exposed. *See '336 Patent at 16:1-18:2; 32:1-32:57; 32:58-33:58; id. at figs. 1, 17, 24, 27, 29, & 33*. These terms are no less comprehensible when

presented in succession than they are when recited discretely. *See* United States v. Telectronics, Inc., 857 F.2d 778, 781 (Fed.Cir.1988) (faulting a district court for interpreting a term without reference to the rest of the limitation).

For another, the court finds that the claim language sufficiently connotes "structure" for the purposes of section 112. The claim language expresses a location (viz., "disposed on an optical path"); it builds from a mechanism with pre-established structural meaning (viz. "illumination optical system"); and it defines spatial and organizational attributes (viz., "optical axis"), all in a manner indicative of structure. *See, e.g.,* Al- Site Corp. v. VSI Int'l, 174 F.3d 1308, 1318 (Fed.Cir.1999); Apex Inc., 325 F.3d at 1373; *cf.* CellNet Data Sys., Inc. v. Itron, Inc., 17 F.Supp.2d 1100, 1109 (N.D.Cal.1998) (Infante, Mag. J.); Database Excelleration Sys. Inc. v. Imperial Technology, Inc., 48 U.S.P.Q.2d 1533, 1537 (N.D.Cal.1998) (Whyte, J.). ASML, thus, cannot rebut the presumption that section 112, para. 6 does not apply.

Consistent with the ordinary meaning of the claim term, the court thus construes "an illumination optical system disposed on an optical path along which the illumination beam passes to illuminate the mask with the illumination beam of which an intensity distribution, on a Fourier transform plane with respect to a pattern surface of the mask, is determined in accordance with a pattern to be transferred on the substrate" to mean **"a collection of optical components, situated on an optical path, that produces an intensity distribution on a Fourier transform plane with respect to a pattern surface of a mask."**

4. "illumination beam of which an intensity distribution, on a Fourier transform plane with respect to a pattern surface of the mask, is determined in accordance with a pattern to be transferred on the substrate"

[37] The parties seem to agree that the court's consideration of this claim term should follow the court's analysis of like-worded claim phrases in the '041 patent claims (e.g., "defining ..." and "determining ..."). The parties do not agree, however, regarding the meaning-and location-of the act of "determining" as contemplated by this claim term. The claim language makes clear that an "intensity distribution ... is [to be] determined in accordance with a pattern to be transferred on the substrate." *See* Patent '336 at 44:20-48. Specification language, in turn, suggests that the relevant light intensity distribution is to be determined on the basis of mask-pattern characteristics. *See, e.g.,* id. at 5:57-6:9; 9:50-53; 24:1-24:15. Both describe an act that is to occur (namely, of determining), delimiting what the necessary calculus for this determination is. *Id.*

But, as before, neither the claim language nor the specification language expressly or impliedly locate that act precisely on the Fourier transform plane-itself occupying a relative location within the optical system. *Id.* Without cabining the process to a particular spatial location, the specifications discuss the determination of the appropriate light intensity distribution, *see, e.g.,* id. at 24:1-25; 40:38-58; 9:50-53, and the '336 patent embodiments identify systems distinct from the Fourier transform plane that produce the relevant intensity distribution. *See, e.g.,* Patent '336 at Figs. 8-10, 13, 14, & 24. Absent a firm indication that the Fourier transform plane is the exclusive location on which the relevant "determin[ation]" may occur, the court is loath to read ASML's location-limitation into the claim. Consistent with the claim's plain meaning and with the instruction of the specification language, the court thus construes "illumination beam of which an intensity distribution, on a Fourier transform plane with respect to a pattern surface of the mask, is determined in accordance with a pattern to be transferred on the substrate" to mean **"an illumination beam with an intensity distribution on a Fourier transform plane determined in accordance with a pattern to be transferred to a substrate."**

5. *"intensity distribution"*

[38] In its claim construction memorandum, ASML accedes to Nikon's construction of the "intensity distribution" term. The court thus construes "intensity distribution" to mean **"a spatial arrangement of the illumination light intensity over a surface or a plane."**

6. *"pattern to be transferred to a substrate"*

[39] In the context of the '041 patent, the court construed both "pattern" and "substrate": "Pattern," the court determined, denotes "a circuit pattern in a semiconductor integrated circuit that is to be transferred to a photoresist layer of a substrate"; "substrate," the court found, means "an item on which a photosensitive layer is placed." Because the court has already addressed these terms, the court need only construe "to be transferred to" to give meaning to the "pattern to be transferred to a substrate" phrase. Plain meaning suggests that "to be transferred to" connotes the process of photolithographic translation of a mask pattern to a substrate. Teaching a similar definition, the specification language posits photolithographic "transfer" as the process through which mask patterns are exposed onto a substrate. *See, e.g.,* '336 Patent at 12:46-52. Nothing in the record-intrinsic or otherwise-compels the court to depart from this predicate definition, and the court reads "to be transferred to" accordingly. Putting the constituent claim terms together (and removing obvious redundancies), the court thus construes "pattern to be transferred to a substrate" to mean **"a circuit pattern in a semiconductor integrated circuit to be exposed or translated to an item on which a photosensitive layer is placed."**

7. *"illumination optical system forming the intensity distribution"*

[40] As with "pattern to be transferred on a substrate," the court has already construed substantial aspects of the phrase "illumination optical system forming the intensity distribution." To note, the court has construed "illumination optical system" to mean "an optical component, or combination of optical components, that directs light from a light source onto and through a mask pattern"; and the court has read "intensity distribution" to mean "a spatial arrangement of the illumination light intensity over a surface or a plane." The focus of the court's construction of the "illumination optical system forming the intensity distribution" term thus falls on one otherwise quotidian word-viz., "forming."

As the parties suggest, "forming" may well mean "creating," and it may well mean "acting on" as well, depending on the context in which it is used. But neither "creating" nor "acting on" sufficiently captures the meaning of "forming" as a matter of contextual claim analysis. As it is used in the claim, "forming" connotes both creation and modification (i.e., shaping) of the intensity distribution. The specifications and the related figures confirm this understanding, discussing both the generation of the intensity distribution along the illumination beam and the molding of that distribution. *See* '336 Patent at 16:1-18:2; 35:50-36:19; figs. 17 & 32-33. Compared to the parties' relatively over- and under-inclusive constructions, a definition of "forming" that embraces both creation and modification is more consistent with the relevant plain meaning and more coherent with terms of the intrinsic evidence. *Id.* To this end, the court reads "illumination optical system forming the intensity distribution" to mean **"an illumination optical system that creates or modifies an intensity distribution."**

8. *"the intensity distribution with an increased intensity portion apart from an optical system relative to a portion of the intensity distribution optical axis"*

[41] Though this claim term touches on a surfeit of figures, *see, e.g.*, '336 Patent Figs. 1, 9, 13, 17, 24, 27, & 29, and a host of specification sections, *see, e.g.*, *id.* at 16L1-18:2, 32:1-57, & 38:48-40:4, the parties' dispute only one segment of this extended claim term: "increased intensity portion apart from." In substantial part, the parties' contest whether the "increased intensity portion" and "the portion of the intensity distribution on the optical axis" need be "discrete" (i.e., completely separate), a question the relevant figures and specifications leave somewhat unclear. *Id.* At first blush, the parties' dispute over the meaning of "portion" seems a semantic quibble. *Cf. Koston v. Secretary, Dept. of Health and Human Services*, 974 F.2d 157, 160 (Fed.Cir.1992). To explicate "portion apart from" as "a discrete area of radiation" (in ASML's terms) or as a "region ... away from" (in Nikon's) is, as a matter of language, merely to substitute one imprecise verbal formula for another. The Federal Circuit has long cautioned courts from positing constructions that "contribute nothing but meaningless verbiage to the definition of the claimed invention," *Harris Corp. v. IXYS Corp.*, 114 F.3d 1149, 1152 (Fed.Cir.1997), and the court is mindful of this admonition here.

Regrettably, however, not all of the intrinsic record is particularly helpful in construing this term, for little in the specification or prosecution history addresses the "portion apart from" phrase. In multiple places, of course, the specifications refer to different forms of off-axis illumination (whether dipole, quadripole, or annular), forms that include areas of increased-intensity light somehow removed from the optical axis. *See, e.g.*, '336 Patent at 9:20-10:10; 36:6-19. If nothing more, this intrinsic evidence makes clear that the two light portions are separate. *Id.* Still, neither the specifications nor the prosecution history define precisely *how* separate the portions must be. *Id.*

Yet because the claim term's meaning is apparent on its face, the court need not venture far from the claim language itself. *See Interactive Gift Exp., Inc. v. Compuserve Inc.*, 256 F.3d 1323, 1331 (Fed.Cir.2001) ("If the claim language is clear on its face, then our consideration of the rest of the intrinsic evidence is restricted to determining if a deviation from the clear language of the claims is specified."). In pertinent part, the claim language demands that the "increased intensity portion" of an intensity distribution be "apart from an optical axis." Read in context, "apart from" must mean "sufficiently separated from" or "sufficiently distinct from" the optical axis of illumination such that the "increased intensity portion" constitutes a distinct entity in the photolithographic process. Understood this way, the claim term does not demand that the two portions be so thoroughly divided-or, in ASML's terminology, so completely discrete-that the portions do not touch, contact, or otherwise meet at any point. Consistent with the claim language and with patent figures 1 and 5, the court thus construes "the intensity distribution with an increased intensity portion apart from an optical system relative to a portion of the intensity distribution optical axis" to mean **"the intensity distribution having an increased intensity portion sufficiently separated or distinct from an optical axis of the illumination optical system relative to a portion of the intensity distribution optical axis."**

9. "prisms"

[42] As claim 1 describes it, a photolithographic "exposure apparatus" includes, *inter alia*, a "plurality of prisms of which at least one is movable along the optical axis, arranged on the optical axis." *See* Patent '336 at 44:27-38. Two questions grow from this claim text: one, whether the generic "prisms" term embraces so-called conical (or cone) prisms or is limited to polyhedral forms, and, two, whether Nikon nevertheless acted as its own lexicographer when using the word "prisms." *See Anchor Wall Systems, Inc. v. Rockwood Retaining Walls, Inc.*, 340 F.3d 1298, 1306 (Fed.Cir.2003) ("[T]he presumption in favor of the ordinary meaning of claim language as understood by one of ordinary skill in the art may be overcome where the patentee chooses to be his or her own lexicographer by clearly setting forth a definition for a claim term in

the specification.") (citation omitted); *see also* Akamai Techs., Inc. v. Cable & Wireless Internet Servs., Inc., 344 F.3d 1186, 1193 (Fed.Cir.2003).

Taking the second question first, the court finds that Nikon did not act as its own lexicographer regarding the term "prisms." The Federal Circuit has long noted that, when attempting to act as a lexicographer, a patentee must posit new or different definitions with clarity, deliberateness, and precision. *See, e.g.*, In re Paulsen, 30 F.3d 1475, 1480 (Fed.Cir.1994). Nikon did not do so here, leaving completely impressionistic any attempt to assign "prism" a meaning different from-or otherwise antithetical to-common understanding. The specification language does, of course, expressly disclose a "so-called cone prism having a conical shape inclined incidental surface and the emission surface so that the irradiation light beams are formed into the annular band shape." *See* Patent '336 at 32:24-30 (referencing Figure 23A). But the specification language posits this disclosure in reference to a different embodiment and a distinct function (*viz.*, to distribute an illumination beam in an annular portion) than those at issue in the relevant claim language. *Id.* at 45:29-45. Plain as it is that Nikon referenced "so-called cone prism[s]" in crafting the '336 patent invention, the evidence Nikon adduces does not "provide [the type of] reasonable clarity, deliberateness, and precision sufficient to narrow the definition of the claim term in the manner urged." *Abbott Laboratories v. Syntron Bioresearch, Inc.*, 334 F.3d 1343, 1354-1355 (Fed.Cir.2003).

But it is unnecessary to rely on Nikon's self-styled lexicography to fit conical prisms within the broader meaning of the "prisms" term. Prisms of a cone shape are expressly contemplated by the patent, and no linguistic or scientific rule mandates that "prisms" possess two flat planes rather than one flat plane with an affixed conical surface. The essence of a prism is simply that it alters or refracts the direction or path of incident light; like any other prism shape, conical prisms may perform this function, even if it does not do so in a manner identical to a polyhedral prism. Specification language makes clear that a lithographic exposure apparatus comprises a surfeit of prism forms: "Pyramid type prism[s]," "polyhedron prism[s]" (of convex and concave varieties), and "cone prism[s]" occupy various parts of the overall apparatus, *see* Patent '336 at 23:1-13; 32:24-28, and the claim itself identifies a "plurality of prisms," *id.* at 44:28-38, making unequivocal that the "prism" term is an incorporative one. The court thus includes conical prisms within the generic category of "prisms," construing "prism" to mean **"an optical element, made up of two or more planar or conical surfaces, capable of changing the direction or path of light."**

B. Claims 2 and 8

Three terms give shape to the parties' disagreement regarding claims 2 and 8:(1) "zoom optical system disposed between a light source for emitting said illumination beam and said plurality of prisms to adjust a size of said illumination beam"; (2) "optical integrator"; and (3) "rod integrator." The court assesses each below.

1. "zoom optical system disposed between a light source for emitting said illumination beam and said plurality of prisms to adjust a size of said illumination beam" FN24

FN24. Dependent claim 2 continues:

An exposure apparatus according to claim 1, further comprising a zoom optical system disposed between a light source for emitting said illumination beam and said plurality of prisms to adjust a size of said illumination beam.

Id. at 44:39-42.

[43] [44] As the claim language makes clear, a "zoom optical system," positioned between "a light source for emitting [an] illumination beam and [a] plurality of prisms," alters or adjusts the dimensions of an illumination light beam. *See* '336 Patent at 37:14-41; figs. 27-28B. The parties do not contest the location of the zoom optical system, nor do they seem to dispute the meaning of "zoom" or "optical" as those words are used here. Instead, the parties dispute the meaning of "system," and only in an oblique manner at that. As it is used in the claim, "system" implies an entity of more than one constituent part. The intrinsic record makes clear that the word "system" is not connotative of a group of one, nor does it mean, in Nikon's facile terminology, "a collection of one ... component[]." *See* Patent '336 at 26:27-39 (using a term functionally synonymous with "zoom optical system"-viz., "zoom lens system"-but not assigning any particular meaning to the term); *see also* *Interactive Gift Exp.*, 256 F.3d at 1331. The court thus reads "zoom optical system" to mean **"a collection of two or more devices, positioned between a light source for emitting an illumination beam and a plurality of prisms, configured to adjust a dimension of an illumination beam."** FN25

FN25. And the term "zoom optical system ... to adjust a size of said illumination beam" means nothing more. In its construction of this term, ASML ably recounts the operation of a "zoom optical system." *See* '336 Patent at 37:14-37:41. But however precise ASML's discussion of the invention's function, it is a discussion at best orthogonally related to the court's construction of the relevant "zoom optical system ... illumination beam" term. The parties ask the court to describe and to define what a particular device is; they do not ask the court-and the court is not otherwise required in the name of claim construction-to recite the particularized operation of that device, thereby folding the entire description of the invention into one claim term. As the Federal Circuit has cautioned, claim construction does not permit a court to invest, through some form of linguistic alchemy, every discrete claim term with a prolix definition. *See, e.g., Intervet Am., Inc. v. Kee-Vet Lab., Inc.*, 887 F.2d 1050, 1053 (Fed.Cir.1989) (noting that, in looking to the specification to construe claim terms, courts must scrupulously avoid reading "limitations appearing in the specification ... into [the] claims"). As the Federal Circuit has also cautioned, claim construction does not involve reading single claim terms to denote entire patent specifications. *Id.*

2. "optical integrator"

Because the parties now agree on a construction for this term, the court need not construe "optical integrator."

3. "rod integrator" FN26

FN26. Dependent claim 8 adds: "An exposure apparatus according to claim 7, wherein said optical integrator is a rod integrator." *Id.* at 44:66-67.

[45] The parties are "in essential agreement" regarding the appropriate construction of the term "rod integrator." The parties agree, to note, that a "rod integrator" is an optical component through which light is transmitted; the parties agree that a rod integrator operates through a process of internal reflection; and the parties agree that the rod integrator functions to enhance the uniformity of the light's intensity distribution. Where the parties disagree, ASML notes, is over Nikon's putative effort to "expand" the meaning of "rod" to include non-rod items.

According to ASML, hollow items are definitively "non-rod," regardless of shape. But nothing in the

conventional meaning of "rod" precludes hollowness; in fact, "hollow rods" are neither peculiar to advanced technology generally nor unique to photolithography specifically; they are, rather, well known to those of ordinary skill in the art. Nor does anything in the intrinsic record limit "rods" to solid blocks of material. *See* Patent '336 at 30:41-46; 39:26-32; 42:39-52; figs. 32-33. The specification language teaches that, when used in a photolithographic apparatus, a "rod integrator" is elongated in the direction in which light passes a rod, thereby achieving a more uniform illuminance (i.e., equalized intensity) through internal reflections-not diffractions-of light. *Id.* Neither this teaching nor the function it specifies precludes the necessary "rod" from being hollow; the intrinsic record does nothing to contradict the term "hollow rod" in any relevant linguistic or scientific way. *Id.* As the court reads the relevant claim, "rod integrator" means **"an optical component, elongated in the direction in which light passes, that achieves a more uniform illumination intensity on the illuminated surface through internal reflections of light."** The claim term is construed accordingly.

C. *Claim 14* FN27

FN27. Independent claim 14 reads:

An exposure apparatus which exposes a substrate with an illumination beam irradiated on a mask by an illumination optical system, comprising: an optical device having a conical incident surface and a conical exit surface which are arranged along an optical axis of said illumination optical system in said illumination optical system to distribute substantially said illumination beam in an annular portion on a plane perpendicular to said optical axis of said illumination optical system, a distance between said conical incident surface and said conical exit surface being changed in accordance with a pattern to be transferred on said substrate; and a projection optical system of which an optical axis is substantially aligned with the optical axis of said illumination optical system to project said illumination beam onto said substrate.

Id. at 45:26-43.

The parties dispute the meaning of three terms used in claim 14:(1) "conical incident surface" and "conical exit surface"; (2) "an optical device having a conical incident surface and a conical exit surface which are arranged along an optical axis of said illumination optical system in said illumination optical system to distribute substantially said illumination beam in an annular portion on a plane perpendicular to said optical axis of said illumination optical system"; and (3) "a distance between said conical incident surface and said conical exit surface being changed in accordance with a pattern to be transferred on said substrate."

1. "*conical incident surface*" and "*conical exit surface*"

[46] [47] There is, in many ways, more agreement than disagreement regarding the meaning of the terms "conical incident surface" and "conical exit surface." Both parties, for example, understand "incident surface" to denote the surface that light strikes and "exit surface" to denote the surface that light departs; in addition, both parties read "conical" to connote some type of cone shape, and the two seem to agree that such surfaces emit ring-shaped light patterns. All that the parties actually dispute is whether the phrase "conical ... surface" mandates that the surface resemble a *complete* cone or, by contrast, that the surface resemble a cone *in part*. As it is used in the claim language, the word "conical" is plainly adjectival; it modifies and qualifies the kind of surface the light strikes. Basic semantics suggests that "conical" means cone-like, much like "pyramidal" means pyramid-like and "spherical" means sphere-like, and it also suggests that "conical [] surface" means nothing more than a surface with cone-like attributes. Simpler and more congruent with the claim text than either of the parties' somewhat diffuse definitions, a construction of "conical [] surface" to mean a surface with cone-like attributes is buttressed by the specifications'

discussion of cone-shaped surfaces, *see* '336 Patent at 32:12-57, and of "incident" surfaces generally. *Id.* at 6:31-33; 13:35-39; 14:31-35; 40:5-12; *see also id.* at figs. 17-20; 31-33. The court thus construes "conical incident surface" to mean **"a surface with cone-like attributes that light strikes."** In the same manner and to the same effect, the court construes "conical exit surface" to mean **"a surface with cone-like attributes from which light departs."**

2. "an optical device having a conical incident surface and a conical exit surface which are arranged along an optical axis of said illumination optical system in said illumination optical system to distribute substantially said illumination beam in an annular portion on a plane perpendicular to said optical axis of said illumination optical system"

[48] Like "an illumination optical system disposed ... with a pattern to be transferred on the substrate," the term "an optical device ... of said illumination optical system" implicates 35 U.S.C. section 112, para. 6. Before the ITC, Nikon conceded that the term "optical device," as it is used in this instance, is subject to section 112, para. 6, *see In the Matter of Certain Microlithographic Machines and Components Thereof*, Investigation No. 337-TA-468 at 179 ("All parties agree that the 'optical device' element is subject to the provisions of 35 U.S.C. s. 112, para. 6."); during earlier portions of the litigation before this court, in fact, Nikon reiterated that the "optical device" term should be construed as a means-plus-function limitation subject to section 112, para. 6. *See* Appendix to ASML's Claim Construction Memorandum, Exh. 6 at 13 (reproducing Nikon's preliminary proposed claim constructions under Local Rule 4-2). In its claim construction memorandum, however, Nikon has reversed tack, labeling the claim language structural and arguing that section 112 is inapplicable.

As noted, to determine if a section 112, para. 6 limit applies, the court must evaluate one of two rebuttable presumptions. Because the relevant claim language does not use the word "means," there arises a rebuttable presumption that section 112, para. 6 does not apply. To rebut this presumption, ASML argues that "optical device" has no ordinary meaning in the art and that the claim language is not sufficiently structural. *Cf. Al-Site Corp. v. VSI Int'l*, 174 F.3d 1308, 1318 (Fed.Cir.1999); *see also A.C. Aukerman Co.*, 960 F.2d at 1045.

For the purposes of construing this claim phrase, the court recognizes that "optical device" is a somewhat generic term. Even so, those of ordinary skill in the art will no doubt understand "optical device" to denote a device of an optical nature performing an optically-related function. Those of ordinary skill will also know that light must strike a surface before exiting it, and those skilled in the art will also readily grasp the meaning of each discrete component of the extended "an optical device having a conical incident surface and a conical exit surface which are arranged along an optical axis of said illumination optical system in said illumination optical system to distribute substantially said illumination beam in an annular portion on a plane perpendicular to said optical axis of said illumination optical system" phrase. None of the constituent words defy ready definition, and reading the claim text as whole, *see Teletronics, Inc.*, 857 F.2d at 781, the court finds that the claim term has ordinary meaning accessible to those skilled in the art.

[49] The court also finds that the limitation sufficiently connotes structure. The text of the claim describes a device of a particular shape (*viz.*, "a conical incident surface and a conical exit surface") and of a particular position (namely, "arranged along an optical axis of said illumination optical system"). These descriptions are inherently structure-related, *see Altiris, Inc. v. Symantec Corp.*, 318 F.3d 1363, 1376 (Fed.Cir.2003), and the court need not "refer to the specification" to determine the construct of the device. *Id.* The claim text, thus, adequately communicates structure for the purposes of section 112, para. 6. *See Envirco Corp. v. Clestra Cleanroom, Inc.*, 209 F.3d 1360, 1365 (Fed.Cir.2000) (holding the limitation "second baffle means"

sufficient to connote structure because it used the word "baffle" (a physical structure) and because the claim "described the particular structure of this particular baffle"); *Rodime PLC*, 174 F.3d at 1303-04 (holding that a claim recited sufficient structure where the limitation was "positioning means" and the claim "provid[ed] a list of the structure underlying the means"); *Cole v. Kimberly-Clark Corp.*, 102 F.3d 524, 531-32 (Fed.Cir.1996) (holding that the limitation "perforation means for tearing" was not a means-plus-function claim because the word "perforation" constituted sufficient structure). Consistent with plain meaning and the terms of the specification, *see, e.g.*, '336 Patent at 12:25-44; 41:1-11, the court construes "an optical device having a conical incident surface and a conical exit surface which are arranged along an optical axis of said illumination optical system in said illumination optical system to distribute substantially said illumination beam in an annular portion on a plane perpendicular to said optical axis of said illumination optical system" to mean **"one or more optical components including conical incident and exit surfaces positioned along the optical axis within an illumination optical system such that an illumination beam is directed in an annular portion on a plane perpendicular to the optical axis."**

3. "a distance between said conical incident surface and said conical exit surface being changed in accordance with a pattern to be transferred on said substrate"

[50] The court has already addressed many of the elements of this claim term, including "conical incident surface," "conical exit surface," "pattern," and "substrate." To construe this claim term, then, it remains only for the court to address the "being changed in accordance with" segment. As a threshold matter, the court finds the predicate claim term ambiguous. The term "being changed in accordance with" is both undefined and externally referential, meaning the court cannot define the term simply by looking to the claim terms themselves.

In this context, fortunately, the specifications offer ample guidance. *See Vitronics*, 90 F.3d at 1582. In pertinent part, the specifications discuss the preferred method of conical lens change:

In a case where the inner or the outer diameter of the annular band shape irradiation light beams is changed to correspond to the periodicity of the precision of the reticle pattern, *it is preferable that a plurality of cone prisms having different thicknesses are exchanged by being disposed in the irradiation optical path* and the size (the diameter) of the circular irradiation light beams to be incident on the cone prism 92 can be varied by a variable aperture diaphragm.

See Patent '336 at 32:49-57 (emphasis added). This specification language answers precisely the question the claim term asks-*viz.*, how the "change" is to occur. The court thus finds that "being changed," as it is used in the claim, includes an "exchange[]" of "a plurality of cone prisms having different thicknesses" as a viable mechanism, and any construction to the contrary would be at least under-inclusive. *See id.* But the specifications also make clear that "exchange" is only the "preferable" path of change, not the *exclusive* or required mechanism of it. *Id.*; *see also id.* at 23:45-58; figs. 17-20. Guided by the lessons of the specifications, the court construes "a distance between said conical incident surface and said conical exit surface being changed in accordance with a pattern to be transferred on said substrate" to mean **"a distance between the conical incident surface and the conical exit surface is varied as appropriate based on one or more characteristics of the pattern of the mask to be transferred on the substrate."**

D. Claim 17 FN28

FN28. Independent claim 17 follows:

An exposure apparatus which exposes a substrate with an illumination beam irradiated on a mask from a

light source, comprising: an illumination optical system disposed on an optical path along which the illumination beam passes to illuminate the mask with the illumination beam of which an intensity distribution, on a Fourier transform plane with respect to a pattern surface of the mask, is determined in accordance with a pattern to be transferred on the substrate; a rod integrator of which an optical axis is subutentially [sic] aligned with an optical axis of the illumination optical system; and an optical system disposed between the light source and said rod integrator in said illumination optical system that changes an incident angle of said illumination beam on an incident surface of said rod integrator to adjust the intensity distribution having an increased intensity portion apart from the optical axis relative to a portion of the intensity distribution on the optical axis.

Id. at 45:53-46:6.

At issue regarding claim 17 are 2 terms: (1) "subutentially (sic) aligned"; and (2) "an optical system disposed between the light source and said rod integrator in said illumination optical system that changes an incident angle of said illumination beam on an incident surface of said rod integrator to adjust the intensity distribution having an increased intensity portion apart from the optical axis relative to a portion of the intensity distribution on the optical axis."

1. "*subutentially (sic) aligned*"

In its claim construction memorandum, ASML accepts Nikon's construction of the "subutentially (sic) aligned" term. As a result, the court need not construe this claim language.

2. "*an optical system disposed between the light source and said rod integrator in said illumination optical system that changes an incident angle of said illumination beam on an incident surface of said rod integrator to adjust the intensity distribution having an increased intensity portion apart from the optical axis relative to a portion of the intensity distribution on the optical axis*"

[51] [52] Like the term "an illumination optical system disposed ... with a pattern to be transferred on the substrate," the claim term "an optical system disposed ... having an increased intensity portion apart from the optical axis relative to a portion of the intensity distribution on the optical axis" implicates 35 U.S.C. section 112, para. 6. Since the germane claim language does not use the word "means," there is a rebuttable presumption that section 112 does not apply. To rebut this presumption, ASML asserts-as before-that the term "an optical system disposed ... having an increased intensity portion apart from the optical axis relative to a portion of the intensity distribution on the optical axis" does not denote the requisite kind of "definite" or "specific" structure. And, as before, the court cannot agree. The claim language plainly expresses a location, "dispos [ing]" the entity "*between* the light source and said rod integrator in said illumination system." The claim language also places the "optical system" within a larger optical and photolithographic "system" with established structural meaning, referencing spatial and organizational attributes of that system, e.g., "between," "optical axis." Under Federal Circuit law, such language adequately denotes structure, *see, e.g., Al- Site Corp.*, 174 F.3d at 1318; *Apex Inc.*, 325 F.3d at 1373; *cf. CellNet Data Sys., Inc.*, 17 F.Supp.2d at 1109; *Database Excelleration Sys. Inc.*, 48 U.S.P.Q.2d at 1537, and ASML cannot rebut the presumption that section 112, para. 6 does not apply.

The specifications describe a variety of optical systems capable of changing the incident angle on the rod integrator, *see* '336 Patent at 42:27-43:32, and the patent figures are in accord. *See id.* at figs. 15-20. Consistent with this intrinsic evidence, the court construes the "optical system ... optical axis" term to mean **"a collection of optical components, positioned between a light source and the rod integrator, that**

operates to change the angle at which an illumination beam enters the rod integrator, thus adjusting the intensity distribution. This intensity distribution has a portion of increased intensity apart from the optical axis of the illumination system."

E. Claim 18 FN29

FN29. Claim 18 reads: "An apparatus according to claim 17, wherein said optical system includes an optical element moveable along the optical axis of said illumination optical system." *Id.* at 46:7-9.

[53] [54] Before the court can construe any segment of claim 18, the court must determine precisely what term the parties ask the court to consider. Nikon asks the court to construe "an optical element movable (sic) along the optical axis," arguing that it would be meaningless and futile to interpret the term otherwise. ASML, in turn, asks the court to construe only the two-word term "optical element." It goes-or should go-without saying that the court would prefer not to be confronted with such threshold confusion. A court's claim-construction task is demanding enough when the parties properly delimit the terms to be construed, something Nikon and ASML have not done particularly well in this instance. Nonetheless, the court must construe claim 18, and plain language, the relevant figures, and the patent's specifications offer sufficient guidance. The parties seem to agree that "optical element" denotes an optical part or component constructed of a single piece of material. In their claim construction papers, the parties find common ground, largely agreeing that an "optical element" is a **"single part or component of an optical system"**; the court construes "optical element" accordingly.

The remaining portions of the claim are easily addressed. "[M]oveable along the optical axis of said illumination optical system" means precisely what it says: not fixed to any individual point and relocatable along the optical axis. This type of movement is both integral to the art and denoted throughout the patent specifications. *See, e.g.*, Fig. 5; 9:50-65; 14:48-52. Taken together, "optical element" and "movable along the optical axis of said illumination optical system" thus mean **"a single part or component of an optical system not fixed to any individual point and relocatable along the optical axis."**

F. Claim 25 FN30

FN30. Independent claim 25 states:

A method of exposing a substrate, through a projection optical system, with an illumination beam irradiated on a mask by an illumination optical system, comprising: forming an intensity distribution having an increased intensity portion apart from an optical axis of the illumination optical system relative to a portion of the intensity distribution on the optical axis on a Fourier transform plane with respect to a pattern surface of the mask in the illumination optical system, the intensity distribution being adjusted, by changing an incident angle of said illumination beam on an incident surface of a rod integrator in said illumination optical system in accordance with a pattern to be transferred on said substrate; and projecting said illumination beam onto said substrate by said projection optical system.

Id. at 46:54-47:2.

Two terms in claim 25 are in dispute: (1) "forming an intensity distribution having an increased intensity portion apart from an optical axis of the illumination optical system relative to a portion of the intensity distribution on the optical axis on a Fourier transform plane with respect to a pattern surface of the mask in the illumination optical system"; and (2) "the intensity distribution being adjusted, by changing an incident

angle of said illumination beam on an incident surface of a rod integrator in said illumination optical system in accordance with a pattern to be transferred on said substrate." The court construes each below.

1. *"forming an intensity distribution having an increased intensity portion apart from an optical axis of the illumination optical system relative to a portion of the intensity distribution on the optical axis on a Fourier transform plane with respect to a pattern surface of the mask in the illumination optical system"*

[55] The parties agree that the term "forming an intensity ... optical system" focuses on the production of the desired intensity distribution on a Fourier transform plane. As they do in comparable contexts, however, the parties disagree about *where* this act of production must occur. *Cf.* '041 Patent, claim 12. Given the prior iterations of a similar debate, this point of disagreement is hardly surprising-and the answer is essentially the same. Though the plain language of claim 25 requires the formation of an intensity distribution relative to a portion of the intensity distribution on the optical axis, the claim and the intrinsic record leave the location of this act unspecified, and neither require that the act occur on the Fourier transform plane. *See generally* '336 Patent at 6:38-63; 42:39-49. As a result, the court will not demand that the act take place there. The Federal Circuit has long cautioned courts against reading limitations into claim constructions where none exist in the claim or in the specification language, and the court will not import the "on the Fourier transform plane" limitation ASML forwards. Instead, consistent with the plain meaning of the claim term, the court construes "forming an intensity distribution ... in the illumination optical system" to mean **"shaping or reshaping an intensity distribution such that it has an increased intensity as described on a Fourier transform plane with respect to a pattern surface of the mask in the illumination optical system."**

2. *"the intensity distribution being adjusted, by changing an incident angle of said illumination beam on an incident surface of a rod integrator in said illumination optical system in accordance with a pattern to be transferred on said substrate"*

[56] In its claim construction memorandum, ASML accedes to Nikon's construction of this term (save for the disagreement regarding "rod integrator," construed above). Consistent with this agreement, the court construes the claim language to mean: **"adjusting the intensity distribution of the illumination beam as appropriate based on one or more characteristics of the pattern of a mask by changing an angle at which the illumination beam enters the rod integrator."**

III. *The '740 Patent*

The parties dispute the meaning of terms used in a handful of '740 patent claims. For terms already construed in the context of the '041 or the '336 patents, the court adopts and incorporates those constructions here. The remaining claim terms are considered seriatim.

A. *Claim 3* FN31

FN31. Independent claim 3 posits:

A projection exposure apparatus having a rod integrator comprising: an illumination optical system disposed between a light source and a mask to illuminate the mask with light passing through the rod integrator and having a decreased intensity portion on first and second axes defined to intersect with each other at an optical axis of the illumination optical system and defined along first and second directions in which components of a pattern on the mask extend, the illumination optical system including an optical device disposed between the light source and the rod integrator to change an intensity distribution of light incident

on the rod integrator; and a projection optical system disposed between the mask and a substrate on which the pattern is transferred to project light from the mask onto the substrate.

See '740 Patent at 44:38-54.

At issue in claim 3 are three terms: (1) "an illumination optical system disposed between a light source and a mask to illuminate the mask with light passing through the rod integrator and having a decreased intensity portion on first and second axes defined to intersect with each other at an optical axis of the illumination optical system and defined along first and second directions in which components of a pattern on the mask extend"; (2) "decreased intensity portion" and "decreased intensity portion on first and second axes defined to intersect with each other at an optical axis of the illumination optical system and defined along first and second directions in which components of a pattern on the mask extend"; and (3) "an optical device disposed between the light source and the rod integrator to change an intensity distribution of light incident on the rod integrator."

1. "an illumination optical system disposed between a light source and a mask to illuminate the mask with light passing through the rod integrator and having a decreased intensity portion on first and second axes defined to intersect with each other at an optical axis of the illumination optical system and defined along first and second directions in which components of a pattern on the mask extend"

[57] [58] In its opening claim construction memorandum, Nikon asks the court to construe the term "an illumination optical system ... on the mask extend." ASML does not respond to Nikon's argument in its own memorandum, providing no assessment of the claim term beyond that offered in the parties' claim construction charts. The resulting dearth of adversarial presentation complicates the court's analysis, but the court is not left without adequate claim construction tools. Many segments of the relevant term have already been construed-e.g., "illumination optical system" and "rod integrator"-and the court adopts those constructions here. The court also finds that section 112, para. 6 does not apply to this claim language. Since the claim language does not use the word "means," and since ASML cannot rebut the consequent presumption section 112-inapplicability, the court can proceed to consider the claim text itself.

In the "Related Background Art" and "Summary of Invention" portions of the specifications, the patent describes a collection of optical components working on light to generate a region of illumination light possessing particular characteristics. See, e.g., '740 Patent at 1:19-61; 5:8-37. Related portions of the specification language restate this description, see id. at 38:42-39:65; 42:1-44:6, offering examples of illumination optical components and systems. Id. Portions of the specification language likewise describe "intensity distribution" as a spatial variation in the amount of illumination present on a plane perpendicular to the optical axis. Id. at 38:48-40:4. This specification language teaches that "an illumination optical system disposed ... on the mask extend" connotes **"a collection of optical components that illuminate the mask of light that has passed through the rod integrator and which has a decreased intensity portion along two axes which intersect each other at an optical axis of the 'illumination optical system, and in any case, the two axes are defined along directions in which the lines of the mask extend."** The parties agreed, during the court's *Markman* hearing, to accept this construction, and the court adopts it here.

2. "decreased intensity portion" and "decreased intensity portion on first and second axes defined to intersect with each other at an optical axis of the illumination optical system and defined along first and second directions in which components of a pattern on the mask extend"

[59] [60] Two questions grow from this claim term: one, what "decreased intensity portion" means, and,

two, whether the "decreased intensity portion" must be "discrete" from other radiation areas. Both questions can be resolved by reference to plain meaning of the claim text and to terms already construed by the court. First, consistent with plain meaning and as a converse to "increased intensity distribution," "decreased intensity portion" means **"a portion of the illumination light with a decreased intensity relative to an area on an optical axis of the illumination optical system."** Second, nothing in the claim or specification language demands that the "decreased intensity portion" be wholly "discrete" from the illumination beam overall. The court is unwilling to import limitations into claim language where the intrinsic record does not so compel, and the court is particularly unwilling to import limitations where plain meaning militates against them. Plain meaning suggests that the "decreased intensity portion ... on the mask extend" term means **"an area of decreased light intensity situated on two axes intersecting with one another at an optical axis and corresponding with components of a pattern on a mask extend."** The court thus construes the term to mean precisely that.

3. "an optical device disposed between the light source and the rod integrator to change an intensity distribution of light incident on the rod integrator"

[61] [62] Like "an optical system disposed ... having an increased intensity portion apart from the optical axis relative to a portion of the intensity distribution on the optical axis," "an optical device disposed between ... on the rod integrator" implicates section 112, para. 6. The claim language does not use the word "means," so there is a rebuttable presumption that section 112 does not apply, and this presumption cannot be rebutted here. Read *as a whole*, the relevant claim term sufficiently connotes structure, even if the word "device" is, when viewed in isolation, a generic term. The claim language, for example, expresses a location, referencing the position of particular elements and noting the purpose of this structural organization. Courts have long accepted such language as sufficiently denoting structure in the context of section 112, para. 6, *see, e.g., Al- Site Corp.*, 174 F.3d at 1318; *Apex Inc.*, 325 F.3d at 1373; *cf. CellNet Data Sys., Inc.*, 17 F.Supp.2d at 1109; *Database Excelleration Sys. Inc.*, 48 U.S.P.Q.2d at 1537, and the court finds that section 112, para. 6 does not apply.

The court has construed the constituent terms of the relevant phrase, and the court need not revisit those constructions here. Building from these prior constructions, the court construes the "optical device disposed ... on the rod integrator" to mean **"one or more optical components, positioned between the light source and the rod integrator, that change an intensity distribution of light striking the rod integrator."**

B. Claim 6 FN32

FN32. Independent claim 6 notes:

A projection exposure apparatus having a rod integrator comprising: an illumination optical system disposed between a light source and a mask to illuminate the mask with light passing through the rod integrator and having an increased intensity portion relative to a portion on an optical axis of the illumination optical system, the illumination optical system including an optical device disposed between the light source and the rod integrator to change a position of the increased intensity portion and a projection optical system disposed in an optical path between the mask and a substrate on which a pattern on the mask is transferred.

Id. at 44:64-45:10.

The parties dispute the meaning of four terms used in claim 6:(1) "an illumination optical system disposed between a light source and a mask to illuminate the mask with light passing through the rod integrator and having an increased intensity portion relative to a portion on an optical axis of the illumination optical

system"; (2) "light passing through the rod integrator and having an increased intensity portion relative to a portion on an optical axis of the illumination optical system"; (3) "increased intensity portion"; and (4) "optical device disposed between the light source and the rod integrator to change a position of the increased intensity portion." Consideration of these terms follows directly from the court's construction of terms in the '336 and '041 patents.

1. *"an illumination optical system disposed between a light source and a mask to illuminate the mask with light passing through the rod integrator and having an increased intensity portion relative to a portion on an optical axis of the illumination optical system"*

[63] [64] In its evaluation of particular '336 patent claims, the court construed many of the claim terms contained in the extended "an illumination optical system ... axis of the illumination optical system" term. In so doing, the court also discussed the application of section 112, para. 6 to claim terms largely identical to this "an illumination optical system ... axis of the illumination optical system" phrase. The court's foregoing analysis is both relevant and directly applicable here. Without more, the court construes "an illumination optical system ... optical system" to mean **"a collection of optical components configured to illuminate the mask with light passing through a rod integrator; the light has a portion of increased intensity relative to an area of light intensity on the optical axis of the illumination system."**

2. *"light passing through the rod integrator and having an increased intensity portion relative to a portion on an optical axis of the illumination optical system"*

[65] The court's foregoing analysis likewise applies to the construction of the "light passing through ... illumination optical system" term. Since the court has construed the term "the intensity distribution with an increased intensity portion apart from an optical system relative to a portion of the intensity distribution optical axis" to mean "the intensity distribution having an increased intensity portion sufficiently separated or distinct from an optical axis of the illumination optical system relative to a portion of the intensity distribution optical axis," the court can readily construe "light passing through the rod integrator and having an increased intensity portion relative to a portion on an optical axis of the illumination optical system" to mean **"light having an area of increased intensity relative to an area on an optical axis of an illumination optical system."**

3. *"increased intensity portion"*

[66] The court's foregoing analysis also applies to the construction of "increased intensity portion." Using "increased intensity portion" as a counterpoint, the court has construed "decreased intensity portion" to mean "a portion of the illumination light with a decreased intensity relative to an area on an optical axis of the illumination optical system." Plain meaning supports the converse construction as well; thus, "increased intensity portion" means **"a portion of the illumination light with an increased intensity relative to an area on an optical axis of the illumination optical system."**

4. *"optical device disposed between the light source and the rod integrator to change a position of the increased intensity portion"*

[67] [68] And the court's foregoing analysis—including its section 112, para. 6 analysis of a comparable term—applies to the construction of "optical device disposed between the light source ... portion" as well. The court has construed "an optical device disposed between the light source and the rod integrator to change an intensity distribution of light incident on the rod integrator" to mean "one or more optical components,

positioned between the light source and the rod integrator, that change an intensity distribution of light striking the rod integrator." It follows that "optical device disposed between the light source and the rod integrator to change a position of the increased intensity portion" means **"one or more optical components, positioned between the light source and the rod integrator, that change a position of the increased intensity portion."**

C. Claim 7 FN33

FN33. Dependent claim 7 adds:

An apparatus according to claim 6, wherein said increased intensity portion includes at least two sections separated from each other and disposed apart from the optical axis of said illumination optical system.

Id. at 45:11-14.

The parties dispute two terms in claim 7:(1) "increased intensity portion includes at least two sections separated from each other and disposed apart from the optical axis of said illumination optical system"; and (2) "at least two sections separated from each other." Because the second term is part and parcel of the first, the court will construe the two together.

1. "increased intensity portion includes at least two sections separated from each other and disposed apart from the optical axis of said illumination optical system"

[69] [70] The parties agree that the terms "increased intensity portion" and "illumination optical system" should be construed here as they have been vis-a-vis the '336 and '041 patents. The parties also agree that, in the context of claim 7, FN34 "separate from each other" denotes at least two sections of light that neither touch nor overlap. The court thus construes the claim term to mean **"an increased intensity portion that has at least two non-overlapping areas located apart from the optical axis of the illumination optical system."**

FN34. Nikon pauses to stress that the "increased intensity portions" described in claim 6 -as opposed to claim 7-may in fact overlap or touch. The court has not been asked to determine whether claim 6 contemplates the type of overlapping portions Nikon describes, but the court is well aware that limitations read into claim 7 do not *a fortiori* reach claim 6. *See* Sunrace Roots Enter. Co., Ltd. v. SRAM Corp., 336 F.3d 1298, 1302 (Fed.Cir.2003) ("Our court has made clear that when a patent claim does not contain a certain limitation and another claim does, that limitation cannot be read into the former claim.") (quoting *Amgen, Inc. v. Hoechst Marion Roussel, Inc.*, 314 F.3d 1313, 1326 (Fed.Cir.2003)).

D. Claim 8 FN35

FN35. Independent claim 8 reads:

A method of exposing a substrate with light passing through a rod integrator, comprising the steps of: adjusting an intensity distribution of light incident on the rod integrator in accordance with a pattern on a mask to illuminate the mask with light having increased intensity portions between the rod integrator and the mask, relative to a portion on an optical axis of the rod integrator; and projecting light from the illuminated mask onto the substrate.

Id. at 45:15-25.

[71] [72] [73] [74] The parties dispute one term in claim 8: "increased intensity portions between the rod integrator and the mask, relative to a portion on an optical axis of the rod integrator." ASML believes that this claim language is vague and indefinite under 35 U.S.C. section 112, para. 2 because the claim seems to require light traveling between the rod integrator and the mask to have portions of intensity higher than that of light *not* between the rod integrator and the mask. The court recognizes that the claim language is somewhat inelegant. But semantic clunkiness does not necessarily indicate that the claim language is so vague, indefinite, or nonsensical that it implicates section 112, para. 2. As the Federal Circuit has interpreted it, section 112, para. 2 applies only where claim language is " *insolubly* ambiguous [] and [where] no narrowing construction can properly be adopted." *See Exxon Research & Eng'g Co. v. United States*, 265 F.3d 1371, 1375 (Fed.Cir.2001) (adding that courts must attempt to construe all claims "amenable to construction, however difficult that task may be") (emphasis added); *see also Honeywell Intern., Inc. v. International Trade Comm'n*, 341 F.3d 1332, 1338-1339 (Fed.Cir.2003). No "insolubl[e]ambigu[ity]" precludes the court from achieving an adequate narrowing construction here; indeed, the term "increased intensity portions between the rod integrator and the mask, relative to a portion on an optical axis of the rod integrator" is no more "difficult" to construe than any number of other terms at issue in this action. Read as a whole, the term suggests a location (viz., "between the rod integrator of the mask") and an object (namely, "increased intensity portions"). Such language is both "amenable to construction," *Exxon Research*, 265 F.3d at 1375, and adequately definite to notify "the public of the [scope of the] patentee's right to exclude." *S3 Inc. v. nVIDIA Corp.*, 259 F.3d 1364, 1371-72 (Fed.Cir.2001) (alteration in original; citation omitted). As a result, section 112, para. 2 does not control.

The plain meaning of the claim language is "**areas of light, positioned between the rod integrator and the mask, of increased intensity relative to a portion on the optical axis of the rod integrator.**" The court construes the claim accordingly.

E. Claim 9 FN36

FN36. Dependent claim 9 follows: "A method according to claim 8, wherein said increased intensity portions are separated from each other and apart from the optical axis of said rod integrator by substantially the same distance." *Id.* at 45:26-46:2.

The parties contest the meaning of one term in claim 9: "separated from each other." The court construed this term in the context of claim 7 of the '740 patent, and the court adopts that construction here.

F. Claim 10 FN37

FN37. Independent claim 10 reads: "A method of producing a device, comprising a lithography step of transferring a device pattern on a workpiece using an exposing method recited in claim 8." *Id.* at 46:3-5.

In claim 10, three terms are disputed by the parties: (1) "device"; (2) "workpiece"; and (3) "transferring a device pattern to a workpiece."

1. "device"

[75] In the "Field of Invention" portion of the '740 patent, "the present invention" is described as "relate[d]

to a projection exposure apparatus for use to form a pattern of a semiconductor integrated circuit, or liquid crystal device, or the like." *See* Patent '740 at 1:16-18. Claim 10 repeats this use of "device," discussing a "method of producing a device, comprising ... using an exposing method recited in claim 8." *Id.* at 46:3-5. As with any other term, the court must read "device" in accord with its claim-and specification-language context, both of which suggest that "device" means something more particular than the superficially generic "object or item" phrase ASML forwards. The claim language denotes a particular lithography-related "device," viz., the device produced through the lithographic process of transferring a pattern to a workpiece. Specification language, in turn, refers repeatedly to the imaging of a "circuit" "pattern" onto a substrate, typically in reference to various patent figures. *See, e.g.*, 39:41-46 & 42:52-58; figures 29 & 32. Congruent with this intrinsic evidence, the court thus construes "device" to mean **"an integrated circuit or similar item."**

2. "workpiece"

[76] Similar logic applies to evaluation of the term "workpiece." As it is used in claim 10, "workpiece" unequivocally refers to a substrate. In the lithographic process, the substrate (or wafer) is the item onto which the pattern is transferred; the text of claim 10—which discusses the transferring of a pattern—makes clear that "workpiece" is the item that receives the pattern. Taken together, these two conclusions make clear that "workpiece," as used in this context, is synonymous with **"substrate."** The court construes "workpiece" accordingly.

3. "transferring a device pattern to a workpiece"

[77] Because the court has already construed "device" and "workpiece," it remains only to construe the meaning of "transferring." When read in context, the claim text discusses more than the act of transferring a generic device to a generic workpiece; it discusses, instead, "a *lithography* step of transferring a device pattern on a workpiece using an exposing method." *See* '336 Patent at 46:3-5 (emphasis added). The specification language likewise teaches that this lithographic "step" involves the formation of a "circuit pattern of a semiconductor device" through "a method[] in which a reticle [] pattern is formed on a substrate such as a semiconductor wafer." *Id.* at 1:21-25. Only because this substrate is "applied with photosensitive photoresist," the specification language adds, can a "circuit pattern [be] transferred"; that is, the transfer depends on the presence-and reactive quality-of photoresist. The meaning of "transferring a device pattern" reflects, and is defined by, this specification language.

[78] Still, important as it is for the court to understand-and to construe-claim terms in the context in which they appear, it is equally important for the court to avoid folding independent claim (or specification) language into the construction of every discrete claim term. The court cannot ignore that the definition of "pattern" is itself finite; it does not embrace a summary, however pithy, of the operation of the entire photolithographic apparatus. Intrinsic evidence teaches that "transferring a device pattern on a workpiece" means **"conveying, through a photolithographic process, the pattern for an integrated circuit or similar item onto a substrate with a photoresist layer."** Standard canons of claim construction preclude the court from adding more.

IV. *The* '500 Patent

The parties dispute the meaning of a number of terms used in three '500 patent claims. Each claim term is addressed separately below.

A. *Claim 1* FN38

FN38. Claim one reads:

An exposure apparatus comprising: an exposure device disposed between a mask and an object, the exposure device exposes a pattern of the mask onto the object; a movable mask stage that holds the mask; a movable object stage that holds the object; a reaction frame dynamically isolated from the exposure device; a drive to move the mask stage and the object stage such that a reaction force caused by movement of the mask stage and the object stage is transferred substantially to the reaction frame; a first position detector, dynamically isolated from the reaction frame, to detect a position of the mask stage; and a second position detector, dynamically isolated from the reaction frame, to detect a position of the object stage.

Id. at 7:42-59.

The parties' dispute six terms in claim 1:(1) "reaction frame"; (2) "dynamically isolated"; (3) "a drive to move the mask stage and the object stage"; (4) "a reaction force caused by movement of the mask stage and the object stage"; (5) "transferred substantially to the reaction frame"; and (6) "first position detector" and "second position detector."

1. "*reaction frame*"

[79] In its "summary" section, the '500 patent specifications describe the relevant invention as a "precision motion stage mechanism includ [ing] the stage itself ... surrounded by a 'window frame' guide structure." *See* '500 Patent at 1:55-58. The parties agree that "reaction frame" has no generally accepted meaning in the art, and however obvious the meaning of "reaction" and "frame" may be when disaggregated, the conjoined "reaction frame" term has no plain meaning, either. The court must look to the intrinsic record accordingly.

In pertinent part, the specifications discuss a "frame" separate and distinct from that supporting the various precision photolithographic components. The abstract to the '500 patent discusses "a mechanical support for the stage independent of the support for its window frame guide," *see* Patent '500 at Abstract, and "reaction force" is understood as being "transmitted independently directly to the earth's surface by an independent supporting structure." *See id.* at 2:36-40. According to the intrinsic record, moreover, the reticle stage mechanism is placed "apart [] and [is] independently supported from the other elements of the photolithography machine." *Id.* at 2:49-52; *see also id.* at 5:23-28 (discussing an "independent support structure"); *id.* at 2:35-40 ("An additional aspect ... is that the reaction force of the stage and window frame drive is not transmitted to the support frame ... but is transmitted independently directly to the earth's surface by an independent supporting structure."). The specification language for the incorporated '118 patent is largely in accord, as is the '118 patent's prosecution history. *See, e.g.,* Patent '118 at 4:5-9 & 7:17-19; Appendix to ASML's Memorandum, Exh. 21, Patent '118 file history (noting that Nikon, in prosecuting the '118 patent, emphasized an "independently supported reaction frame [that] has its own supporting pillars resting on [a] foundation ... without any mechanical coupling to the XY stage 30 or to the optical elements").

[80] But not all of the specification language suggests that the reaction frame must go separately and independently to the ground. Both the '500 patent specifications and the correlative '118 patent text discuss a structural support that "under[ies]" -i.e., buttresses from below, perhaps through a stacked-frame structure-the mechanism's frames. *See* Patent '500 at 5:15-17; 5:23-52; Patent '118 at 4:11-19; 6:66-7:4. Nothing in the intrinsic (or extrinsic) record demands that the reaction frame itself run independently to the ground in every case, rather than to a separate component of the larger device which itself contacts "the earth's surface." '500 Patent at 2:36-40. Only by limiting the claim to a particular embodiment does such a limit

emerge, and the court is unwilling to impose such a limit here. *See, e.g.,* Intervet Am., Inc. v. Kee-Vet Lab., Inc., 887 F.2d 1050, 1053 (Fed.Cir.1989) (noting that attempts to impose such limits rarely, if ever, succeed). A "cardinal sin of claim construction," the Federal Circuit has observed, is to import limitations into claims where claim language permits a construction broader than the embodiments. *Teleflex, Inc. v. Ficoso North Am. Corp.*, 299 F.3d 1313, 1324 (Fed.Cir.2002). It is equally problematic, of course, to construe a claim to exclude a preferred embodiment, *see Vitronics*, 90 F.3d at 1583-84 (noting that a construction that excludes the preferred embodiment is "rarely, if ever, correct"), but construing "reaction frame" to include a stacked-frame configuration suffers neither of these flaws. For one, the claim language is broader than the relevant embodiment and the specification text; nothing in the claim language excludes a stacked-frame configuration, and nothing in the claim language requires separate and independent attachment to the ground. Indeed, embodiments in the incorporated '118 patent depict precisely the contrary. *See* Exh. 14 at 1:40-64; Fig. 1B. For another, a construction of the term "reaction frame" that includes a stacked configuration does not exclude the preferred embodiment; it simply acknowledges that the reaction frame *need* not extend separately and independently to the ground. The court thus construes "reaction frame" to mean **"a physical structure, separate and distinct from the structure supporting the precision components, that transfers reaction forces, caused by the movement of a stage drive, away from the precision components."**

2. "dynamically isolated"

[81] Like "reaction frame," the term "dynamically isolated" lacks established technical meaning. The specification language for the '500 patent refers to "physical[] isolati[on]" of a stage to "prevent [] [] reaction forces from vibrating the projection lens," '336 Patent at 2:44-47, and it discusses how the mechanism should avoid "coupl[ing]" of the reaction force into the base structure, *id.* at 5:15-17, but nowhere is the ungainly "dynamically isolated" phrase specifically defined in the specification language. Still, a pair of points are clear: First, "dynamic isolation" does not demand "complete isolation." Neither party suggests-and nothing in the patent implies-that a reaction frame will reduce vibration to zero, no matter how effective or firmly fastened to the ground. All that "dynamically isolated" connotes, and all that is physically possible in the context of the photolithographic machine, is that vibration-i.e., the relevant reaction forces-transmitted from one frame to the next be minimized sufficiently to permit the projection apparatus to function accurately. *See, e.g.,* '500 Patent at 2:40-47 (discussing reduction of undesirable movement such that the projection lens can operate accurately); *see also In the Matter of Certain Microlithographic Machines and Components Thereof*, Investigation No. 337-TA-468 at 41-45.

Second, nothing in the claim or in the specification language compels the conclusion that this vibration-minimization occurs through motorized means. Indeed, as ASML noted during the court's *Markman* hearing, Nikon expressly disclaimed use of active motors when securing a patent (*viz.*, the '128 patent) directly germane to the '500 patent claims. *Cf. Georgia-Pacific Corp. v. U.S. Gypsum Co.*, 195 F.3d 1322 (Fed.Cir.1999); *see also Microsoft Corp. v. Multi-Tech Sys., Inc.*, 357 F.3d 1340, 1350 (Fed.Cir.2004) ("Any statement of the patentee in the prosecution of a related application as to the scope of the invention would be relevant to claim construction, ... not only to [patents issued *after* the predicate patent], but also to [] *earlier issued* [] patent[s].") (emphasis added). The court has located nothing in the intrinsic record suggesting that the patent contemplates motorized means of vibration-minimization, and recognizing that the claim term is inherently ungainly, the court construes "dynamically isolated" to mean that **"the two frames are sufficiently free of transferred vibrations and reaction forces that the photolithographic machine can perform accurately."** FN39

FN39. This construction is not inconsistent with the gloss recently placed on "dynamically isolated" by the Board of Appeals and Patent Interferences of the PTO. *See* Decision on Prelim. Motions and Judgment, Interference No. 104,813 (defining "dynamically isolated" as the state in which "reaction forces, e.g., dynamics of the one frame, are not transmitted to the other frame"); *see also* Decision on Preliminary Motions, Interference No. 104,814 (noting that two frames are not "dynamically isolated" if "some vibrations or reaction forces [are] transferred between the two frames"). The court does not read these recent statements to suggest that *no* vibration could *ever* possibly be transferred between the two frames, as that kind of segregation would not be physically possible given the construct of the relevant art; rather, the court assumes, consistent with the construction the court offers, that the vibrations are reduced / not transferred such that the invention can operate effectively.

3. "a drive to move the mask stage and the object stage"

[82] [83] Though it risks making the claim construction process an inherently circular enterprise, the parties appear to agree that the proper construction of "a drive to move the mask stage and the object stage" should include the words of the term itself. The parties disagree, however, regarding whether the court should append the phrase "which may include a mask drive to move the mask stage and an object drive to move the object stage" to its construction. According to Nikon, the doctrine of claim differentiation requires this appendix because claim 19-a dependent claim of claim 1-states "wherein the drive includes a mask drive to move the mask stage and an object drive to move the object stage."

[84] As a predicate matter, the court finds Nikon's reliance on claim differentiation doctrine logically puzzling. The doctrine of claim differentiation requires that terms in independent claims-like this one-be read more broadly than comparable (and narrower) terms in dependent claims-like claim 19. *See* Transmatic, Inc. v. Gulton Industries, Inc., 53 F.3d 1270, 1277-1278 (Fed.Cir.1995) ("Consistent with the claim differentiation doctrine, the term 'light housing' in claim 1 is broader in scope than in claim 3 and the other dependent claims."); *United States v. Teletronics, Inc.*, 857 F.2d 778, 783-84 (Fed.Cir.1988), *cert. denied*, 490 U.S. 1046, 109 S.Ct. 1954, 104 L.Ed.2d 423 (1989); *D.M.I., Inc. v. Deere & Co.*, 755 F.2d 1570, 1574 (Fed.Cir.1985) ("Where some claims are broad and others narrow, the narrow claim limitations cannot be read into the broad."). The foundation of this doctrine is that reading a dependent claim more broadly than its governing independent claim would make the two claims concomitantly inconsistent and inverted. *Id.* There is no risk of violating the rule in eschewing Nikon's limitation. In fact, to assert, as Nikon has, that claim differentiation doctrine requires the court to import a limitation from a *dependent* claim gets claim differentiation doctrine precisely backwards. The limitation in claim 19 does not compel the court to append a limitation to the plain-meaning construction of the claim 1 term; indeed, the claim 19 limitation unavoidably, if indirectly, suggests that the court should construe claim 1's terms to be "broader in scope" than the identical terms in claim 19. *Id.*

Nor can the court agree with Nikon that construing claim 1 absent claim 19's limitation would render claim 19 meaningless. As the court understands the relevant claims, the converse is true; if the court were to exclude claim 19's limitation from its construction of claim 1, the two claims would avoid redundancy and retain independent, if interrelated, meaning. If, by contrast, the court were to read claim 19's limitation into claim 1, claim 19 would become superfluous, repeating what claim 1 already says. Neither claim differentiation doctrine nor common sense require the court to read dependent claims into nugatoriness. Specification language for the '500 patent contemplates separate drives moving each stage. *See* '500 Patent at 4:24-56; figs. 1, 2, & 5. Consistent with this specification language, and consistent with the plain meaning

of the claim term, the court construes the phrase "a drive to move the mask stage and the object stage" term to mean "**components used to move the mask stage and to move the object stage.**"

4. "*a reaction force caused by movement of the mask stage and the object stage*"

[85] For similar reasons, the court construes "a reaction force caused by movement of the mask stage and the object stage" to mean precisely what the claim term implies: "**an equal and opposite counterforce spurred by the shifts and vibrations of the mask stage and the object stage.**" Repeating, by implication, its claim differentiation doctrine argument, Nikon asks the court to read "a reaction force ... stage" to mean "a reaction force produced by a motor drive in moving the mask stage and a reaction force produced by a motor drive in moving the object stage." The specification language does discuss "transmitting the reaction forces of the reticle stage mechanism drive motors." *See* Patent '500 at 5:23-31. But this specification language says nothing about motor drives acting specifically on mask or object stages. Read in context, the term "a reaction force caused by movement of the mask stage and the object stage" concerns transference of this operation-related force to the reaction frame. *Id.* at 7:42-59. The "cause[]" of the force is specified by the claim language itself, and the court need not import limitations from elliptically relevant specification language. "[A] reaction force caused by movement of the mask stage and the object stage" should be read consistently with "a drive to move the mask stage and the object stage." Thus, the court construes "a reaction force caused by movement of the mask stage and the object stage" to mean "**an equal and opposite counterforce created by the shifts and vibrations of the mask stage and the object stage.**"

5. "*transferred substantially to the reaction frame*"

[86] It is clear from the specification language that the central aim of the '500 patent invention is the prevention of reaction forces reaching-and thereby negatively impacting-the precision components of the photolithographic projection system. *See* '500 Patent at Abstract. Claim 1's language captures this aim, noting that reaction force is to be "transferred substantially to the reaction frame." The court has already construed the term "reaction frame," reading the phrase to mean "a physical structure, separate and distinct from the structure supporting the precision components, that transfers reaction forces, caused by the movement of a stage drive, away from the precision components." Thus, it remains only to construe "transferred substantially."

Simple etymology suggests that "transferred" connotes the direction to, passage from, or exposure of one item to another. "Substantially," in turn, "means what it says[-] 'largely, but not' " entirely. *See* *Ecolab, Inc. v. Envirochem, Inc.*, 264 F.3d 1358, 1369 (Fed.Cir.2001) (construing the term "substantially uniform"). Taken together, "transferred substantially" denotes precisely what the phrase would mean in common parlance: "the movement or direction of most, but not necessarily all, of a particular entity to another." The court need not venture from this plain meaning here, and the court thus construes "transferred substantially to the reaction frame" to mean "**the movement or direction of most, but not necessarily all, of the reaction force to a physical structure, separate and distinct from the structure supporting the precision components, that transfers reaction forces caused by the movement of a stage drive away from the precision components.**"

6. "*first position detector*" and "*second position detector*"

[87] ASML asks the court to read "first position detector" and "second position detector" with little detail, inserting only an illustrative reference to interferometers and construing "position detector" to mean "a device (such as a interferometer) that measures the position of another object." As the court understands the

relevant technology, ASML's generalized construction is no doubt valid as far as it goes; a "position detector" is a device used to monitor and to determine the position of another object, and interferometers are a variety of position detectors. In the context of the claim language and the patent specification, however, ASML's definition does not go quite far enough. In the '500 patent invention, interferometers are used-and used exclusively-as "position detectors." *See* Patent '500 at 3:21-26. Read in full, claim 1 discusses two position detectors, positing one "position detector" (namely, the "first") as the determiner of the position of the mask stage and another "position detector" (namely, the "second") as the determiner of the position of the object stage. *See* Patent '500 at 7:55-59. The specifications, in turn, describe the precise type of position detectors at issue. "Two interferometry mirrors 14A and 14B located on state 10," the specification language teaches, "interact conventionally with laser beams 16A and 16B." '500 Patent at 3:21-26. Consistent with this description, *see* Vitronics, 90 F.3d at 1582, the court construes the "first" and "second position detector" terms to denote what such a detector is in the lithographic sense, viz., "**a device, constructed of, *inter alia*, a mirror and a laser.**" Claim 1 makes clear that the first such device monitors the mask stage and the second monitors the object stage; that they do so, however, is specified by adjacent portions of the claim text, not the meaning of the "first" and "second position detector" terms alone. Accordingly, the court will refrain from reading in such functional limitations.

B. Claim 4 FN40

FN40. Claim 4 states: "The exposure apparatus of claim 1, further comprising a main frame, dynamically isolated from the reaction frame, which supports the first position detector." *Id.* at 8:1-3.

[88] The parties dispute the meaning of one term used in claim four: "main frame." To a significant degree, Nikon's evaluation of this claim term reiterates an unavailing claim differentiation doctrine argument it raises elsewhere. *See* Transmatic, Inc., 53 F.3d at 1277-1278. Were the court to construe "main frame" only to denote structural support of the first position detector, Nikon seems to assert, claim 9's language would prove broader than the correlative (independent) claim 4 language. *Id.*; *see also* Teletronics, Inc., 857 F.2d at 783-84. But the court cannot agree that the claim 9-claim 4 interrelation invokes the kind of inconsistency Nikon identifies. Claim 9 simply does not depend on claim 4 in a manner that implicates claim differentiation doctrine. *Id.* Rather, both claim 9 and claim 4 depend on claim 1, a claim that does not use the term "main frame" at all. *Cf.* Patent '500 at 2:35-49 (using "main frame" to refer to "precision frame"). For definitional purposes, then, the court can safely assume that claim 4's limitation and claim 9's limitation are not mutually exclusive; i.e., the main frame can do what claim 4 indicates, and it can do what claim 9 indicates as well.

For definitional purposes, moreover, the court need not wrap all other claim or specification limits-whether claim 9-based or not-into the definition of "main frame" in claim 4. The specification language equates the term "main frame" with a "precision frame," particularly a precision frame in the larger photolithographic apparatus. The claim language does, to be sure, discuss the "main frame" supporting the "first position detector," *id.*, but that limitation is adequately imparted by the remaining claim language; it need not be inserted into the meaning of the discrete "main frame" term. Consistent with the intrinsic record and the scope of the parties' dispute, the court construes "main frame" to mean "**a precision frame,**" a term understood by those skilled in the art.

C. Claim 6 FN41

FN41. Claim 6 adds: "The exposure apparatus of claim 4, wherein the exposure device is supported by the

main frame." Id. at 8:6-7. Included in the parties' claim construction charts-but not in their briefs-is a dispute regarding the meaning of "exposure device." Questions regarding this term were not included in the parties' lists of proposed terms and claim elements for construction, and ASML has objected to Nikon's tardy addition of this claim. According to ASML, however, Nikon now agrees that "exposure device" does not require construction. The court finds Nikon's failure to brief construction of "exposure device" indicative of this agreement, and the court refrains accordingly from construing the term.

[89] The parties' dispute the meaning of the term "supported by" as that term is used in claim 6. At the core of the parties' disagreement is the question of whether "supported by" connotes one structure bearing part or all of the weight of another structure or entity or if, by contrast, there is no weight support whatsoever.

Plain meaning offers substantial guidance here. As the court reads the relevant claim language, "supported by" connotes the holding, propping, or bearing of another item, and the language of the specifications is not to the contrary. In no fewer than four places, in fact, the specifications use a form of the word "support" to imply the bearing of weight: "Stage 10" is discussed as "supported on a conventional rectangular base structure," *see* Patent '500 at 3:43-45; "[t]he window frame guide structure" is depicted as "supported on horizontal surfaces of fixed guides 46A and 46B," *id.* at 5:11-14; "[b]ase support structure 80 is supported by its own support pillars or other conventional support elements," *id.* at 5:17-18; and "the photolithography apparatus" is placed on "supporting base structure 100." *Id.* at 6:1-2. Each of these specification sections implies, if not more, that some or all of the weight of one structure or item is borne by another, and ASML's unconvincing attempts to read weight-bearing out of the term are not to the contrary.^{FN42} Consistent with plain meaning, the court finds that "supported by" connotes the bearing of some weight, and the court thus construes the term to mean "**held, propped, or with weight borne by.**"

FN42. In support of its claim construction, ASML discusses a person leaning against a wall: "[I]f a person stands on a floor and leans against the wall," ASML contends, "the floor and the wall both provide support [but][t]he wall ... does not bear the person's weight." As a matter of physics, this is not necessarily correct in every case; depending on a host of variables (e.g., angle of incidence), the wall may in fact bear some of the leaner's weight, particularly if-as in ASML's definition-some of the support is from "below."

V. *The '832 Patent*

The parties dispute the meaning of a number of terms used in six '832 patent claims. These claim terms are addressed separately below.

A. *Claim 1* ^{FN43}

FN43. The claim reads in full:

A method of repetitively imaging, by means of a projection system, a mask pattern present on a mask plate each time on a different sub-area of an area on a substrate arranged on a substrate support, whereby before the mask pattern is imaged on an individual sub-area, this sub-area is accurately positioned with respect to the mask pattern, which positioning comprises global alignment of the substrate with respect to the mask pattern by two alignment marks located in the mask plate outside the mask pattern and at least two substrate alignment marks located on the substrate outside said area, said global alignment being realized by: imaging mask alignment marks and substrate alignment marks onto each other by the projection system; observing the extent of overlap between an alignment mark image and the alignment mark on which the image must

be formed; displacing along a first, X axis and a second, Y axis of a three-axes system of coordinates and rotation about the third, Z axis of the system of coordinates of the mask pattern and the substrate relative to each other until a sufficient degree of overlap is obtained; positioning each individual sub-area with respect to the mask pattern by displacing the substrate and the mask pattern relative to each other from the global-aligned position while measuring the displacement along at least one of said X and Y axis, the rotation about the Z axis and tilts about the X and Y axis of the substrate; and using all measuring results to realize the ultimate positioning of the relevant sub-area in an X-Y plane with respect to the mask pattern.

See '832 Patent at 32:50-33:15.

As the court reads the parties' claim-construction papers, no fewer than 12 terms in the '832 patent claims are in dispute: (1) "substrate"; (2) "substrate support"; (3) "accurately positioned"; (4) "accurately displacing and positioning"; (5) "global alignment"; (6) "globally aligning"; (7) "globally positioned"; (8) "substrate alignment marks"; (9) "onto each other"; (10) "by the projection system"; (11) "displacing ... and rotation ... until a sufficient degree of overlap is obtained"; and (12) "measuring the displacement along at least one of said X and Y axis, the rotation about the Z axis and tilts about the X and Y axis of the substrate." In its claim construction memorandum, Nikon suggests that a pair of additional terms require construction: one, "sub-area of an area" and, two, "at least two substrate alignment marks located on the substrate outside said area." ASML fails to address these claim terms in its opening claim construction brief and in its response to Nikon's opposition. That said, the two latter terms appear in the parties joint claim construction chart, and the court will thus construe all of the putatively disputed terms, however incomplete the adversarial presentation.

Some of the relevant claim terms (e.g., "substrate" and "substrate support") can be grouped analytically for purposes of construction, and where possible, the court will address related claim terms together. Some of the relevant claim terms, moreover, have been construed in the context of other patents (e.g., "substrate" in the context of the '041 patent), and the court will abide those prior constructions where possible and where appropriate as a matter of law.

1. "*substrate*" and "*substrate support*"

[90] A "substrate," the parties agree, is "an item on which a photosensitive layer is formed or placed." As it did in the context of its own patents, Nikon asks the court to read "substrate" to mean substantially more, but Nikon's request is no more convincing here than it was there. "Proper claim construction ... demands interpretation of the entire claim in context, not a single [linguistic] element in isolation," *see* Hockerson-Halberstadt, Inc. v. Converse, Inc., 183 F.3d 1369, 1374 (Fed.Cir.1999), but the purpose of claim construction is not to use any "single [claim] element," *id.*, as a platform on which to describe an entire invention. *Cf.* Teleflex, Inc., 299 F.3d at 1328. As both the claim language and the specifications make clear, a "substrate" is simply "an item on which a photosensitive layer is formed or placed." *See, e.g.*, '832 Patent at 1:59-2:4; 3:18-29; 34:49-56; *see also* *McGraw-Hill Dictionary of Scientific and Technical Terms* (defining "substrate" as, *inter alia*, "the physical material on which [a] microcircuit is fabricated"). Nothing more need-or should-be added to the definition of the predicate term, and the court construes "substrate" to mean **"an item on which a photosensitive layer is formed or placed."**

[91] A definition of "substrate support" closely follows. Plain meaning suggests that "substrate support" connotes a base or structure in some way undergirding the substrate. Specification language generally comports with this plain, if pleonastic, meaning, *see, e.g.*, '832 Patent at 14:18-21, depicting in every

germane embodiment the "substrate support" as the part of the "substrate table"-which itself provides direct and immediate bolstering to the substrate. *See id.* at 9:2-4 ("The substrate is held by a substrate support WC which forms part of a substrate table WT"); figs. 1, 9, & 26. "[E]ssential" to the '832 invention "is that the substrate support is integrated with the mirror block cooperating with the interferometer system." *Id.* at 14:18-21; *see also id.* figs. 9, 13, 17, 25, & 26 (showing an "integrated" mirror block and substrate support). And "essential" to the '832 invention "is that ... the substrate is fixed on this support." *Id.* From this, a definition would seem to flow directly.

According to ASML, however, the specifications teach that the "substrate support" includes particular moving components-namely those that shift with the substrate-and not a monolithic entity. ASML's argument is not entirely untenable, but it is effectively limited to one embodiment, and the court is chary of construing claims to fit single embodiments where the patent as a whole indicates otherwise. *See Digital Biometrics v. Identix, Inc.*, 149 F.3d 1335, 1345 (Fed.Cir.1998). As the court reads the specifications, there is no uniform movement limitation assigned to each disclosed embodiment; indeed, the first figure of the patent portrays a "movable substrate table WT." *See id.* 8:50-9:4; *see also id.* at 12:45-47 (discussing the same). The court thus construes "substrate support" to mean **"the part of the substrate table, integrating the mirror block, on which the substrate is fixed"**

2. "*accurately positioned*" and "*accurately displacing and positioning*"

[92] [93] The parties agree that the words "positioned" (as used in claim 1) and "positioning" (as used in claims 5, 8, 15, 16, and 17) require no court interpretation. The parties also agree that "displacing" (as the word is used in claims 5, 8, 15, 16, and 17) denotes moving or movement. But the parties do not agree regarding the meaning of the adverb "accurately." *See id.* at 2:14 (discussing "very great positioning accuracy" through "satisfactor[y]" alignment); *Abbott Labs. v. Baxter Pharm. Prods., Inc.*, 334 F.3d 1274, 1279 (Fed.Cir.2003). In both the claim overall and in this particular claim term, "accurately" is used to imply a minimum standard, a threshold standard of exactness. Terms like "sufficiently accurate" and "satisfactorily aligned" necessarily connote a baseline of required accuracy, and related aspects of the specification-as well as the parties' own constructions-are in accord. In various parts, in fact, specification language discusses both the proper (i.e., accurate) positioning of a substrate sub-area and the proper positioning of the substrate itself. *See generally* '832 Patent at 2:60-3:9; 13:15-14:17.

[94] The claim language makes clear that proper positioning of a substrate sub-area is the focus of this claim term; that is, a "sub-area" is the entity "accurately positioned with respect to the mask pattern." *Id.* at 32:55-56. The claim language also makes clear that "accurately positioned" references the exactitude with which that sub-area is oriented. *Id.* Consistent with this language, the court construes "accurately positioned" to mean **"locating and situating a sub-area with sufficient exactness relative to the mask pattern."** "Accurately displacing and positioning," in turn, means **"moving, locating, and situating an item with adequate exactness."** FN44

FN44. A like construction is indicated for the word "sufficiently."

3. "*global alignment*," "*globally aligning*," and "*globally positioned*"

[95] [96] [97] Variations of the term "global alignment" appear in three '832 patent claims. In their claim construction memoranda, the parties have not brought the terms of their "global alignment"-related dispute into firm relief, leaving it to the court to divine both the meaning of the claim terms and the contours of the

parties' dispute.FN45 As the term is used repeatedly in the '832 patent, "global alignment" offers a kind of technological counterpoint to "field-by-field" alignment. Where "field-by-field" alignment denotes the process through which individual substrate sub-areas are aligned for exposure, "global" alignment denotes the alignment (i.e., positioning relative to the mask pattern) of the entire substrate form. In this vein, reading "global" to connote "entire" comports with both the plain meaning of the term and the intrinsic evidence.

FN45. To note, ASML construes each usage separately, assailing Nikon's supposed failure to read the terms consistently across claims; Nikon, on the other hand, asserts that ASML has "mistaken" Nikon's position, prompting ASML to omit consideration of both of the parties' two core disputes: one, whether "global alignment" requires the use of substrate alignment marks located on the substrate outside the area containing the sub-areas to be imagined, and, two, whether "global alignment" has the same meaning across all claims.

By reference to the use of prior art, the specifications teach that "[w]ith this system an alignment mark provided in the substrate and an alignment mark provided in the mask outside the mask pattern are imaged on each other and the mutual positions of the marks are determined." *See* '832 Patent at 2:9-12. "Initially," the specifications add, "two and possibly several further substrate alignment marks outside the substrate area which must be repetitively illuminated with the mask pattern are aligned This alignment is known as the global alignment." *Id.* at 2:20-25; *see also* Exh. 2 at 264 (April 5, 1993, prelim. am.) ("Global alignment means that two or more alignment marks at the edge of the substrate are aligned relative to corresponding marks on the reticle."); '832 File History, Am., March 20, 1998, p. 4. Against this intrinsic evidence, Nikon's contention that this tardily-added claim requires the court to confine the relevant type of alignment to that of sub-area components is unconvincing. "Global alignment," the claim notes, is "realized" through

imaging mask alignment marks and substrate alignment marks onto each other by the projection system; observing the extent of overlap between an alignment mark image and the alignment mark on which the image must be formed; displacing along a first, X axis and a second, Y axis of a three-axes system of coordinates and rotation about the third, Z axis of the system of coordinates of the mask pattern and the substrate relative to each other until a sufficient degree of overlap is obtained; positioning each individual sub-area with respect to the mask pattern by displacing the substrate and the mask pattern relative to each other from the global-aligned position while measuring the displacement along at least one of said X and Y axis, the rotation about the Z axis and tilts about the X and Y axis of the substrate; and using all measuring results to realize the ultimate positioning of the relevant sub-area in an X-Y plane with respect to the mask pattern.

See '832 Patent at Claim 1. This claim is as cumbersome as it is long, and it is at least slightly misleading to imply, as the claim does, that "global alignment" involves all five of the steps listed. Global alignment, in fact, is "realized" in the first three steps—a fact suggested, albeit inexpertly, in the articulation of step four: "... positioning each individual sub-area with respect to the mask pattern by displacing the substrate and the mask pattern relative to each other *from the global-aligned position*" *Id.* The position could not be already "global-aligned," of course, if the process of global alignment were not complete. Nothing in this claim language necessarily posits sub-area-specific alignment as the definitive aspect of "global" alignment; rather, the claim sloppily adds two field-by-field steps to a recitation of a distinct realization process. It is poor claim drafting, but it does not change the meaning of the predicate "global alignment" term.

Throughout the patent, the term "global alignment" refers to the positioning of the entire substrate, not to "each individual sub-area" on that substrate. *See* Vitronics, 90 F.3d at 1583. This is what global alignment

has long meant to those of ordinary skill in the art, regardless of the cognomen affixed to the step-by-step process articulated in the claim. Consistent with conventional usage and the intrinsic record, the court construes "global alignment" to mean **"the initial positioning of the entire substrate according to substrate alignment marks,"** "globally aligning" to mean **"the process or act of positioning of the entire substrate according to substrate alignment marks,"** and "globally positioned" to mean **"situated or located by reference to the entire substrate."**

4. "*substrate alignment marks*"

[98] The parties dispute regarding the phrase "substrate alignment marks" centers on whether the marks referenced in one portion of the claim text are the same marks referenced three lines earlier in the same claim. Before the court can assess whether the two pairs of marks are actually the same pair of marks, though, it is necessary to determine what "substrate alignment marks" are. Both parties submit largely self-evident definitions of "substrate alignment marks," construing the term as "alignment marks associated with the substrate" (in ASML's terms) and marks "disposed on the substrate" (in Nikon's). Leaving this circularity aside, throughout the specification, "substrate alignment marks" are described as those markers or symbols, positioned on the outer edge of a substrate, used to coordinate the location of the substrate with the mask pattern. *See* '832 Patent at 2:20-24; 9:30-34. Nothing in the claim language controverts this description, and the court thus reads "substrate alignment marks" to mean **"markers or symbols, positioned on the outer edge of a substrate, used to coordinate the location of the substrate with the mask pattern."**

Nor does anything in the claim language or the specifications indicate that the first-referenced pair of alignment marks need be one-and-the-same with the second-referenced pair of marks. To demonstrate that the referenced marks are but one pair, Nikon points to two specification sections, arguing that these sections "explicitly state[] that these are the marks by which 'global alignment' is realized." *See id.* at 33:57-61 ("... global alignment of the substrate ... by two alignment marks in the mask plate and at least two substrate alignment marks located on the outside said area"); *id.* at 32:61-64 ("... global alignment ... realized by ... substrate alignment marks ..."). These sections do state that the "substrate alignment marks" are the marks by which global alignment is realized. *See id.* It does not necessarily follow, however, that the claim plainly states that the two pairs of substrate alignment marks are the same pair. The "said global alignment" phrase denotes nothing in particular about the marks at issue, "antecedent basis" or otherwise; at most, the phrase proves a grammatical antecedent to another use of the "global alignment" term. *Cf.* *Abtox, Inc. v. Exitron Corp.*, 122 F.3d 1019, 1023-25 (Fed.Cir.1997). Further, nothing in the specification or the claim language demands that there be but one pair of "substrate alignment marks." Intrinsic evidence suggests that "substrate alignment marks" means **"markers or symbols, positioned on the outer edge of a substrate, used to coordinate the location of the substrate with the mask pattern."** With the caveat that the marks referenced at column 32, lines 60-61 need not be the same marks discussed at lines 63-64 of the same column, the court construes the term accordingly.

5. "*onto each other*"

[99] Read in context, the pertinent claim language discusses the "imaging [of] mask alignment marks and substrate alignment marks onto each other by the projection system." Specification language suggests that "onto each other" means to be placed with a substantial degree of overlap. *See* '832 Patent at 10:20-43. In so suggesting, the specification language implies that the imaging can occur in a unidirectional manner; i.e., the first pair of marks *and* the second pair of marks need not both be imaged onto the other so long as one pair is so imaged onto the other. *Id.* Congruent with this intrinsic evidence, the court thus construes "onto each other" to mean **"projecting mask alignment marks and substrate alignment marks to a substantial**

degree of overlap."

6. "*by the projection system*"

[100] The parties' dispute regarding the term "by the projection system" reduces to whether the term "projection system" is synonymous with the entire "projection apparatus" or whether it is limited to "optics in the same projection lens system that is used to repetitively image the mask pattern on different sub-areas of the substrate." Nikon argues that reading "projection system" to denote the full projection apparatus would "render meaningless the very limitation" that the court has been asked to construe; since the projection apparatus is understood to host all of the steps in the alignment process, and since the claim term uses the prepositional phrase "by the projection system" to modify the "imaging" step specifically, Nikon notes, "the projection system" must denote something narrower and more limited than the entire projection apparatus.

The specifications support Nikon's contention. In at least two places, specification language distinguishes between the "projection lens system" and the larger "projection apparatus" of which the "lens system" is a part. *See* '832 Patent at 12:19-23; 16:19-24. In no fewer than four places, moreover, the specification language identifies the "projection lens system" as the entity that performs the imaging at issue in the claim. *See id.* at 1:23-25; 2:16-19; 9:63-68; 11:24-28. And in one notable place, the preamble to claim 1 emphasizes that the five projection steps are to be performed at a particular chronological point (*viz.*, "before the mask pattern is imaged"), not that the "projection system" term is coterminous with the complete "projection apparatus." Nothing in this intrinsic evidence proves "projection system" synonymous with the whole projection apparatus. In fact, the specifications use the term " *a* projection apparatus"-with a notably indefinite article-to discuss repetitive imaging, not the definite article "the" such that a singular and comprehensive apparatus would be indicated. *See id.* at 32:31 (emphasis added); 32:30-35. Consistent with the specification language, the court construes "by the projection system" to mean "**by optics in the projection lens system used to image the mask pattern.**"

7. "*displacing ... and rotation ... until a sufficient degree of overlap is obtained*"

[101] According to Nikon, this claim term raises four areas of dispute: one, whether this putative "step" in the process requires the alignment of only one alignment mark or the alignment of at least two such marks; two, whether the systems of coordinates are simply the substrate and the mask pattern moving relative to the other; three, whether the claim recites specific movements; and, four, whether "sufficient degree of overlap" means "to a degree sufficient to provide acceptable global alignment." ASML suggests that the question is far simpler, asking only whether the claim term "mean[s] what it says." As should be obvious, the court believes that it does. "Displacing" is, in this context, used to mean what plain language would indicate—namely, moving or readjusting—and neither party suggests otherwise. In a like vein, the term "sufficient degree of overlap" has a meaning accessible to those of ordinary skill in the art. "[S]ufficient" connotes a quantitative measure reaching a degree adequate to permit the achievement of a particular act or thing; "degree of overlap," in turn, means the extent of alignment mark mapping achieved. Put together, "sufficient degree of overlap" means "**an adequate amount of alignment mark mapping or correlation such that the alignment can be accurately achieved.**" Nothing in this particular claim term demands movement of the three axes, and nothing in this particular claim term implicates the putative need to avoid using sub-area alignment marks on the substrate. FN46 Nikon's far more elaborate construction is not completely incorrect, but it is not entirely persuasive. The claim text does not, for example, demand that "each of the ... alignment marks" align; and even if the claim text does not *preclude* such multi-mark alignment, it definitely does not *mandate* it, either.

FN46. By contrast, sparing no detail, Nikon asks the court to construe the claim term to mean "moving the mask pattern and the substrate relative to each other until each of the respective mask/substrate alignment mark images and each of the mask/substrate alignment marks on which the images are formed have a positional relationship that is sufficient to avoid the need for using any sub-area alignment marks on the substrate. The movement includes displacement along a first X axis and a second Y axis of a three-axes system of coordinates and rotation about a third Z axis of the system of coordinates." As the court reads Nikon's effort, at least three aspects of its construction are valid: One, the concluding sentence is relatively consistent with the claim text, for the movement implied in the claim text does "include[] displacement along the first X axis and a second Y axis of a three-axes system of coordinates"; indeed, this is almost precisely what the claim says. *See* '832 Patent at 33:1-5 ("displacing along a first, X axis and a second, Y axis of a three-axes system of coordinates and rotation about the third, Z axis of the system of coordinates of the mask pattern and the substrate relative to each other until a sufficient degree of overlap is obtained"). Two, Nikon's construction adequately captures the type of movement denoted in the claim; it is, as Nikon notes, the mask pattern and substrate that move relative to each other. And, three, Nikon's construction correctly depicts the location of the movement contemplated by the claim, viz., along the X and the Y and rotation around the Z axes. *Id.* But much of Nikon's proposed phraseology attempts to import limitations found nowhere in the claim itself, and the court will not adopt it in full.

8. "*measuring the displacement along at least one of said X and Y axis, the rotation about the Z axis and tilts about the X and Y axis of the substrate*"

[102] The parties agree that this claim term refers to the measurement of displacement, rotation, and tilts along the relevant axes, the measured displacements found along either the X or the Y axes, the measured rotation found about the Z axis, and the measured tilts registered about the X and Y substrate axis. ASML believes that the court need not investigate further, construing the claim as simply a "step of a method claim." To the extent that ASML argues that no limitations appear in the claim text, the court agrees.

[103] [104] But to the extent that ASML asserts that the court need not investigate further, the court cannot agree. The Federal Circuit has long noted that "claim language [must be] limited based on a feature that was described as essential to the invention." *See Sunrace Roots Enter. Co., Ltd. v. SRAM Corp.*, 336 F.3d 1298, 1305 (Fed.Cir.2003). Where specification language identifies an essential claim feature, and where the embodiments uniformly disclose that feature, the feature proves a required limitation of all the relevant claims. *See, e.g., ATD Corp. v. Lydall, Inc.*, 159 F.3d 534, 542 (Fed.Cir.1998); *Gentry Gallery, Inc. v. The Berkline Corp.*, 134 F.3d 1473, 1478-80 (Fed.Cir.1998). In this instance, specification language identifies an essential claim feature, and the embodiments uniformly disclose that feature; thus, the court must apply the attendant limitation. A seminal aspect of the '832 invention is the enhanced accuracy with which substrate and mask position can be determined by interferometer use. *See* '832 Patent at 3:35-40. "[I]ntegrated" with the interferometers is a block of mirrors, a block unequivocally described in the specifications as "[a]n essential condition and an important aspect of the present invention." *Id.* at 4:39-50; 14:18-21. This mirror block is consistently depicted in the embodiments as the art's method of measurement, *see, e.g., id.* at figs. 7-9 & 25-26, and this mirror block is uniformly described as part of the structure serving as substrate support. *Id.* In such a context, Federal Circuit doctrine directs the court to apply a limitation to an otherwise unlimited claim term. *See Sunrace Roots*, 336 F.3d at 1305. For this reason, the court construes "measuring ... of the substrate" to mean "**determining and quantifying, by means of interferometers with an integrated mirror block, movement along either the X or Y axis or both, rotation around the Z axis,**

and tilts about the X and Y axes of the substrate."

9. "sub-area of an area" and "at least two substrate alignment marks located on the substrate outside said area"

[105] [106] Both of these claim terms permit straightforward construction. In important part, claim 1 discusses the presence of "at least two substrate alignment marks located *on the substrate outside said area*." '832 Patent at 32:60-61 (emphasis added). That is, claim 1 expressly contemplates a region "on the substrate" "outside" of and distinct from the "area." Were "area" to include the entire substrate (as ASML contends), claim 1's language would be self-contradictory and self-defeating; for "at least two substrate alignment marks" to be located "on the substrate" but "outside said area" demands that the "substrate" and the "area" be less than fully coextensive. The parties agree that a "sub-area" is a portion of a substrate on which a mask pattern is exposed, and consistent with this logical and linguistic truism, the court construes "sub-area of an area" to mean **"a distinct portion of a larger portion of a substrate, which is to be imaged with a pattern."**

For like reasons, the court construes "at least two substrate alignment marks located on the substrate outside said area" to mean **"two or more 'substrate alignment marks' positioned on a substrate outside the substrate portion on which a pattern is to be exposed"** Specification language supports this conception of "area" and "sub-area," *see id.* at 2:20-25 (placing the marks "outside the substrate area which must be repetitively illuminated with the mask pattern"), as do relevant figures. *Id.* at fig. 1.

B. Claims 5, 8, 15, 16, and 17

Many of the terms construed above (e.g., "substrate," "global alignment") appear in more than one claim. After reviewing the claim language and the intrinsic evidence, the court discerns no reason to depart from the claim 1-based constructions. The court adopts those constructions vis-a-vis claims 5, 8, 15, 16, and 17 accordingly. A handful of claim terms remain to be construed, and each is addressed separately below.

1. "substrate table" (claim 16)

[107] Echoing language used throughout the patent claims, claim 16 discusses a "substrate table with a substrate support." Since the court has already defined "substrate support" as "the part of the substrate table, integrating the mirror block, on which the substrate is fixed," the court need only determine the meaning of "substrate table" as a discrete term. Plain meaning suggests that "substrate table" connotes a base or structure on which the substrate sits. The specifications are generally in accord with this plain meaning, *see, e.g.,* '832 Patent at 9:2-4, depicting the "substrate table" in every embodiment as an assembly of components-e.g., the substrate support-moved by the X, Y, and (ϕ)Z drives. *See id.* ("The substrate is held by a substrate support WC which forms part of a substrate table WT"); figs. 1, 9, & 26. The court need not depart from the lessons of this intrinsic evidence, and the court thus construes "substrate table" to mean **"a base assembly of components moved by the X, Y, and (ϕ)Z drive."**

2. "reference" (claims 5, 8, 15, 16, and 17)

[108] At a basic level, the parties agree that "reference" denotes a "position." ASML suggests that "reference" denotes "a position or item (other than the object) relative to which displacement can be measured"; Nikon, by contrast, reads "reference" to mean a "position defined in a coordinate space, from which the object/substrate is displaced and positioned relative thereto." The court cannot accept either

definition as offered, and it finds that a person of ordinary skill in the art would understand "reference," as it is used in this context, to denote a basis of comparison. The specifications are not to the contrary. In various places, the patent uses "reference" to describe four positions: the initial position determined by global alignment, the position of the projection lens system, the position of the mask, and the position of location-related stationary mirrors. *See, e.g.*, '832 Patent at 3:23-27; 18:9-13. Throughout the patent, usage of "reference" is invariably comparative and positional, assessing one thing relative to another and pegging the location of one item with respect to a second item. *Id.* Nothing in the intrinsic evidence supports Nikon's attempt to limit "reference" to positional definition in "a coordinate plane," and nothing in the claim language suggests the court need read in claim terms (*viz.*, "object") found elsewhere in the relevant claims. Consistent with plain meaning and the specification, the court construes "reference" to mean **"a position or item relative to which displacement, location, or both can be measured."**

3. "object holder forming part of and being supported in an object stage" (claims 5, 8, 15, 16, and 17)

[109] The parties agree that the object holder (or "support") is part of the object stage, and they agree, too, that the object holder "holds" the object. The parties also agree, without equivocation, that "object" in this context means "substrate." In its opening claim construction memorandum, ASML avers that the parties also agree that the term "object" requires no interpretation and that the "object holder (or support) is moved by at least portions of the X, Y, [and] (ϕ)Z drive"; in its opposition memorandum, however, Nikon contends that "object" requires court construction for claims 16 and 17.

[110] It is by now axiomatic that claim terms should possess equivalent meanings across claims wherever possible. This is particularly true where, as here, the claim term is concomitantly generic and accessible to ready explication. The parties agree that "object" requires no construction in the context of claims 5 and 15, and the court finds that it requires no construction in the context of claims 16 and 17, either. When read closely, Nikon's citations to portions of the claims themselves are not to the contrary. The opening phrase of claim 5 (a claim in which the parties agree "object" requires no interpretation) begins, "[a] device for accurately displacing and positioning an object with respect to a reference" *See* '832 Patent at 27-28. Echoing this phrasing verbatim, claim 16 reads in pertinent part, "a device for accurately displacing and positioning an object with respect to a reference" *Id.* at 34:57-59. This linguistic coincidence is telling; it both undercuts Nikon's claim that the "object" term is used differently between the patent claims and counsels like construction of the term across these claims. Mindful as the court is that context helps define claim terms, *see* *Pitney Bowes*, 182 F.3d at 1311, the court is equally mindful that claim terms must carry meaning independent of the context in which they appear. As "object" is used in all of the relevant claims, the term carries common meaning, a meaning the parties agree requires no explication.

The remainder of the parties' dispute centers on the meaning of "object holder." Plain meaning suggests that "object holder" connotes a base or structure constructed to bear a particular object. The specifications generally support this plain, if circular, meaning, *see, e.g.*, '832 Patent at 4:62-64, and the specifications depicts "the substrate support [a]s displaceable across the upper face 307 by means of a positioning device which is provided with linear motors 301, 311 and 312." *Id.* at 32:1-7; fig. 26. In this context, the object holder is the step-wise displaceable entity about the top surface of the table. *Id.* To function properly, the linear drive system requires connection to both the stage base and the object holder by the X, Y, and (ϕ)>>>>>>Z drives; in this, the object holder is indeed connected to the linear drive. Consistent with this lesson, the court construes "object holder forming a part of and being supported in an object stage" to mean **"a base assembly of components, holding an object, moved by the X, Y, and (ϕ)Z drives and constituting a portion of the object stage."**

4. "interferometer mirrors comprising reflecting side surfaces of the object holder and the interferometer mirrors thereby being stationary with respect to the object" (claims 5, 8, 15, 16, and 17)

[111] The claim language expressly states that interferometer mirrors "compris[e] reflecting side surfaces of the object holder." To some extent, the court believes that this claim text signals that the mirrors cannot be separate structures fastened to the object holder. As the word is used in the claim text, in fact, "comprise" denotes something akin to "included in," "made up of," or "constituting," and the use of that specific term is telling here. *See, e.g., Georgia-Pacific Corp. v. United States Gypsum Co.*, 195 F.3d 1322 (Fed.Cir.2000) ("The transitional term 'comprising' ... does not exclude additional, unrecited elements or method steps."). Instructive portions of the specifications buttress this understanding. In pertinent part, the specifications teach that the substrate support and mirror block are "integrated," uniformly depicting a single device performing the relevant functions. *See* '832 Patent at 4:39-51; 14:18-22; figs. 25-26. ASML attempts to explain away this type of "integrat[ion]," arguing that the specification language merely emphasizes the importance of fastening the mirrors to the support, not that the two need be melded into one component. *See Epcos Gas Systems, Inc. v. Bauer Compressors, Inc.*, 279 F.3d 1022, 1030 (Fed.Cir.2002) (interpreting "integrated" to "connote[] physical combination"). Nothing in the specifications directly supports ASML's construction, and the prosecution history runs largely the other way, defining "interferometer mirrors" as those "constituted by reflective side faces of an object holder" and as "formed by reflecting side surfaces." *See* Exh. 2, pp. 266 & 302 (emphasis added); *cf.* Exh. 3 (discussing mirrors "fixed to" the surface). The parties do not contest that an interferometer mirror is a mirror capable of reflecting interferometer light and stationed with respect to an object. From this, and from the foundation of the intrinsic evidence, the court construes "interferometer mirrors comprising reflecting side surfaces of the object holder and the interferometer mirrors thereby being stationary with respect to the object" to mean **"mirrors, constituted by or integrated with the reflecting side surfaces of the object holder, and stationary with respect to an object, capable of reflecting interferometer light."**

5. "each sub-area of an object surface can be accurately and directly positioned with respect to the reference without the use of additional alignment means for each sub-area"

[112] [113] The parties dispute two portions of this claim: "sub-area of an object surface" and "without additional alignment means." The first dispute is hardly significant, and it can be readily resolved with quick reference to plain meaning and the intrinsic record; "sub-area of an object surface" means **"a portion less than the complete surface of an object."**

[114] By comparison, the second dispute is not so easily resolved. Nikon argues that the phrase "without additional alignment means" is, in context, fatally vague and indefinite, largely because there is no antecedent basis in the claim such that the court can determine the predicate (as opposed to the "additional") alignment means. *See* 35 U.S.C. s. 112, para. 2. As the Federal Circuit has interpreted it, section 112, para. 2 applies only where claim language is "insolubly ambiguous[] and [where] no narrowing construction can properly be adopted." *See Exxon Research*, 265 F.3d at 1375 (adding that courts must attempt to construe all claims "amenable to construction, however difficult that task may be"). Though the claim language at issue is ungainly, no "insolubl[e] ambigu[ity]" precludes the court from crafting a reasonable narrowing construction; indeed, the term "each sub-area of an object surface can be accurately and directly positioned with respect to the reference without the use of additional alignment means" can be construed as readily as any number of other terms at issue in this action. Read as a whole, for example, the claim term provides context-and, indeed, an antecedent-for the "additional means" cited; even without explicit citation to the preceding "reference" or "global alignment" terms, the claim term plainly references an alignment means

already described, making the language both "amenable to construction," Exxon Research, 265 F.3d at 1375, and adequately definite to notify "the public of the [scope of the] patentee's right to exclude." S3 Inc., 259 F.3d at 1371-72 (alteration in original; citation omitted). As a result, section 112, para. 2 does not control.

[115] But section 112, para. 6 does control, just as the parties seemed to agree until mid-2003. The claim term uses the word "means," giving rise to a rebuttable presumption that section 112, para. 6 does apply. The relevant claim term also lacks conventional meaning in the art, and the language of the claim is more descriptive than structural, confirming that section 112, para. 6 should apply *See* Altiris, 318 F.3d at 1375; Sage Prods., Inc. v. Devon Indust., Inc., 126 F.3d 1420, 1427 (Fed.Cir.1997). The court recognizes, of course, that this claim is not a paradigmatic means-plus-function claim: It only obliquely references the art's core function; it uses "means" in an imprecise way; and it operates almost as a negative disclaimer, not as a precise limitation of the function of the invention. *Cf.* Valmont Indus., Inc. v. Reinke Mfg. Co., Inc., 983 F.2d 1039, 1042 (Fed.Cir.1993) (noting that section 112, para. 6 operates to "restrict[] the scope of the literal claim language") (citation omitted). As its long acquiescence in the application of section 112, para. 6 to this claim indicates, however, Nikon has proffered nothing that compels the court to ignore the applicable section 112, para. 6 presumption. *Cf.* Altiris, 318 F.3d at 1375; Sage Prods., Inc. v. Devon Indust., Inc., 126 F.3d 1420, 1427 (Fed.Cir.1997). The court thus reads the claim term according to section 112, para. 6, reading the claimed function to be "alignment" and the corresponding structure to be "individual alignment marks for each sub-area of the object" as depicted at C13/L51-C14/L17. Thus, the phrase is construed to mean that **"each object sub-area can be positioned directly and with sufficient exactness with respect to the reference without the use of additional alignment means for each sub-area."**

6. "sixth, reference, axis" (claims 8 and 17)

[116] The parties agree that the term "sixth, reference, axis" denotes an interferometer beam. Nikon asks the court to append the term "that is used to correct the measuring errors of the other five measuring axes caused by changes in ambient pressures" to its construction; ASML asserts that the court can simply construe the term in counterpoint to the other five axes.

Nikon may well be correct that the "sixth, reference, axis" operates to correct the errors of the five other measuring axis. But nothing in the relevant claim language advises the court to adopt this function-related limitation, *see, e.g.*, '832 Patent at 33:59-61 (reading "the interferometer system has a sixth, reference, axis whose measuring beam cooperates with a stationary reflector"), and the court sees no reason to ignore the simpler, more discrete plain meaning of the claim term. As it is used in the claim text, "sixth, reference, axis" denotes **"an interferometer beam other than the five measuring axes."** The court construes the claim term to mean precisely that.

7. "measuring beam cooperates with a stationary reflector" (claims 8 and 17)

[117] At the core of the parties dispute regarding "measuring beam cooperates with a stationary reflector" is the meaning of the term "cooperates." Read in context, "cooperates" connotes that the measuring beam and the stationary reflector are working, in some fashion, in tandem. That the two work together is clear, yet *how* or *to what end* they work together is generally unspecified in the claim text and in the relevant specifications. *See* '832 Patent at 25:58-61 ("... a sixth axis which is used as a reference along which a beam extends which cooperates with a fixedly arranged mirror."). The parties have provided no valid reason to depart from the plain meaning of "cooperates," and the court thus construes "measuring beam cooperates with a stationary reflector" to mean **"measuring beam operates or works in tandem with a stationary reflector."**

8. "interferometer system comprising a first and second interferometer unit, each unit comprising ... a separate interferometer beam splitter ... and a plurality of detectors equal to the number of measuring axes" (claim 15)

[118] The claim language lists a "separate interferometer beam splitter" in the catalog of items each interferometer unit includes, and the parties do not seem to dispute the meaning of "beam splitter" or "interferometer." Instead, the parties seem to dispute whether each unit must have its own beam splitting apparatus or, by contrast, whether the splitters can be shared among more than one interferometers. As a threshold matter, the plain claim language makes clear that "each unit" includes a " *separate* " splitter, and nothing in the specifications contradicts this indication. *See* '832 Patent at 7:10-13 (discussing a "plurality" of splitters). In addition, the prosecution history discusses a plurality of beam splitters, reinforcing, if indirectly, the notion that each interferometer unit possesses a separate and independent beam splitting mechanism. *See* '832 Appl. 08/437, 490, amend. May 6, 1996, July 5, 1996, and March 10, 1997. During the prosecution of the patent, in fact, ASML distinguished prior art by referencing a "condition" precisely relevant here, viz., that the present invention uses a separate beam splitter for each unit. *Id.* Guided by the intrinsic record and the limits of the parties' disagreement, the court construes the claim term to mean "**an interferometer beam splitter distinct and unique to a particular unit.**" Since plain language and related claim terms adequately denote the type and nature of the "measuring axes" listed, the court need not import redundancy into the construction of otherwise comprehensible claim terms. And since the parties do not contest the meaning of the surrounding claim terms (e.g., "interferometer system," "plurality of detectors"), the court will not discuss them here.

CONCLUSION

For the foregoing reasons, the court construes the disputed claims in the manner described above.

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