IN THE UNITED STATES DISTRICT COURT

FOR THE DISTRICT OF OREGON

PORTLAND DIVISION

RICKY D. HANGARTNER,

Plaintiff,

v.

INTEL CORPORATION,

Defendant.

No. 3:14-cv-00141-MO

OPINION AND ORDER

MOSMAN, J.,

Plaintiff Ricky Hangartner brings this action against Defendant Intel Corporation alleging infringement of United States Patent No. 6,463, 422 (the '422 Patent). Dr. Hangartner alleges Intel sells processors that incorporate circuitry and techniques disclosed in Claim 1. Intel denies infringement and counterclaims that the '422 Patent is invalid.

Dr. Hangartner and Intel dispute the meaning of nine phrases in Claim 1. The parties filed initial and responsive claim construction memoranda and the court held a claim construction hearing on November 17, 2014. Based on the parties' evidence, memoranda, and the argument of counsel, I issued a brief Opinion and Order setting forth my construction of the nine disputed phrases on November 20, 2014. This explanatory opinion discusses how I applied the governing claim construction standards to the phrases to arrive at these constructions.

CLAIM CONSTRUCTION STANDARDS

The court is charged with determining the meaning of ambiguous claim language as a matter of law. *Markman v. Westview Instruments, Inc.*, 517 U.S. 370, 372 (1996). ("[T]he

construction of a patent, including terms of art within its claim, is exclusively within the province of the court."). When an ambiguity arises, the court must assign the term the meaning that it would have "to a person of ordinary skill in the art in question at the time of the invention." *Phillips v. AWH Corp.*, 415 F.3d 1303, 1312 (Fed. Cir. 2005). This approach is intended to create an "objective baseline from which to begin claim interpretation." *Id.* at 1313. "In the end, the court's ultimate goal is to construe the disputed terms in a manner consistent with the way the inventor defined them and a person of ordinary skill in the art would understand them." *Skedco, Inc. v. Strategic Operations, Inc.*, No. 03:13-cv-00968-HZ, 2014 WL 4385752, at *5 (D. Or. Sept. 3, 2014).

Construing a disputed term as a person of ordinary skill in the art would understand it requires the court to review multiple sources of evidence, both intrinsic and extrinsic to the patent itself. *Vitronics Corp. v. Conceptronic, Inc.*, 90 F.3d 1576, 1586 (Fed. Cir. 1996). Intrinsic evidence encompasses the words of the claim themselves, the patent specification, and those portions of the patent prosecution history entered into evidence. *Id.* The court considers extrinsic evidence only when it is otherwise insufficient to resolve the ambiguity. *Id.* at 1583.

Some of these sources of evidence are "more valuable than others." *Phillips*, 415 F.3d at 1324. The claim language itself contains the most valuable evidence of its own meaning. *Vitronics*, 90 F.3d at 1582 ("First, we look to the words of the claims themselves…to define the scope of the patented invention.") There is a "heavy presumption" that these words carry their "ordinary meaning," as observed "through the viewing glass of a person skilled in the art." *Johnson Worldwide Assocs., Inc. v. Zebco Corp.*, 175 F.3d 985, 989 (Fed. Cir. 1999); *Ferguson-Beauregard/Logic Controls v. Mega Sys., LLC*, 350 F.3d 1327, 1338 (Fed. Cir. 2003).

Beyond the plain language of the claims, the patent specification is always "highly relevant" and often dispositive to the proper construction. *Vitronics*, 90 F.3d at 1582 ("[I]t is the

single best guide to the meaning of a disputed term."). The purpose of the patent specification is to teach and enable those skilled in the art to make and use the invention, along with the best method for doing so. *Cyber Acoustics, LLC v. Belkin Int'l., Inc.*, No. 3:13-cv-01144-SI, 2014 WL 1225198 (D. Or. Mar. 24, 2014), quoting *Phillips*, 415 F.3d at 1323. The inventor can use the specification to describe the invention in a number of ways, such as describing different "embodiments" of the invention and by assigning particular meanings to specific claim language. *Metabolite Lab., Inc. v. Lab. Corp. of Am. Holdings*, 370 F.3d 1354, 1360 (Fed. Cir. 2004); *Phillips*, 415 F.3d at 1316. In the first instance, the embodiments serve as illustrative examples of the invention claimed. *Phillips*, 415 F.3d at 1323 ("One of the best ways to teach a person of ordinary skill in the art how to make and use the invention is to provide an example of how to practice the invention in a particular case."). In the second instance, the inventor clarifies that he or she intends the claim language to carry a specific meaning in contravention to the meaning it would otherwise possess. *Id.* In these cases, "the inventor's lexicography governs." *Id.* at 1316.

Finally, the prosecution history, which contains the record of the proceedings before the Patent and Trademark Office, informs the analysis into what a person skilled in the art would understand the term to mean. *Vitronics*, 90 F.3d. at 1582–83. The prosecution history becomes useful where it "provides evidence of how the PTO and the inventor understood the patent." *Phillips*, 415 F.3d at 1317. However, this evidence is less valuable in that it represents the "ongoing negotiation" between the inventor and the PTO. *Id.* The final result of that negotiation, the patent itself, provides better evidence of the claim's intended meanings at the time the patent issued. *Id.*

Taken together, "[t]he claims, specification and file history, rather than extrinsic evidence, constitute the public record of the patentee's claim, a record on which the public is

entitled to rely." *Vitronics*, 90 F.3d.at 1583. This intrinsic evidence forms the basis of the claim construction analysis below. As I find it is sufficient to resolve the ambiguities in the claim language, I need not resort to the use of extrinsic evidence. *Id.*

DISCUSSION

I. Overview of the '422 Patent

The '422 Patent discloses a computing system that uses random numbers, or boolean values, to solve extremely difficult computing problems. The overall computing system is comprised of a number of subsystems whose functions are coordinated as follows: One subsystem generates random numbers that act as proposed solutions to the problem; another subsystem tests the random numbers against the problem; and another creates feedback as to the result of this test. The '422 Patent discloses this overall system in ten claims, but only the subsystem that generates the random numbers is at issue in this suit. This "nondeterministic" subsystem is described in Claim 1, which reads:

"A nondeterministic logic circuit for generating random boolean values of one or more variables as a proposed solution to a computing problem expressed in conjunctive normal form as one [or] more clauses in said one or more variables, the logic circuit comprising:

> one nondeterministic logic element for generating a respective random boolean value for each one of the said one or more variables; and
> each nondeterministic logic element comprising:
> a cross coupled pair of transistor inverter circuits;
> means for controlling power to the cross-coupled pair of transistor inverter circuits; and
> means for equalizing charge on the gates of the transistor inverter circuits while power is removed from the cross-coupled pair, thereby driving the cross coupled pair to an unstable equilibrium, whereby intrinsic circuit noise will cause the cross-coupled pair to randomly assume one of two stable states when power is restored to the cross coupled pair, the stable state assumed by the cross coupled pair providing a probabilistically selected random boolean value

and further comprising common synchronization means coupled to all of the nondeterministic logic elements for synchronizing operation of the nondeterministic logic elements."

The preamble sets forth the type of invention claimed: here, a "nondeterministic logic circuit for generating random boolean values." It ends by introducing a list of components that form the logic circuit ("the logic circuit comprising:"). The remainder of claim 1 consists of three paragraphs, each providing detailed information about the components of the logic circuit. The first paragraph following the colon, herein referred to as paragraph 1, indicates the logic circuit is comprised of "one nondeterministic logic element … for each one of the said one or more variables" in the computing problem to be solved. The subsequent paragraph, herein referred to as paragraph 2, indicates each of the nondeterministic logic elements is itself comprised of three separate components. The last paragraph in the claim, herein referred to as paragraph 3, indicates the logic circuit is "further comprising" of a "common synchronization means coupled to all of the nondeterministic logic elements for synchronizing operation of the nondeterministic logic elements." Thus at a high level, the claim indicates Dr. Hangartner's invention consists of a logic circuit containing at least one logic element, itself comprised of three separate components, as well as a means of synchronizing each of the logic elements contained within the circuit.

II. Claim Construction

A. Minimum Number of Logic Elements in the Circuit

The primary issue of claim construction is whether claim 1 should be construed to require multiple logic elements within the circuit, or whether a single logic element suffices. Dr. Hangartner argues a logic circuit containing one logic element is sufficient. Intel disagrees, arguing only those circuits containing multiple logic elements fall within the scope of the claim. Both parties consider this claim construction issue to be dispositive of the underlying infringement dispute.

The claim construction analysis begins with the examination of the words of the claim themselves. *Vitronics*, 90 F.3d at 1582. Rather than reading each of the nine disputed phrases in isolation, reading the claim as a whole reveals an internal inconsistency that warrants further construction. Specifically, Dr. Hangartner's use of singular nouns in paragraph 1 is in tension with his use of plural nouns in paragraph 3. That is, he describes a single logic element in paragraph 1 ("one nondeterministic logic element") but pluralizes "logic elements" twice in paragraph 3 when describing the circuit's synchronization means ("and further comprising common synchronization means coupled to all of the nondeterministic *logic elements* for synchronizing operation of the nondeterministic *logic elements*") (emphasis added). Describing the logic elements both in the singular and in the plural creates uncertainty regarding the minimum number of logic elements the claim contemplates.

The parties offer different interpretations to explain this inconsistency. Dr. Hangartner argues the singular language in paragraph 1 indicates the minimum number of logic elements must be one. In contrast, Intel argues the plural language in paragraph 3 indicates the minimum number of logic elements must be greater than one. Therefore in Intel's view, a logic circuit containing only one logic element, but no more, falls outside the scope of the claim.

I conclude that the plain meaning of the term "logic elements" requires multiple logic elements to be present within the circuit. First, I assume Dr. Hangartner, as the inventor and the author of the claim language, deliberately pluralized "logic elements" in paragraph 3. He specified that the synchronization means is coupled to "all" of the logic "elements" in order to synchronize the operation of the logic "elements." Interpreting this to mean that only one logic element could be present would require "all" to mean "each," and "elements" to mean "element." This interpretation stretches his language to include the singular where he chose to use the plural;

this stretches the ordinary meaning too far. Had he intended circuits comprised of only one logic element to fall within the scope of his claim, use of the singular would have accomplished this goal. However, he chose to refer to elements in the plural, the ordinary meaning of which must be "more than one element." Pluralizing "logic elements" in paragraph 3 indicates that his claim contemplates a circuit comprising, at a minimum, "more than one" logic element.

Notably, the language contemplating multiple logic elements does not appear until paragraph 3, where it refers to "common synchronization means." The language in preceding paragraphs seems to contemplate a logic circuit that could consist of a single logic element, in addition to the common synchronization means described in paragraph 3. Specifically, paragraph 1 plainly refers to a logic circuit comprising "one nondeterministic logic element." Just as it would stretch the language to read "elements" as "element" in paragraph 3, the converse is also true in paragraph 1: It would stretch the language too far to read "element" as "elements." Only the plural language of paragraph 3 widens the purview of the claim to include, and in fact require, multiple logic elements to be present within the circuit.

This linguistic shift may be explained in part by the prosecution history of the '422 patent. In an earlier version of the patent application, Dr. Hangartner claimed a logic circuit that did not include a common synchronization means. *See* October 4, 2000 Response to Office Action [45-7] at 5–6. After the USPTO rejected the application, Dr. Hangartner added the synchronization requirement onto what is now claim 1. May 13, 1999 Amendment [45-2] at 3, 8 (amending the claim to include the limitations from cancelled claim 9, such as synchronization). As he explained the revised claim to the USPTO in his Opening Appeal Brief in 2001:

> [t]his circuit claim includes essentially two elements: (a) one nondeterministic logic element for each variable, to generate a random boolean value for the corresponding variable; and (b) a "common synchronization means" that synchronizes operation of the nondeterministic logic elements. They have to be

> synchronized because each guess at a solution to the problem requires that a random value be picked for every variable in the problem.

[45-3] at 5. This indicates that Dr. Hangartner argued on appeal that his logic circuit contains two components, a logic element for each variable plus a common synchronization means, whereas originally he had argued that the logic circuit was patentable without the synchronization means. The fact that Dr. Hangartner "tacked on" the synchronization requirement to the preexisting, yet apparently unpatentable, claim might explain the sudden shift from the singular reference to "one nondeterministic logic element" in paragraph 1 to the plural references to "logic elements" in what now appears as the synchronization requirement in paragraph 3.

To be clear, this is not to say that this evidence from the prosecution history is dispositive. Rather, I find the prosecution history is consistent with the construction required from the plain meaning of the term "logic elements" in paragraph 3. The prosecution history here further "inform[s] the meaning of the claim language by demonstrating how the inventor understood the invention[.]" *Phillips*, 415 F.3d at 1317. Here, it indicates that Dr. Hangartner understood the final invention to include both one logic element for each variable as well as a means of synchronizing the operation of multiple logic elements within the circuit. His explanation of the invention in the prosecution history sheds light on the internal inconsistency between the references to a single "logic element" in paragraph 1 and the reference to "logic elements" in paragraph 3 that is otherwise resolved on a linguistic basis.

Moreover, requiring multiple logic elements within the circuit is also consistent with Dr. Hangartner's proposed solution to the specific complex computing problems at hand. The background of the invention explains that "Nondeterministic Polynomial Time Complete (NP-complete) decision problems are those for which no efficient solution method is known[.]" '422

Patent 1:14–16. These problems are so complex that one way to solve them is simply to guess at the answer by using random numbers, and then check to see which of the many guesses was in fact correct. The parties agree that claim 1 describes a random number generator, structured as a logic circuit. They also agree that within the circuit, an individual logic element can generate its own string of random numbers, one after the other. *See, e.g.*, '422 Patent 7:3–5 ("[e]ach individual ND element…generates one of the probabilistic variables and its complement"). Furthermore, they agree that the circuit can be "scaled up" to include multiple logic elements. *See, e.g.*, '422 Patent 8:11–12 ("in an integrated circuit, individual ND elements could be grouped, for example in groups of 8 or 16 such elements"). By using multiple logic elements at once, the user can generate many strings of random numbers simultaneously. This is much more efficient than relying on a single element to produce random numbers one at a time.

Dr. Hangartner's claimed invention, consisting of all ten of his claims, is clearly aimed at producing efficient solutions to these difficult problems, not inefficient ones. The first line of the '422 Patent abstract describes the invention as a computing system that "provides computational functionality needed to *efficiently* realize randomized computing methods in otherwise standard, deterministic digital computing systems" (emphasis added). Also, the written description of the preferred embodiment specifically contemplates adding multiple logic elements to the circuit: "[i]n a practical implementation in an integrated circuit, individual [nondeterministic logic] elements could be grouped, for example, in groups of 8 or 16 such elements[.]" '422 Patent 8:11–13. Thus it appears that the inefficient solution—that is, patenting circuits containing only one logic element—is inconsistent with both the proposed solution to the complex computing problems at hand and the preferred embodiment of the invention. And while the abstract and written description do not delimit the claim language *per se*, "[s]uch intrinsic evidence is the

most significant source of the legally operative meaning of disputed claim language." *Vitronics*, 90 F.3d at 1582.

Read in light of the plain meaning of "logic elements" and "synchronization" in paragraph 3, it becomes clear that Dr. Hangartner's claim can only encompass those logic circuits containing more than one logic element; a minimum of two. This conclusion is consistent with the intrinsic evidence from the patent's abstract, written description, and prosecution history. Therefore I construe the term "coupled to all of the nondeterministic logic elements" as "coupled to all of the *multiple* nondeterministic logic elements."

B. Conjunctive Normal Form

The preamble states Dr. Hangartner's logic circuit presents "a proposed solution to a computing problem," specifically, a problem which is "expressed in conjunctive normal form as one [or] [sic] more clauses in said one or more variables[.]" The parties agree that "conjunctive normal form" is an ambiguous term requiring further construction. Each proposes a construction drawn from definitions of the term contained in the patent's written description. Intel cites to the definition found at 6:30–33: "a series of clauses logically ANDed together, each of the clauses consisting of a series of variables, or literals, logically ORed together." Dr. Hangartner cites to a very similar definition found at 4:4–6: "a series of clauses, each clause made up of literals (variables or their complements)[.]" The key distinction between the two is that Intel's definition suggests that "conjunctive normal form" describes only those problems containing multiple variables, whereas Dr. Hangartner's suggests problems containing a single variable can be correctly expressed in "conjunctive normal form." By describing the computing problem as necessarily containing a "series of variables," Intel argues computing problems containing a single variable fall outside the scope of the claim.

Here, the plain language of the preamble is dispositive. The terms "one [or] more clauses" and "one or more variables" clearly indicates a computing problem containing a single clause and a single variable would fall within the scope of the claim. This construction does not limit the claimed circuit to solving single variable problems; rather, it simply means that multivariable problems are not required. And while Intel correctly points out that an inventor's own definition is controlling, this is a case where the inventor has proffered multiple definitions for the same term. *See C.R. Bard, Inc. v. U.S. Surgical Corp.*, 388 F.3d 858, 862 (Fed. Cir. 2004). Where one definition is more consistent with the plain language of the claim, the plain language must decide the issue. *See Vitronics*, 90 F.3d at 1582 ("First, we look to the words of the claims themselves…to define the scope of the patented invention."). Thus I adopt Dr. Hangartner's construction of "conjunctive normal form" "described as a series of one or more clauses, each clause made up of one or more literals (variables or their complements)."

C. Synchronization

"Synchronization" appears within a "means-plus-function" limitation under 35 U.S.C. § 112 ¶ 6 ("common synchronization means coupled to all of the nondeterministic logic elements for synchronizing operation of the nondeterministic logic elements"). A "means-plus-function" limitation is essentially a form of shorthand that allows Dr. Hangartner to import a structural limitation from the patent's written description into the claim without having to describe it in detail within the claim itself. *See, e.g.*, *Envirco Corp. v. Clestra Cleanroom, Inc.*, 209 F.3d 1360, 1364 (Fed. Cir. 2000). The parties agree that the structure must include signal 32 and delay element 64. Their proposed constructions differ only as to whether "inverters 80," depicted in Figure 4 of the '422 Patent, is part of the structure that performs the function.

Intel argues that "inverters 80" is essential to the synchronization function because it "fans out" synchronization signals among multiple logic elements. The significance of this argument seems to be that if "inverters 80" functions as Intel claims, that fact provides further evidence that synchronization can only occur in circuits containing multiple logic elements. Dr. Hangartner disagrees, arguing "inverters 80's" plays only a simplistic, nonessential role during synchronization.

Whether "inverters 80" or its functional equivalent plays an important role in synchronization is inapposite to the conclusion that synchronization must occur within the context of multiple logic elements, for the reasons stated above. This conclusion moots Intel's argument that "inverters 80" is essential to synchronization. Absent additional evidence that "inverters 80" is in fact critical to synchronization, I decline to read Intel's proposed limitation into the claim. *See SciMed Life Sys. v. Advanced Cardiovascular Sys., Inc.*, 242 F.3d 1337, 1340 (Fed. Cir. 2001) (stating "one of the cardinal sins of patent law [is] reading a limitation from the written description into the claims"). Therefore I adopt Dr. Hangartner's construction as follows: The phrase "common synchronization means coupled to all of the nondeterministic logic elements for synchronizing operation of the nondeterministic logic elements" has the function of "synchronizing operation of the nondeterministic logic elements," and its corresponding structure is "signal 32, and delay element 64."

D. Correlation between Logic Elements and Variables

As is true of the synchronization dispute described above, requiring multiple logic elements moots the issue of whether the preamble requires a "one-to-one" or "one-to-many" correlation between the logic elements in the circuit and the variables in the computing problem. The thrust of Intel's argument is that because the preamble suggests the circuit can solve

multivariable problems, and one logic element can pair with only one variable, the logic circuit must contain multiple logic elements (an exclusively "one-to-one" correlation). Dr. Hangartner disagrees, citing to the written description's statement that "one of the individual ND logic elements … can be configured to generate random values for all of the variables" (a non-exclusive "one-to-many" correlation). '422 Patent 7:14, 24–25. Dr. Hangartner also asserts the language in question, "one nondeterministic logic element for generating a respective random boolean value for each one of the said one or more variables," unambiguously suggests that both one-to-one and a one-to-many correlations are possible.

I agree with Dr. Hangartner that the term is unambiguous. The terms "one logic element" and "one or more variables" plainly suggest that one element could pair with one variable or with more than one. On a broader level, the multiple logic element requirement that Intel suggests appears in the preamble, in fact appears only in paragraph 3 in the context of synchronization. Thus I decline to adopt Intel's proposed construction that would limit the claim to "one-to-one" correlations and find no further construction of the term is necessary.

E. Unstable Equilibrium

Paragraph 2 indicates that each logic element contains three components: a pair of inverters cross-coupled together, a means for controlling power to the pair, and a means for equalizing its electrical charge under particular circumstances; namely, once the pair reaches a state of "unstable equilibrium." The parties agree that this ambiguous term describes a condition in which a pair of inverters, cross-coupled together such that the output of one is typically the complement of the other, is forced into an unstable state where the output of each is now the same as the other. The parties further agree that even a small disturbance, such as thermal or "random" noise, could cause the pair of inverters to "fall out" of this unstable state and revert to

their stable, complementary state. The parties disagree as to whether the inverters' electrical charges can fluctuate while they exist in this forced, unstable condition.

Intel argues that one skilled in the art understands this unstable state to encompass a moment, however brief, in which the outputs of each inverter cease rising and falling and come to rest in equivalence with each other. At this moment, the output of each inverter, measured as electrical voltage, is unchanging. Dr. Hangartner argues that this moment may occur during "unstable equilibrium," or it may not. He believes it is possible that the outputs of each inverter never truly come to rest at the same, unchanging value because minute voltage fluctuations could continue to recur during this period of instability.

Intel replies that this unchanging state is better known in the industry as a "metastable state." Intel and Dr. Hangartner agree that a metastable state is a condition that occurs while power is being added to a typical circuit. However, Dr. Hangartner's logic circuit functions in a fundamentally different manner in that the equilibrium reached, however it is described, occurs only "while power is removed from the cross-coupled pair." While it is conceivable that the unstable equilibrium that occurs while power is removed from Dr. Hangartner's atypical circuit resembles the metastable state that occurs while power is added to a typical circuit, I find the claim language requires no such limitation. Thus I construe "unstable equilibrium" as "a condition where the inputs and outputs of a cross-coupled pair of inverters are in substantially the same state and are substantially unchanging and a small disturbance would produce a change away from that state."

The particular manner in which this pair of inverters functions is not readily apparent from the plain language of the claim, despite Dr. Hangartner's contention. Accordingly, I agree with Intel that the phrase describing the circuit's unique power off/power on mechanism requires

construction: "while power is removed from the cross-coupled pair, thereby driving the cross-coupled pair to an unstable equilibrium ... whereby the cross-coupled pair[] randomly assume[s] one of two stable states when power is restored to the cross-coupled pair." Intel suggests the phrase should be construed as "the cross-coupled pair of inverters is driven to an unstable equilibrium while power is removed from the pair; when power is restored, the pair transitions directly from the existing unstable equilibrium state to a randomly assumed stable state." This construction more clearly delineates the events occurring while power is removed from those events occurring while power is restored. However, describing the transition from the unstable state to the stable state as occurring "directly" is overly precise, particularly given the fact that the triggering event for this transition is inherent randomness. Thus I adopt Intel's construction of this term with the word "directly" omitted.

F. Unambiguous Terms

The parties contend the phrase "equalizing charge on the gates of the transistor inverter circuits" in paragraph 2 requires additional construction. I disagree. This is evident from the fact that the parties' proposed constructions differ only as to whether the means for "equalizing charge" should be described as reaching "the same charge" or "substantially the same charge." However, the plain meaning of "equalizing" clearly invokes the concept of being "the same." A construction requiring the charges to become either precisely or only substantially "the same" risks reading too much into language that is otherwise understood without confusion. *Phillips*, 415 F.3d at 1312.

The same is true for the phrase "cause the cross-coupled pair to randomly assume one of two stable states." I agree with Dr. Hangartner that this phrase is unambiguous and should not be construed. He argues in the alternate that the court should adopt the parties' identical

proposed construction, along with his qualification that "random" is described as "substantially random." I decline to draw such a distinction for the same reasons described above.

Finally, the parties propose competing constructions of the term "proposed solution to a computing problem" in the preamble. Dr. Hangartner argues this should be rephrased as "a proposed solution to a problem that is solved with a computer." Intel's construction is more specific: a "set of values proposed to satisfy a NP-complete problem." However, the plain meaning of the terms "proposed solution" and "computing problem" is readily apparent, making further construction unnecessary.

CONCLUSION

The Court construes the disputed '422 Patent claim terms as stated herein.

IT IS SO ORDERED.

DATED this 17th day of December, 2014.

/s/ Michael W. Mosman
MICHAEL W. MOSMAN
United States District Judge