

**IN THE UNITED STATES DISTRICT COURT
FOR THE EASTERN DISTRICT OF TEXAS
MARSHALL DIVISION**

CALIFORNIA INSTITUTE OF
TECHNOLOGY,

Plaintiff,

V.

SAMSUNG ELECTRONICS CO., LTD.,
SAMSUNG ELECTRONICS AMERICA,
INC.,

Defendants.

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CIVIL ACTION NO. 2:21-CV-00446-JRG

CLAIM CONSTRUCTION MEMORANDUM AND ORDER

Before the Court is the Opening Claim Construction Brief (Dkt. No. 101) filed by Plaintiff California Institute of Technology (“Plaintiff” or “Caltech”). Also before the Court are the Responsive Claim Construction Brief (Dkt. No. 109) filed by Defendants Samsung Electronics Co. Ltd. and Samsung Electronics America, Inc. (collectively, “Defendants” or “Samsung”) and Plaintiff’s Reply (Dkt. No. 112). The Court held a hearing on February 28, 2023. (Dkt. No. 118; *see also* Dkt. No. 124.)

I. BACKGROUND

Plaintiff alleges infringement of United States Patent Nos. 7,116,710 (the “’710 Patent”), 7,421,032 (the “’032 Patent”), 7,916,781 (the “’781 Patent”), and 8,284,833 (the “’833 Patent”) (collectively, “the Patents-in-Suit”). (Dkt. No. 101.) Plaintiff refers to the Patents-in-Suit as the “IRA Patents.”

Plaintiff submits that “the IRA Patents cover a revolutionary communications technology known as ‘irregular repeat and accumulate codes’ or ‘IRA codes.’ IRA codes are used in a variety

of digital-communication applications. . . . The IRA Patents are directed to the field of error-correction coding, which seeks to achieve error-free communication at the highest data rates possible. This generally involves transmitting information in the form of encoded ‘codewords’ that are resilient against noise in the communication channel.” (Dkt. No. 101 at 1–2.) Plaintiff also submits that all of the Patents-in-Suit claim priority to the application that issued as the ’710 Patent and that all four Patents-in-Suit share a common specification. (*Id.*)

The ’710 Patent, titled “Serial Concatenation of Interleaved Convolutional Codes Forming Turbo-Like Codes,” issued on October 3, 2006, and bears an earliest priority date of May 18, 2000.

The ’710 Patent states:

A serial concatenated coder includes an outer coder and an inner coder. The outer coder irregularly repeats bits in a data block according to a degree profile and scrambles the repeated bits. The scrambled and repeated bits are input to an inner coder, which has a rate substantially close to one.

(’710 Patent at Abstract.) The Central District of California construed disputed terms of the Patents-in-Suit in *California Institute of Technology v. Broadcom Ltd., et al.*, No. 2:16-CV-3714-GW-AGRx (“*Broadcom*”) and *California Institute of Technology v. Hughes Communications Inc., et al.*, No. 2:13-CV-7245-MRP-JEM (“*Hughes*”). Plaintiff submits several claim construction documents from *Broadcom* and *Hughes*. (See Dkt. Nos. 101-8, 101-9, 101-10, 101-11, 101-12.)

Plaintiff also submits that in 2020, a jury found that certain Apple and Broadcom products infringed the ’710, ’032, and ’781 Patents. See *Broadcom*, No. 2:16-CV-3714-GW, Dkt. No. 2114. The Federal Circuit affirmed the finding of infringement as to the ’710 Patent and the ’032 Patent, vacated as to the ’781 Patent, and remanded for a new trial on infringement as to the ’781 Patent as well as for a new trial on damages. See *Cal. Inst. of Tech. v. Broadcom Ltd.*, 25 F.4th 976 (Fed. Cir. 2022).

II. LEGAL PRINCIPLES

It is understood that “[a] claim in a patent provides the metes and bounds of the right which the patent confers on the patentee to exclude others from making, using or selling the protected invention.” *Burke, Inc. v. Bruno Indep. Living Aids, Inc.*, 183 F.3d 1334, 1340 (Fed. Cir. 1999). Claim construction is clearly an issue of law for the court to decide. *Markman v. Westview Instruments, Inc.*, 52 F.3d 967, 970–71 (Fed. Cir. 1995) (en banc), *aff’d*, 517 U.S. 370 (1996).

“In some cases, however, the district court will need to look beyond the patent’s intrinsic evidence and to consult extrinsic evidence in order to understand, for example, the background science or the meaning of a term in the relevant art during the relevant time period.” *Teva Pharm. USA, Inc. v. Sandoz, Inc.*, 135 S. Ct. 831, 841 (2015) (citation omitted). “In cases where those subsidiary facts are in dispute, courts will need to make subsidiary factual findings about that extrinsic evidence. These are the ‘evidentiary underpinnings’ of claim construction” discussed in *Markman. Id.* (citing 517 U.S. 370).

To ascertain the meaning of claims, courts look to three primary sources: the claims, the specification, and the prosecution history. *Markman*, 52 F.3d at 979. The specification must contain a written description of the invention that enables one of ordinary skill in the art to make and use the invention. *Id.* A patent’s claims must be read in view of the specification, of which they are a part. *Id.* For claim construction purposes, the description may act as a sort of dictionary, which explains the invention and may define terms used in the claims. *Id.* “One purpose for examining the specification is to determine if the patentee has limited the scope of the claims.” *Watts v. XL Sys., Inc.*, 232 F.3d 877, 882 (Fed. Cir. 2000).

Nonetheless, it is the function of the claims, not the specification, to set forth the limits of the patentee’s invention. Otherwise, there would be no need for claims. *SRI Int’l v. Matsushita Elec. Corp.*, 775 F.2d 1107, 1121 (Fed. Cir. 1985) (en banc). The patentee is free to be his own

lexicographer, but any special definition given to a word must be clearly set forth in the specification. *Intellicall, Inc. v. Phonometrics, Inc.*, 952 F.2d 1384, 1388 (Fed. Cir. 1992). Although the specification may indicate that certain embodiments are preferred, particular embodiments appearing in the specification will not be read into the claims when the claim language is broader than the embodiments. *Electro Med. Sys., S.A. v. Cooper Life Sciences, Inc.*, 34 F.3d 1048, 1054 (Fed. Cir. 1994).

This Court's claim construction analysis is substantially guided by the Federal Circuit's decision in *Phillips v. AWH Corporation*, 415 F.3d 1303 (Fed. Cir. 2005) (en banc). In *Phillips*, the court set forth several guideposts that courts should follow when construing claims. In particular, the court reiterated that "the claims of a patent define the invention to which the patentee is entitled the right to exclude." *Id.* at 1312 (quoting *Innova/Pure Water, Inc. v. Safari Water Filtration Sys., Inc.*, 381 F.3d 1111, 1115 (Fed. Cir. 2004)). To that end, the words used in a claim are generally given their ordinary and customary meaning. *Id.* The ordinary and customary meaning of a claim term "is the meaning that the term would have to a person of ordinary skill in the art in question at the time of the invention, *i.e.*, as of the effective filing date of the patent application." *Id.* at 1313. This principle of patent law flows naturally from the recognition that inventors are usually persons who are skilled in the field of the invention and that patents are addressed to, and intended to be read by, others skilled in the particular art. *Id.*

Despite the importance of claim terms, *Phillips* made clear that "the person of ordinary skill in the art is deemed to read the claim term not only in the context of the particular claim in which the disputed term appears, but in the context of the entire patent, including the specification." *Id.* Although the claims themselves may provide guidance as to the meaning of particular terms, those terms are part of "a fully integrated written instrument." *Id.* at 1315 (quoting

Markman, 52 F.3d at 978). Thus, the *Phillips* court emphasized the specification as being the primary basis for construing claims. *Id.* at 1314–17. As the Supreme Court stated long ago, “in case of doubt or ambiguity it is proper in all cases to refer back to the descriptive portions of the specification to aid in solving the doubt or in ascertaining the true intent and meaning of the language employed in the claims.” *Bates v. Coe*, 98 U.S. 31, 38 (1878). In addressing the role of the specification, the *Phillips* court quoted with approval its earlier observations from *Renishaw PLC v. Marposs Societa’ per Azioni*, 158 F.3d 1243, 1250 (Fed. Cir. 1998):

Ultimately, the interpretation to be given a term can only be determined and confirmed with a full understanding of what the inventors actually invented and intended to envelop with the claim. The construction that stays true to the claim language and most naturally aligns with the patent’s description of the invention will be, in the end, the correct construction.

Phillips, 415 F.3d at 1316. Consequently, *Phillips* emphasized the important role the specification plays in the claim construction process.

The prosecution history also continues to play an important role in claim interpretation. Like the specification, the prosecution history helps to demonstrate how the inventor and the United States Patent and Trademark Office (“PTO”) understood the patent. *Id.* at 1317. However, because the file history “represents an ongoing negotiation between the PTO and the applicant,” it may lack the clarity of the specification and thus be less useful in claim construction proceedings. *Id.* Nevertheless, the prosecution history is intrinsic evidence that is relevant to the determination of how the inventor understood the invention and whether the inventor limited the invention during prosecution by narrowing the scope of the claims. *Id.*; see also *Microsoft Corp. v. Multi-Tech Sys., Inc.*, 357 F.3d 1340, 1350 (Fed. Cir. 2004) (noting that “a patentee’s statements during prosecution, whether relied on by the examiner or not, are relevant to claim interpretation”).

Phillips rejected any claim construction approach that sacrificed the intrinsic record in favor of extrinsic evidence, such as dictionary definitions or expert testimony. The *en banc* court condemned the suggestion made by *Texas Digital Systems, Inc. v. Telegenix, Inc.*, 308 F.3d 1193 (Fed. Cir. 2002), that a court should discern the ordinary meaning of the claim terms (through dictionaries or otherwise) before resorting to the specification for certain limited purposes. *Phillips*, 415 F.3d at 1319–24. According to *Phillips*, reliance on dictionary definitions at the expense of the specification had the effect of “focus[ing] the inquiry on the abstract meaning of words rather than on the meaning of claim terms within the context of the patent.” *Id.* at 1321. *Phillips* emphasized that the patent system is based on the proposition that the claims cover only the invented subject matter. *Id.*

Phillips does not preclude all uses of dictionaries in claim construction proceedings. Instead, the court assigned dictionaries a role subordinate to the intrinsic record. In doing so, the court emphasized that claim construction issues are not resolved by any magic formula. The court did not impose any particular sequence of steps for a court to follow when it considers disputed claim language. *Id.* at 1323–25. Rather, *Phillips* held that a court must attach the appropriate weight to the intrinsic sources offered in support of a proposed claim construction, bearing in mind the general rule that the claims measure the scope of the patent grant.

The Supreme Court has read 35 U.S.C. § 112, ¶ 2 to “require that a patent’s claims, viewed in light of the specification and prosecution history, inform those skilled in the art about the scope of the invention with reasonable certainty.” *Nautilus, Inc. v. Biosig Instruments, Inc.*, 572 U.S. 898, 910 (2014). “A determination of claim indefiniteness is a legal conclusion that is drawn from the court’s performance of its duty as the construer of patent claims.” *Datamize, LLC v. Plumtree Software, Inc.*, 417 F.3d 1342, 1347 (Fed. Cir. 2005) (citations and quotations omitted), *abrogated*

on other grounds by *Nautilus*, 572 U.S. 898. “Indefiniteness must be proven by clear and convincing evidence.” *Sonix Tech. Co. v. Publ’ns Int’l, Ltd.*, 844 F.3d 1370, 1377 (Fed. Cir. 2017). “[P]rior orders in related cases do not bar the Court from conducting additional construction in order to refine earlier claim constructions.” *TQP Dev., LLC v. Intuit Inc.*, WL 2810016, at *6 (E.D. Tex. June 20, 2014).

In general, however, prior claim construction proceedings involving the same patents-in-suit are “entitled to reasoned deference under the broad principals of *stare decisis* and the goals articulated by the Supreme Court in *Markman*, even though *stare decisis* may not be applicable *per se*.” *Maurice Mitchell Innovations, LP v. Intel Corp.*, 2006 WL 1751779, at *4 (E.D. Tex. June 21, 2006); see *TQP*, 2014 WL 2810016, at *6 (“[P]revious claim constructions in cases involving the same patent are entitled to substantial weight, and the Court has determined that it will not depart from those constructions absent a strong reason for doing so.”); see also *Teva*, 135 S. Ct. at 839–40 (“prior cases will sometimes be binding because of issue preclusion and sometimes will serve as persuasive authority”) (citation omitted); *Finisar Corp. v. DirecTV Grp., Inc.*, 523 F.3d 1323, 1329 (Fed. Cir. 2008) (noting “the importance of uniformity in the treatment of a given patent”) (quoting *Markman*, 517 U.S. at 390).

III. AGREED TERMS

In their P.R. 4-3 Joint Claim Construction and Prehearing Statement and in their P.R. 4-5(d) Joint Claim Construction Chart, the parties submit the following agreed-upon constructions (Dkt. No. 84 at 1; Dkt. No. 115-1 at 12):

<u>Term</u>	<u>Construction</u>
“combine” (and variants) (’833 Patent, Claims 1, 8)	“perform logical operations on”

“wherein two or more memory locations of the first set of memory locations are read by the permutation module different times from one another” (’833 Patent, Claims 1, 8)	“wherein two or more memory locations of the first set of memory locations are read by the permutation module a different number of times from one another”
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IV. DISPUTED TERMS

The parties present slightly different positions on the level of ordinary skill in the art, namely as to the fields of study, but Defendants submit that such “”difference, however, is not relevant to the resolution of any disputed construction and the Court need not resolve the parties’ dispute at this stage.” (Dkt. No. 109 at 1.) The Court agrees.

a. “scramble,” “randomly permuting,” “random permutation,” and “interleaver”

<p style="text-align: center;">“scramble” (’710 Patent, Claims 15, 25)</p> <p style="text-align: center;">“randomly permuting” (’032 Patent, Claim 7)</p> <p style="text-align: center;">“random permutation” (’032 Patent, Claims 11, 18)</p>	
Plaintiff’s Proposed Construction	Defendants’ Proposed Construction
“change the order of data elements” / “changing the order of data elements”	Plain and ordinary meaning
<p style="text-align: center;">“interleaver” (’710 Patent, Claims 19, 27)</p>	
Plaintiff’s Proposed Construction	Defendants’ Proposed Construction
“module that changes the order of data elements”	Plain and ordinary meaning.

(Dkt. No. 84-1 at 1–2; Dkt. No. 101 at 4; Dkt. No. 105 at 2; Dkt. No. 115-1 at 2.)

i. The Parties’ Positions

Plaintiff argues that “[t]he specification teaches that the disputed terms are interchangeable and indicate the same concept in the inventions.” (Dkt. No. 101 at 4.) Plaintiff also argues that “[e]ven if the specification does not explicitly say it is defining the terms as synonymous, it is

well-established that a patentee may ‘define claim terms by implication.’” (*Id.* at 5 (citations omitted).)

Defendants respond that “a POSITA would have understood that ‘scrambl[ing],’ ‘interleav[ing],’ and ‘randomly permuting’ require more than *any* change in order; rather, under their plain-and-ordinary meanings each of these terms involves ‘random,’ ‘quasi-random,’ or ‘arbitrary’ reordering or reshuffling.” (Dkt. No. 109 at 2.) Defendants argue that Plaintiff’s proposal of merely “changes the order” “would be overbroad and lacks any support in the specification.” (*Id.* at 4.)

Plaintiff replies that “the sole dispute for all these terms is Samsung’s insistence that they require something more than reordering,” but “Samsung never articulates what that something more might be, seeking instead to take to the jury an improper claim construction argument that is inconsistent with the plain and ordinary meaning of these terms.” (Dkt. No. 112 at 1.) Plaintiff cites disclosure regarding “arbitrary permutation,” arguing that “‘permutation’ calls for nothing more than reordering” and that “‘arbitrary’ unequivocally establishes that the permutation is unspecified.” (*Id.* at 1–2 (citing ’710 Patent at 3:45–50).) Further, Plaintiff argues that Defendants rely on evidence outside of the relevant art.

At the hearing, Defendants argued that Plaintiff is attempting to remove the randomness requirement from the claims. (*See generally* Dkt. No. 124 at 14:4–14.) Defendants also reaffirmed that “random” is not limited to being non-deterministic. (*Id.*) Plaintiff responded that Defendants argue these disputed terms require something “more” than changing order but do not explain what “more” is required. (*Id.*; *see also id.* at 6:24–7:16.)

ii. Analysis

Claim 15 of the ’710 Patent, for example, recites a “first coder operative to repeat said stream of bits irregularly and scramble the repeated bits.” (’710 Patent at Claim 15.) The

specification discloses that “scrambling may be performed by the interleaver 204, which performs a pseudo-random permutation of an input block” (’710 Patent at 3:19–21; *see also id.* at FIG. 2.) The specification also discloses, with reference to Figure 3, that “[t]hese connections correspond to the scrambling performed by the interleaver 204.” (*Id.* at 3:48–50; *see also id.* at 1:59–65 (teaching an “outer coder, which repeats and scrambles bits in the data block” and “may include a repeater with a variable rate and an interleaver”).)

The patentee thus referred to scrambling, permuting, and interleaving all in the sense of creating an output that has a different ordering than the input. This is also consistent with other patents cited by the Patents-in-Suit, which are intrinsic evidence. *Powell v. Home Depot USA, Inc.*, 663 F.3d 1221, 1231 (Fed. Cir. 2011). Those patents refer to an “interleaver (also known as a permuter)” as producing “a reordered sequence of information bits.” (Dkt. No. 109-7, U.S. Patent No. 6,023,783 at 5:48–50; *see also* Dkt. No. 109-8, U.S. Patent No. 6,859,906 at 5:37–39 (“The channel interleaver may optionally be used to re-order bits so that consecutive bits in a data stream are not lost in a noise burst.”).)

This is consistent with a technical dictionary cited by Defendants that refers to “scrambling” as “randomization” that uses “*reversible* processes.” (Dkt. No. 109-6, *Dictionary of Computer Science, Engineering, and Technology* 437 (2001).) This is also consistent with disclosure of “*arbitrary* permutation” of the connections that relate to the scrambling performed by an interleaver. (’710 Patent at 3:45–50 (emphasis added) (“These connections can be made in many ways, as indicated by the arbitrary permutation of the ra edges joining information nodes 302 and check nodes 304 in permutation block 310. These connections correspond to the scrambling performed by the interleaver 204.”); *see also* ’032 Patent at 3:51–55 (same).) The

patentee thus used “scramble” and “randomly permuting” to refer to arbitrariness rather than to non-deterministic randomness.

The extrinsic definitions cited by Defendants pertain to cryptography and are therefore unpersuasive and, even if considered, are consistent with understanding that “scrambling” need not be non-deterministic. (Dkt. No. 109-4, *The McGraw Hill Dictionary of Scientific and Technical Terms* (5th ed. 1999) (defining “scramble” as “[t]o mix, in cryptography, in random or *quasi*-random fashion”) (emphasis added).)

As to whether what is reordered are “data elements” or “bits,” the claims demonstrate that “bits” are a species of, or contained within, “data elements.” (*See* ’710 Patent at Claim 5 (“5. The method of claim 4, wherein the data elements comprises [*sic*] bits.”).) To the extent particular claims refer specifically to “bits,” such language limits those particular claims, so the disputed terms here at issue need not be limited to “bits.” Also of note, the district court in *Broadcom* construed “random permutation” to mean “changing the order of data elements by a purely random or pseudo random process.” (Dkt. No. 101-10, *Broadcom* Additional Claim Constructions, at 2.) Finally, the parties present the word “random” as a distinct disputed term, which is addressed separately herein, so the constructions for the terms “randomly permuting” and “random permutation” can include the word “random.”

The Court therefore hereby construes these disputed terms as set forth in the following chart:

<u>Term</u>	<u>Construction</u>
“scramble” (’710 Patent, Claims 15, 25)	“change the order of data elements”
“randomly permuting” (’032 Patent, Claim 7)	“randomly changing the order of data elements”

“random permutation” (’032 Patent, Claims 11, 18)	“random change in the order of data elements”
“interleaver” (’710 Patent, Claims 19, 27)	“module that changes the order of data elements”

b. “random” and “randomly”

“random” / “randomly” (’032 Patent, Claims 1, 5, 7, 13)	
Plaintiff’s Proposed Construction	Defendants’ Proposed Construction
“repeated message bits are not used in the order they originally appear”	Plain and ordinary meaning

(Dkt. No. 84-1 at 4; Dkt. No. 101 at 6; Dkt. No. 109 at 5; Dkt. No. 115-1 at 4.)

i. The Parties’ Positions

Plaintiff submits that Defendants’ proposal “seeks to preserve a noninfringement argument that ‘random’ means statistically random or non-deterministic reordering,” which Plaintiff argues “would be inconsistent with the patent and how ‘random’ is used in the field of error-correction coding” (Dkt. No. 101 at 6.) In particular, Plaintiff cites disclosure that a “random permutation” can be “fixed,” thus using the term “random” in the sense of arbitrariness rather than in a statistical sense. (*Id.* at 7.)

Defendants respond that Plaintiff’s proposed construction “fails to provide a definition for the terms themselves but rather improperly redrafts the claim language to wholly excise the concept of randomness from the claims.” (Dkt. No. 109 at 5.) Defendants also submit that “Samsung has not alleged that ‘random’ or ‘randomly’ requires ‘statistically random or non-deterministic reordering,’” but “[a] POSITA would understand that a scrambling algorithm can be deterministic while also being ‘random’ in its plain and ordinary sense.” (*Id.* at 7.)

Plaintiff replies as to these terms together with the terms “scramble,” “randomly permuting,” “random permutation,” and “interleaver,” which are addressed above. (*See* Dkt.

No. 112 at 1–3.) The parties similarly argued these terms together at the hearing with the terms “scramble,” “randomly permuting,” “random permutation,” and “interleaver.” (*See, e.g.*, Dkt. No. 124 at 4:3–4.)

ii. Analysis

Claim 1 of the '032 Patent, for example, recites “generating a sequence of parity bits” in accordance with a formula that uses “randomly chosen irregular repeats of the message bits.” ('032 Patent at Claim 1.) Defendants note that the Patents-in-Suit cite to other patents (which are thus intrinsic evidence, *see Powell*, 663 F.3d at 1231) that refer to the output of an “interleaver” being “random.” (Dkt. No. 109-7, U.S. Patent No. 6,023,783 at 5:57–61; Dkt. No. 109-8, U.S. Patent No. 6,859,906 at 2:2–5; Dkt. No. 109-9, U.S. Patent No. 6,044,116 at 17:24–27.)

As discussed above with regard to “randomly permuting” and “random permutation,” the patentee used the word “random” to refer to arbitrariness rather than to refer to truly non-deterministic randomness. As an example, the specification discloses that a “random” permutation can be “fixed,” rather than being non-deterministic, such that a “random permutation” can be merely “arbitrary.” (*See* '032 Patent at 3:51–55; *see also* Dkt. No. 101-14, Daniel Bengtsson & Daniel Landström, *Coding in a Discrete Multitone Modulation System* 8 (1996) (“Interleaving is a technique that rearrange [*sic*] the coded data such that the location of errors *looks* random[.]”) (emphasis added).) Defendants argue that scrambling can be “fixed” in the sense of being predictable (and therefore decodable) while still being “random” in the ordinary sense of that word. (Dkt. No. 109 at 7.)

Given Defendants’ unequivocal statement that “Samsung has not alleged that ‘random’ or ‘randomly’ requires ‘statistically random or non-deterministic reordering” (Dkt. No. 109 at 6), Plaintiff’s proposal to construe “random” as meaning “repeated message bits are not used in the order they originally appear” would introduce unnecessary potential confusion.

Also of note, the district court in *Broadcom* rejected the defendant’s proposal in that case to construe “random” to mean “non-deterministic,” and the court there found:

[T]he named inventors did not attach any specialized meaning to “random” (or its variations), specifically not “non-deterministic” as Defendants improperly suggest, and intended only its plain and ordinary meaning. Substituting “random” with “non-deterministic” hinders, not helps, the factor *[sic]* finder, given the more intricate definition of the latter. . . . Moreover, there is no indication that a person having ordinary skill in the art would bring a distinctive perspective to the term “random” or “randomly” in the context in which the term is used in the claims. To the contrary, a person of ordinary skill would reasonably interpret the term according to its evident meaning.

Broadcom, No. 2:16-CV-3714-GW-AGR_x, Dkt. No. 213.

Having considered the parties proposals in the present case, the Court reaches essentially the same conclusion here as did the district court in *Broadcom*, and the opinion of Plaintiff’s expert does not persuasively support limiting the term “random,” by itself, to the context of rearranging the order of bits. (*See* Dkt. No. 101-1, Shoemake Decl. at ¶¶ 185, 243–44.) Rather, as discussed above, the disclosure regarding “arbitrary permutation” (’710 Patent at 3:45–50) demonstrates that the patentee used the term “random” to refer to arbitrariness rather than to refer to non-deterministic randomness. To address Plaintiff’s concern that this point might be misapplied by Defendants’ expert or misunderstood by the jury without an express construction of the term “random,” the Court expressly construes “random” to mean “arbitrary.” The parties can apply this construction in the context of the relevant art with an understanding that proving an operation is performed “arbitrarily” does not require proving that it is performed in a non-deterministic manner.

The Court therefore hereby construes these disputed terms as set forth in the following chart:

<u>Term</u>	<u>Construction</u>
“random” (’032 Patent, Claims 5, 7, 13)	“arbitrary”

“randomly” (’032 Patent, Claims 1, 7)	“arbitrarily”
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c. “the permutation module”

“the permutation module” (’833 Patent, Claim 8)	
Plaintiff’s Proposed Construction	Defendants’ Proposed Construction
The phrase “the permutation module” in claim 8 of the ’833 Patent refers to a module performing the claimed step of performing an encoding operation.	Indefinite

(Dkt. No. 84-1 at 3; Dkt. No. 101 at 8; Dkt. No. 109 at 7; Dkt. No. 115-1 at 13.)

i. The Parties’ Positions

Plaintiff argues that the absence of an explicit recital of “a permutation module” does not render the claim indefinite. (Dkt. No. 101 at 8–9.) Plaintiff submits that Claim 1 is an apparatus claim that corresponds to the claim here at issue (method Claim 8), and that Claim 1 expressly recites “a permutation module.” (*Id.* at 9–10.)

Defendants respond that “[t]he permutation module’ as used in Claim 8 of the ’833 Patent is indefinite for at least two reasons: (1) the term lacks necessary antecedent basis sufficient to provide the clarity required by 35 U.S.C. § 112, and (2) if ‘the permutation module’ is understood as Caltech urges, the claim is an invalid ‘hybrid’ or ‘mixed’ claim drawn both to an apparatus and a method.” (Dkt. No. 109 at 8.)

Plaintiff replies that “[t]he disputed language is not indefinite because *the claims*—including Claims 1 and 8—and the prosecution history all point unambiguously to the same conclusion: that ‘the permutation module’ refers to a module performing the claimed step of performing an encoding operation, as Caltech proposes.” (Dkt. No. 112 at 4.) Plaintiff also argues that “[m]ethod claims routinely recite steps involving some apparatus without presenting a validity issue.” (*Id.* (citation omitted).)

At the hearing, Defendants argued that the lack of antecedent basis is a drafting error that arose during prosecution, that Plaintiff has not sought to correct, and that cannot be cured through claim construction. (Dkt. No. 124 at 28:8–29:15.) Plaintiff responded that it is not seeking a correction but rather contends that the antecedent basis is implicit. (*Id.* at 29:21–30:14.)

ii. Analysis

Claim 8 of the '833 Patent recites:

8. A method of performing encoding operations, the method comprising:

receiving a sequence of information bits from a first set of memory locations;

performing an encoding operation using the received sequence of information bits as an input, said encoding operation comprising:

reading a bit from the received sequence of information bits, and

combining the read bit to a bit in a second set of memory locations based on a corresponding index of the first set of memory locations for the received sequence of information bits and a corresponding index of the second set of memory locations; and

accumulating the bits in the second set of memory locations,

wherein two or more memory locations of the first set of memory locations are read by *the permutation module* different times from one another.

('833 Patent at Claim 8) (emphasis added). The parties agree that “the permutation module” has no explicit antecedent basis.

On one hand, “failure to provide explicit antecedent basis for terms does not always render a claim indefinite.” *Bose Corp. v. JBL Inc.*, 274 F.3d 1354, 1359 (Fed. Cir. 2001) (citations and quotations omitted). On the other hand, “a claim c[an] be indefinite if a term does not have proper antecedent basis where such basis is not otherwise present by implication or the meaning is not

reasonably ascertainable.” *Halliburton Energy Servs., Inc. v. M-I LLC*, 514 F.3d 1244, 1254 (Fed. Cir. 2008).

Avoiding indefiniteness for Claim 8 of the ’833 Patent would require inferring that the preceding limitations in the claim, such as the “reading” and “combining” operations, amount to an implicit recital of a “permutation module” so as to provide antecedent basis. Such an inference is not sufficiently evident on the face of the claim and finds no clear support in the specification. As an example, a permutation module is not “mathematically an inherent characteristic” of what the claim recites. *Bose*, 274 F.3d at 1359. Rather, it is unclear whether the implicit antecedent basis would be in the “receiving . . .” step, in the “performing . . .” step, both, or neither.

Plaintiff emphasized at the hearing that the opinion of its expert is un rebutted as to this term, but the present dispute regarding implicit antecedent basis turns primarily on the application of legal principles and precedent rather than on any factfinding. (Dkt. No. 124 at 30:22–25; *see also id.* at 32:14–22.) The opinions of Plaintiff’s expert regarding purported implicit antecedent basis are unpersuasive. (*See* Dkt. No. 101-1, Shoemake Decl. at ¶¶ 238, 240.)

Plaintiff emphasizes that, during prosecution, the patentee added “the permutation module” to Claim 1 (which already recited “a permutation module”) at the same time that the patentee added “the permutation module” to Claim 8. (*See* Dkt. No. 101-20, May 7, 2012 Amendment After Allowance, at 2, 4.) This perhaps demonstrates that the lack of antecedent basis in Claim 8 was accidental, but this does not give rise to any implicit antecedent basis for the term in Claim 8, notwithstanding the similarities between Claims 1 and 8. Finally, as Plaintiff affirmed at the hearing, Plaintiff is not seeking a judicial correction of the claim, and no judicial correction is warranted. (Dkt. No. 124 at 29:21–30:5.)

Claim 8 is therefore indefinite based on lack of antecedent basis, and the Court need not reach Defendants' argument that Claim 8 is an improper mixed method-apparatus claim. The Court thus hereby finds that **Claim 8 of the '833 Patent is indefinite.**

d. "irregularly" and "irregular"

<p style="text-align: center;">"irregularly" ('710 Patent, Claims 15, 25)</p> <p style="text-align: center;">"irregular" ('032 Patent, Claims 1, 5, 13)</p>	
Plaintiff's Proposed Construction	Defendants' Proposed Construction
"a different number of times (<i>i.e.</i> , not all the same number of times)"	"a different number of times"

(Dkt. No. 84-1 at 6; Dkt. No. 101 at 11; Dkt. No. 109 at 23.)

Plaintiff argued that "Caltech contends this [term] simply means that not all of the bits are repeated the same number of times" but contends that "Samsung does not agree to a construction with such clarity, apparently seeking to leave open the argument that each information bit must be repeated a different number of times than every other information bit. Such an argument reads out the embodiments of the specification and therefore should not be adopted." (Dkt. No. 101 at 12 (citation omitted).) Plaintiff cited disclosures in the specification regarding what Plaintiff referred to as "fractional sub-groups, within which multiple bits are repeated the same number of times." (*Id.* at 14.)

Defendants responded that "[a]lthough Samsung does not believe that th[e proposed] parenthetical is necessary, to streamline the number of disputed terms Samsung will not oppose Caltech's addition." (Dkt. No. 109 at 24.) The parties are thus in agreement as to Plaintiff's proposed construction, (Dkt. No. 115-1 at 1), which the parties confirmed at the hearing. (Dkt. No. 35:19–36:1.)

As Plaintiff's proposed construction is now unopposed, the Court hereby construes **"irregularly" and "irregular" to mean "a different number of times (i.e., not all the same number of times)."**

e. "repeat"

"repeat" (and variants) ('710 Patent, Claims 11, 15, 16, 19, 25, 26; '032 Patent, Claims 1, 5, 7, 13, 17)	
Plaintiff's Proposed Construction	Defendants' Proposed Construction
Plain and ordinary meaning, which does not limit how repeating is accomplished and can include, for example, duplication or reuse of bits.	"generation of additional bits, where generation can include, for example, duplication or reuse of bits"

(Dkt. No. 84-1 at 7; Dkt. No. 101 at 14; Dkt. No. 109 at 11; Dkt. No. 115-1 at 1.)

i. The Parties' Positions

Plaintiff contends that "[t]he parties agree that 'repeating' can include 'duplication or reuse of bits.' But Samsung would limit the term to requiring the 'generation of additional bits,' and Caltech disputes that limitation." (Dkt. No. 101 at 14.) Plaintiff argues that "[t]he relevant claims recite repetition (in various word forms), but they are agnostic as to the particular method for repeating." (*Id.* at 15.) Plaintiff emphasizes that the Federal Circuit ruled in *Broadcom* that the patents do "not require generating new, distinct bits." (*Id.* at 16 (quoting 25 F.4th at 986).)

Defendants respond that the Federal Circuit has already construed this term, "[a]nd no basis exists for the alleged 'clarification' of the Federal Circuit's construction that Caltech seeks." (Dkt. No. 109 at 11.) Defendants also argue that "Caltech's contention that abandoning the Federal Circuit's construction is required because it contains 'unnecessary ambiguity' is belied by the shared specification and the construction itself." (*Id.* at 12.) Defendants conclude that "[n]o ambiguity is present and no reason exists for this Court to deviate from the Federal Circuit's

construction. A jury is fully capable of understanding this construction, *especially* where the parameters Caltech is purportedly concerned with are defined in the construction itself.” (*Id.* at 13.)

Plaintiff replies:

Caltech agrees with the construction of “repeat” affirmed by the Federal Circuit. Caltech’s only concern is that the language “generation of additional bits,” taken in a vacuum, may be argued to require generating new, distinct bits. This would be contrary to the Federal Circuit’s determination that “repeating information bits does not require generating new, distinct bits.” *Cal. Inst. of Tech. v. Broadcom Ltd.*, 25 F.4th 976, 986 (Fed. Cir. 2022).

(Dkt. No. 112 at 5.) Plaintiff also suggests that “[a] viable alternative, which accomplishes the same ends, would be for the Court to adopt the Federal Circuit’s affirmed construction (*i.e.*, Samsung’s proposal) while also instructing the jury that the construction does not require generating new, distinct bits.” (*Id.*)

At the hearing, Plaintiff was amenable to the Court’s suggestion of applying the Federal Circuit’s construction while also making clear in the Court’s analysis that the Federal Circuit’s analysis is applicable here. (Dkt. No. 124 at 36:2–38:18.)

ii. Analysis

The Federal Circuit affirmed the *Broadcom* court’s construction that “repeat” means “generation of additional bits, where generation can include, for example, duplication or reuse of bits.” *Broadcom*, 25 F.4th at 986. This construction has a *stare decisis* effect. *See Ottah v. Fiat Chrysler*, 884 F.3d 1135, 1140 (Fed. Cir. 2018).

The Federal Circuit also agreed with Plaintiff’s argument on appeal, however, that “the plain claim language requiring repeating information bits does not require generating new, distinct bits and that the district court was correct in construing the term to not exclude the reuse of bits.” *Broadcom*, 25 F.4th at 986. The Federal Circuit noted that “[t]he district court correctly observed that the claims require repeating but do not specify how the repeating is to occur.” *Id.*

Plaintiff also notes disclosures in the specification regarding repeating bits. (*See* '710 Patent at 2:35–38 (“The coder may be used to format blocks of data for transmission, introducing redundancy into the stream of data to protect the data from loss due to transmission errors”); *id.* at 2:52–54 (“Since the repeater has an irregular output, different bits in the block may be repeated a different number of times.”).)

The parties shall abide by the Federal Circuit’s decision in *Broadcom*, including the Federal Circuit’s finding that “repeating information bits does not require generating new, distinct bits.” 25 F.4th at 986. This language should not be incorporated into the construction, however, not only because it does not appear in the construction that the Federal Circuit affirmed but also because it might confuse the jury as to the meaning of “new, distinct bits.” Rather, the parties shall adhere to their apparent mutual understanding of what is already apparent in the Federal Circuit’s construction, namely that the Federal Circuit’s reference to “new, distinct bits” refers to additional bits that need not be different from other bits. (*See id.*; *see also* '710 Patent at 2:50–52 (“In an embodiment, the outer coder 202 is a repeater that repeats the k bits in a block a number of times q to produce a block with n bits.”).)

The Court therefore hereby construes **“repeat”** to mean **“generation of additional bits, where generation can include, for example, duplication or reuse of bits.”**

f. “summing” and “adding”

<p align="center">“summing of bits in a subset of the information bits” (’781 Patent, Claim 6)</p> <p align="center">“adding . . . subset[s] of information bits” (’781 Patent, Claims 21, 22)</p>	
Plaintiff’s Proposed Construction	Defendants’ Proposed Construction
“adding together two or more information bits from a subset of information bits”	Plain and ordinary meaning

<p align="center">“sums of bits in subsets of the information bits” (’781 Patent, Claim 13)</p>	
Plaintiff’s Proposed Construction	Defendants’ Proposed Construction
“the result(s) of adding together two or more information bits from a subset of information bits”	Plain and ordinary meaning
$x_j = x_{j-1} + \sum_{i=1}^a v_{(j-1)a+i}$ <p align="center">(’032 Patent, Claim 1)</p>	
Plaintiff’s Proposed Construction	Defendants’ Proposed Construction
“the parity bit x_j is the sum of (a) the parity bit x_{j-1} and (b) the sum of a number, ‘a’ (which is at least two), of randomly chosen irregular repeats of the message bits”	Plain and ordinary meaning

(Dkt. No. 84-1 at 5; Dkt. No. 101 at 17; Dkt. No. 109 at 13; Dkt. No. 115-1 at 4, 10.)

i. The Parties’ Positions

Plaintiff argues that “Samsung’s apparent motivation is to preserve an invalidity argument that addition of a set of bits has meaning even for a set of one—*i.e.*, a single bit. However, a POSITA would understand that addition in the context of the patent does not apply to a single bit, and the terms should be so construed.” (Dkt. No. 101 at 18.)

Defendants also argue that “Caltech’s proposals simply seek to redefine well-understood terms like ‘sum’ and further import limitations based on non-limiting embodiments in the specification.” (Dkt. No. 109 at 20.) Defendants submit that “[a] ‘subset’ of information bits plainly embraces selection of a single bit.” (*Id.*) Defendants further argue:

Caltech intentionally chose to claim its invention in the form of this mathematical formula and no dispute exists that a POSITA would readily understand that formula. Thus, no construction is necessary. This Court should reject Caltech’s proposed construction because rather than clarifying the formula’s meaning, it instead injects ambiguity by replacing the formula with duplicative language found elsewhere in claim 1 and seeks to add a narrowing limitation—that “*a* . . . is at least two”—found nowhere in the claims, specification, or prosecution history. To the extent the Court decides to construe the formula, at a minimum it should excise the constraint that “*a*” must be two or more, which is not found in the claim or extrinsic record.

(Dkt. No. 109 at 13.)

Plaintiff replies that “‘summing’ a number of bits involves two or more bits being summed.” (Dkt. No. 112 at 5.) Plaintiff argues that “Samsung’s focus on the word ‘subset’ in an abstract or mathematical sense and without the context of the rest of the claim language, leads to absurd results. (*Id.* at 6.)

At the hearing, Defendants argued that the formula term is clear and that Plaintiff seeks to import a limitation. (Dkt. No. 124 at 48:1–11; *see also id.* at 49:21–50:7.) Plaintiff responded that the disclosed example in the specification in which $a=1$ refers to a type of coding that is different from what the patent discloses as the invention. (Dkt. No. 124 at 57:11–58:14.)

ii. Analysis

Claim 21 of the ’781 Patent, for example, recites:

21. A method comprising:

receiving a collection of information bits;

mod-2 or exclusive-OR *adding* a first subset of information bits in the collection to yield a first parity bit;

mod-2 or exclusive-OR *adding* a second subset of information bits in the collection and the first parity bit to yield a second parity bit; and

outputting a codeword that includes the first parity bit and the second parity bit.

(’781 Patent at Claim 21) (emphasis added).

The use of the plural, “bits,” does not by itself require two or more bits because, “in context, the plural can describe a universe ranging from one to some higher number, rather than requiring more than one item.” *Versa Corp. v. Ag-Bag Int’l Ltd.*, 392 F.3d 1325, 1330 (Fed. Cir. 2004) (citation omitted). A “subset of information bits” could therefore include fewer than two bits. The opinions of Plaintiff’s expert in this regarding are unpersuasive. (*See* Dkt. No. 101-1, Shoemake

Decl. at ¶¶ 254–55, 263–64, 268–69.) As an example, Plaintiff’s expert discusses Figure 3 as showing only pluralities of information bits being added (*id.* at ¶ 255), but the claims should not be limited by this particular embodiment. *See Phillips*, 415 F.3d at 1323. Also, Plaintiff’s expert opines that “[i]f the summing were over one bit, there would be no summation at all. There would only be a single bit being added to a parity bit. This would be equivalent to the prior art RA [(repeat and accumulate)] codes.” (Dkt. No. 101-1, Shoemake Decl. at ¶ 256; *see also id.* at ¶ 258 (citing ’032 Patent at 4:41–45).) Any issue in this regard, as to whether a portion of the claim scope encompasses prior art, does not warrant limiting the claims to particular disclosed embodiments in which “a” is 2 or more. *See Phillips*, 415 F.3d at 1327 (“we have certainly not endorsed a regime in which validity analysis is a regular component of claim construction”).

As for the equation term in Claim 1 of the ’032 Patent, the same equation appears in the specification:

$$x_j = x_{j-1} + \sum_{i=1}^a v_{(j-1)a+i}$$

(’032 Patent, Claim 1 (as corrected by July 27, 2010 Certificate of Correction); *see also id.* at 4:14.)

Plaintiff argues that claim construction is necessary for this equation because the constructions in *Hughes* and *Broadcom* did not specify that “a” in this equation must be at least 2. (Dkt. No. 101 at 18, n.5.)

The district court in *Hughes* did not place any lower bound on the value of “a,” although the dispute in that case was different, namely whether the equation is indefinite (the court rejected the indefiniteness challenge). *See Hughes*, No. 2:13-CV-7245-MRP-JEM, Dkt. No. 105 at 21–22.

Plaintiff here proposes an explicit requirement that “a” must be 2 or more, but no such limitation is apparent in these claims or in the specification. Instead, the discussion of the Tanner

graph in Figure 3 of the '032 Patent introduces “a” by stating that “‘a’ is a positive integer.” (’032 Patent at 3:35–37.) Also, whereas Table 1 in the specification lists values for “a” as being 2, 3, and 4, the specification introduces Table 1 by using the phrase “[f]or example.” (*Id.* at 7:5–7.) The feature of “a” being 2 or more in particular disclosed examples should not be imported into the claims. *See Phillips*, 415 F.3d at 1323. Indeed, the specification refers to codes that use “a” equal to 1, (*see* ’032 Patent at 4:42–45), and to whatever extent this might encompasses prior art, this does not warrant limiting the claim scope to particular disclosed embodiments in which “a” is 2 or more. *See Phillips*, 415 F.3d at 1327.

Plaintiff also argues that omitting a requirement that “a” must be 2 or more would allow the claim scope to encompass $a=0$, which Plaintiff argues would be inoperable, but the Federal Circuit has stated that “it is . . . improper to add limitations to constructions to exclude only certain inoperable embodiments.” *Network-1 Techs., Inc. v. Hewlett-Packard Co.*, 981 F.3d 1015, 1025 (Fed. Cir. 2020) (citing *Cordis Corp. v. Medtronic AVE, Inc.*, 511 F.3d 1157, 1174 (Fed. Cir. 2008)).

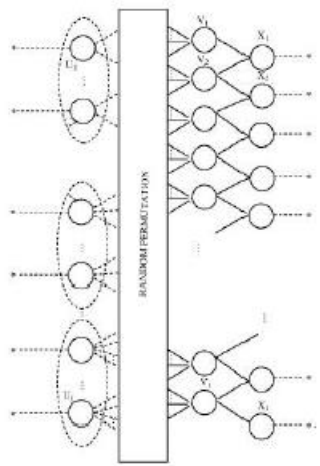
The Court therefore expressly rejects Plaintiff’s proposed construction, and finds that no further construction is necessary. Indeed, this is consistent with Plaintiff’s position in *Hughes*, wherein Plaintiff asserted that the equation in Claim 1 of the ’032 Patent is “well defined in the claim and its meaning would be clear to a [POSITA].” (Dkt. No. 109-13, *Hughes*, Dkt. No. 67, Plaintiff’s Corrected Opening Claim Construction Brief at 8.) The equation in Claim 1 of the ’032 Patent should therefore be construed to have its plain meaning. *See U.S. Surgical Corp. v. Ethicon, Inc.*, 103 F.3d 1554, 1568 (Fed. Cir. 1997) (“Claim construction is a matter of resolution of disputed meanings and technical scope, to clarify and when necessary to explain what the patentee covered by the claims, for use in the determination of infringement. It is not an obligatory exercise

in redundancy.”); *see also* *O2 Micro Int’l Ltd. v. Beyond Innovation Tech. Co.*, 521 F.3d 1351, 1362 (Fed. Cir. 2008) (“[D]istrict courts are not (and should not be) required to construe every limitation present in a patent’s asserted claims.”); *Finjan, Inc. v. Secure Computing Corp.*, 626 F.3d 1197, 1207 (Fed. Cir. 2010) (“Unlike *O2 Micro*, where the court failed to resolve the parties’ quarrel, the district court rejected Defendants’ construction.”); *ActiveVideo Networks, Inc. v. Verizon Commc’ns, Inc.*, 694 F.3d 1312, 1326 (Fed. Cir. 2012); *Summit 6, LLC v. Samsung Elecs. Co., Ltd.*, 802 F.3d 1283, 1291 (Fed. Cir. 2015); *Bayer Healthcare LLC v. Baxalta Inc.*, 989 F.3d 964, 977–79 (Fed. Cir. 2021).

The Court accordingly construes these disputed terms as set forth in the following chart:

<u>Term</u>	<u>Construction</u>
“summing of bits in a subset of the information bits” (’781 Patent, Claim 6) “adding . . . subset[s] of information bits” (’781 Patent, Claims 21, 22)	Plain meaning
“sums of bits in subsets of the information bits” (’781 Patent, Claim 13)	Plain meaning
$x_j = x_{j-1} + \sum_{i=1}^a v_{(j-1)a+i}$ (’032 Patent, Claim 1)	Plain meaning

g. The Tanner Graph

 <p>(’032 Patent, Claims 11, 18)</p>	
Plaintiff’s Proposed Construction	Defendants’ Proposed Construction
<p>“a graph representing an IRA code as a set of parity checks where every message bit is repeated, at least two different subsets of message bits are repeated a different number of times, and check nodes, each randomly connected to subsets of the message bits, enforce constraints that determine the parity bits”</p>	<p>Plain and ordinary meaning</p> <p>Alternative proposed by Defendants at the February 28, 2023 hearing:</p> <p>“a graph representing an IRA code as a set of parity checks where every message bit is repeated, at least two different subsets of message bits are repeated a different number of times, and check nodes, each randomly connected to subsets of the message bits, enforce constraints that determine through accumulation each parity bit as a sum of the prior parity bits and the inputs to the corresponding check node”</p>

(Dkt. No. 84-1 at 8; Dkt. No. 101 at 19; Dkt. No. 109 at 21; Dkt. No. 115-1 at 5–6; Dkt. No. 119-1 at 103.)

i. The Parties’ Positions

Plaintiff argues that “[t]he Tanner graph in Claims 11 and 18 of the ’032 Patent should be construed to help the jury—which presumably will not be familiar with IRA Tanner graphs—to

understand the scope of the claims.” (Dkt. No. 101 at 19 (citation omitted).) Plaintiff submits that its proposed construction is based on the construction in *Hughes* and *Broadcom*. (*Id.*)

Defendants respond that “[t]he patentee chose to draft claims that recite a specific Tanner graph in Claims 11 and 18 of the ’032 Patent and should be held to that choice,” and “a POSITA would understand the boundaries of the claim based on the Tanner graph itself,” particularly when read in light of the patentee’s description of an identical Tanner graph in the specification. (Dkt. No. 109 at 22 (citation omitted).)

Plaintiff replies that construction is appropriate to resolve a dispute between the parties, and as to Defendants’ concern about the absence of an “accumulator feature” in Plaintiff’s proposed construction, Plaintiff replies that “appending ‘through accumulation’ to Caltech’s proposed construction would obviate this argument.” (Dkt. No. 112 at 8–9.)

At the hearing, Plaintiff argued that its proposal is supported by the construction in *Hughes* and *Broadcom*, and Plaintiff reiterated that construing the Tanner graph will assist the jury. (Dkt. No. 124 at 59:1–62:4.) Defendants responded that Plaintiff’s proposal fails to account for the specific accumulation shown in the Tanner graph, and Defendants presented an alternative proposed construction (noted above). (Dkt. No. 124 at 63:21–71:13.)

ii. Analysis

Claims 11 and 18 of the ’032 Patent include a “Tanner” graph. (*See* ’032 Patent at 3:33–35 (“The set of parity checks may be represented in a bipartite graph, called the Tanner graph.”).) This Tanner graph also appears in the specification at Figure 3.

Plaintiff’s proposed construction is based on the construction reached by the Central District of California in the *Hughes* and *Broadcom* cases, but in those cases the parties had agreed to use prose to describe the graph (rather than construing the graph to have its plain meaning to persons of skill in the art), and in *Hughes* the defendants asserted indefiniteness. (*See* Dkt. No.

101-8 at 32; *see also* Dkt. No. 101-12 at 22–28.) Thus, neither *Hughes* nor *Broadcom* considered whether the Tanner graph should be given its plain meaning to persons of skill in the art.

In the present case, Defendants argue that Plaintiff’s proposed construction is an oversimplification of the Tanner graph and omits important elements. (Dkt. No. 109 at 23 (discussing Dkt. No. 101-1, Shoemaker Decl. at ¶ 178).) Plaintiff replies that what Defendants express concern about is actually implicit in Plaintiff’s construction, and Plaintiff alternatively suggests that “appending ‘through accumulation’ to Caltech’s proposed construction would obviate this argument.” (Dkt. No. 112 at 8–9.)

Although the experts at trial can assist the jury in understanding the Tanner graph from the perspective of a person of ordinary skill in the art, at the hearing Defendants did not contest the correctness of what is set forth in the *Hughes/Broadcom* construction or Plaintiff’s present proposed construction. (*See, e.g.*, Dkt. No. 124 at 67:21–70:13.) Defendants’ above-noted alternative proposed construction set forth at the hearing runs too far afield from the *Hughes/Broadcom* construction without adequate justification, and Defendants’ alternative proposal is unnecessary in light of Plaintiff’s proposed construction being substantively uncontested aside from what Defendants see as incompleteness. Further, both sides appear to agree that, as noted in the *Hughes* analysis, Tanner graphs are known and understood in the relevant art. (Dkt. No. 101-12 at 28.) The concerns expressed by both sides in the present case can therefore be best addressed by a construction that explains the Tanner graph as Plaintiff proposes but that also expressly refers to the graph that is set forth in the claims.

The Court therefore construes the Tanner graph of Claims 11 and 18 of the ’032 Patent to mean “the graph of Claims 11 and 18 representing an IRA code as a set of parity checks where every message bit is repeated, at least two different subsets of message bits are repeated a different

number of times, and check nodes, each randomly connected to subsets of the message bits, enforce constraints that determine the parity bits through accumulation.”

h. “low density [generator matrix transformation/coder]”

<p style="text-align: center;">“low-density” “low density” ('710 Patent, Claims 13, 20, 28; '032 Patent, Claims 6, 13 '781 Patent, Claim 5)</p>	
Plaintiff’s Proposed Construction	Defendants’ Proposed Construction
Plain and ordinary meaning	Indefinite

(Dkt. No. 84-1 at 9; Dkt. No. 101 at 21; Dkt. No. 115-1 at 1.)

i. The Parties’ Positions

Plaintiff argues that “[l]ow density” in reference to a matrix is an established, widely used, and clearly understood term in the field of error-correction coding and related computing fields,” and “[i]t generally refers to a matrix having mostly zeroes and relatively few ones.” (Dkt. No. 101 at 21 (citations omitted).) Plaintiff also argues that “Samsung’s focus on a numerical cutoff ignores the relevant context: multiplication of large matrices, where the goal is to maintain sub-quadratic (e.g., linear) computing complexity.” (*Id.* at 24.) Further, Plaintiff notes that the construction of the term “low-density generator matrix coder” in *Broadcom* included the phrase “low-density.” (*Id.* at 26.)

Defendants respond that “[t]he intrinsic record does not provide any example of a particular generator matrix that is considered ‘low density’ and does not delineate what differentiates a ‘low-density’ generator matrix from any other density of generator matrix. ‘Low-density’ is therefore indefinite because it is a term of degree for which the intrinsic record fails to provide any ‘objective boundaries,’ thus leaving a POSITA uncertain what densities fall within the scope of the claims and what do not.” (Dkt. No. 109 at 24 (citation omitted).) “Finally,” Defendants argue,

“Caltech’s reliance on the fact that other defendants in other cases apparently made a strategic decision not to argue that ‘low-density’ is indefinite has no bearing on this case[.]” (*Id.* at 30.)

Plaintiff replies that “[t]he undisputed evidence establishes that ‘low density’ in the context of a generator matrix has a well-established and consistent meaning in the art that would be readily understood by a POSITA.” (Dkt. No. 112 at 9.) Plaintiff argues that “[e]ven if processor characteristics affected whether exploits are available for a given matrix, that does not make the determination subjective.” (*Id.* at 10.)

ii. Analysis

As a threshold matter, Plaintiff notes that the district court in *Broadcom* included the phrase “low-density” in the construction of the term “low-density generator matrix coder” (Dkt. No. 101-10, Court’s Additional Claim Constructions, at 2), but the absence of an indefiniteness challenge as to “low-density” in that case is of limited probative value in the present case.

The disputed term appears, for example, in Claim 13 of the ’710 Patent, which depends from Claim 11. Claims 11 and 13 of the ’710 Patent recite:

11. A method of encoding a signal, comprising:

receiving a block of data in the signal to be encoded, the data block including a plurality of bits;

first encoding the data block such that each bit in the data block is repeated and two or more of said plurality of bits are repeated a different number of times in order to form a first encoded data block; and

second encoding the first encoded data block in such a way that bits in the first encoded data block are accumulated.

* * *

13. The method of claim 11, wherein the first encoding is via a *low-density* generator matrix transformation.

(’710 Patent at Claims 11, 13) (emphasis added). The specification discloses:

In an alternate embodiment, the outer coder 202 may be a low-density generator matrix (LDGM) coder that performs an irregular repeat of the k bits in the block, as shown in FIG. 4. As the name implies, an LDGM code has a *sparse (low-density)* generator matrix.

(’710 Patent at 3:51–55) (emphasis added).

This usage of “sparse” in the specification is notable, and Defendants agree that “sparse” is a synonym for “low-density.” (Dkt. No. 109 at 26.) Plaintiff cites a technical dictionary definition of “sparse matrix” as meaning:

A matrix usually arising in the context of linear algebraic equations of the form $Ax = b$ in which A is of large order and has a high proportion of zero elements (greater than, say, 90%). Special techniques are available that exploit the large number of zeros and reduce considerably the computational effort when compared to a general full matrix.

(Dkt. No. 101-21, *A Dictionary of Computing by the Oxford University Press* 517 (7th ed. 2016).)

In general, “[t]he claims, when read in light of the specification and the prosecution history, must provide objective boundaries for those of skill in the art” and cannot depend on the “unpredictable vagaries of any one person’s opinion,” so indefiniteness can arise from “facially subjective claim language without an objective boundary.” *Interval Licensing LLC v. AOL, Inc.*, 766 F.3d 1364, 1371, 1373 (Fed. Cir. 2014). Also, the parties appear to agree that “low density” is a term of degree, and “[w]hen a word of degree is used, the court must determine whether the patent provides some standard for measuring that degree.” *Nautilus*, 783 F.3d at 1378 (citations and quotations omitted).

Defendants note that “[e]ven Caltech’s own evidence acknowledges that a precise definition of ‘low-density’ is ‘difficult to give.’” (Dkt. No. 109 at 27 (quoting Dkt. No. 101-21, Åke Björck, *Numerical Methods for Least Squares Problems* 215 (1996)).)

But “[t]he definiteness requirement . . . mandates clarity[] while recognizing that absolute precision is unattainable.” *Nautilus*, 572 U.S. at 910. As the Federal Circuit has explained:

While there must be objective boundaries, . . . a patentee need not define his invention with mathematical precision in order to comply with the definiteness requirement. Indeed, patentees often use descriptive words to avoid a strict numerical boundary to the specified parameter. Claim language employing terms of degree has long been found definite where it provided enough certainty to one of skill in the art when read in the context of the invention.

Niazi Licensing Corp. v. St. Jude Med. S.C., Inc., 30 F.4th 1339, 1347 (Fed. Cir. 2022) (citations, quotations, and alterations omitted).

Here, the above-discussed intrinsic and extrinsic evidence demonstrates that a person of ordinary skill would understand “low density” with reasonable clarity in the context of the claims at issue. *See Verve, LLC v. Crane Cams, Inc.*, 311 F.3d 1116, 1120 (Fed. Cir. 2002) (considering extrinsic evidence of usage and understanding of the term in the relevant context); *see also Phillips*, 415 F.3d at 1313 (“the person of ordinary skill in the art is deemed to read the claim term not only in the context of the particular claim in which the disputed term appears, but in the context of the entire patent, including the specification”).

The opinions of Plaintiff’s expert further reinforce that “low density” has a reasonably clear meaning to a person of ordinary skill in the relevant art, such as that a “low density” matrix has significantly more zeros than ones such that the number of necessary computations increases in a linear relationship to the length of the codewords rather than in a squared relationship to the length of the codewords. (*See* Dkt. No. 101-1, Shoemake Decl. at ¶¶ 293–94, 300, 302, 313, 316–336; *see also* Dkt. No. 101-2, Shoemake Rebuttal Decl. at ¶¶ 15–18, 20, 23, 28–30, 37, 42, 47–48.) The opinions of Defendants’ expert do not compel otherwise. (*See* Dkt. No. 109-2, Bims Decl. at ¶¶ 44–49; *see also* Dkt. No. 109-3, Bims Rebuttal Decl. at ¶ 29.)

At the hearing, Defendants argued that indefiniteness is further apparent because computational efficiency is implementation-specific since it is affected, for example, by the particular computer processor, memory size, and instruction set being used. (Dkt. No. 124 at

76:21–77:9; *see also id.* at 83:16–25; Dkt. No. 109-3, Bims Rebuttal Decl. at ¶ 29.) Plaintiff persuasively responded that infringement can be determined on a case-by-case basis without giving rise to any indefiniteness. (Dkt. No. 124 at 89:21–92:10; *see also Nevro Corp. v. Boston Scientific Corp.*, 955 F.3d 35, 39 (Fed. Cir. 2020) (“The test for indefiniteness is not whether infringement of the claim must be determined on a case-by-case basis. Instead, it is simply whether a claim ‘inform[s] those skilled in the art about the scope of the invention with reasonable certainty.’”) (quoting *Nautilus*, 572 U.S. at 910).)

The *Halliburton*, *U.S. Well Services*, *Evicam*, and *Advanced Display* cases cited by Defendants also do not compel a different conclusion. *Halliburton*, 514 F.3d at 1254; *U.S. Well Servs., Inc. v. Halliburton Co.*, 2022 WL 819548, at *5 (W.D. Tex. Jan. 17, 2022) (“pumps . . . configured to pump fluid into the wellbore at high pressure so that the fluid passes from the wellbore into the formation, and fractures the formation”); *Evicam Int’l, Inc. v. Enforcement Video, LLC*, 2016 WL 6470967, at *20 (E.D. Tex. Nov. 2, 2016); *Advanced Display Techs. v. AU Optronics Corp.*, 2012 WL 2872121, at *13–14 (E.D. Tex. July 12, 2012) (“the claims and specification fail to provide an objective standard to determine whether the [*sic*] a surface is ‘highly’ modulated”).

In *Halliburton*, the “fragile gel” limitation involved well properties that would necessarily vary from well to well. Similarly, in *U.S. Well Services*, the phrase “high pressure” was recited in relation to whether the pressure was sufficient to fracture a rock formation. In *Evicam*, the phrase “extended prior of time” was completely subjective. Defendants’ reliance on *Advanced Display* is also unavailing because, in that case, the “specification provide[d] no objective framework regarding what is necessary to serve the inventor’s purposes.” *Advanced Display*, 2012 WL 2872121, at *13. In the present case, by contrast, Plaintiff submits persuasive evidence that “low

density” (as well as its synonym “sparse”) is commonly used in the relevant art to describe matrices, as discussed above, and does not depend on what is being encoded.

Finally, Defendants note that the extrinsic evidence cited by Plaintiff includes several examples of “low” density ranging from 26.7% down to 10% or less, which Defendants argue is too wide a range to demonstrate any reasonably clear meaning, but Plaintiff’s expert persuasively opines that the examples of 26.7% and 20% are pedagogical examples that do not reflect the understanding of persons of skill in the art of what “low density” means in this context. (*See* Dkt. No. 101-2, Shoemake Rebuttal Decl. at ¶¶ 29–30.)

In sum, the parties’ arguments essentially boil down to a factual dispute as to whether this term of art is understood by persons of ordinary skill in the art with sufficient clarity to satisfy the *Nautilus* standard as well as the authorities addressing terms of degree. Having reviewed the briefing and the competing expert declarations, and having heard the oral arguments of counsel, the Court finds that the term “low density” is reasonably clear as used in the context of these claims.

Defendants thus have not demonstrated indefiniteness by clear and convincing evidence and the Court therefore hereby expressly rejects Defendants’ arguments in that regard. *Sonix*, 844 F.3d at 1377. Defendants present no alternative proposed construction, and no further construction is necessary. The Court accordingly hereby construes “**low-density**” and “**low density**” to have their **plain meaning**.

V. CONCLUSION

The Court adopts the constructions set forth in this opinion for the disputed terms of the patents-in-suit.

The parties are ordered that they may not refer, directly or indirectly, to each other’s claim construction positions in the presence of the jury. Likewise, the parties are ordered to refrain from

mentioning any portion of this opinion, other than the actual definitions adopted by the Court, in the presence of the jury. Any reference to claim construction proceedings is limited to informing the jury of the definitions adopted by the Court.

So ORDERED and SIGNED this 7th day of March, 2023.



RODNEY GILSTRAP
UNITED STATES DISTRICT JUDGE