

**IN THE UNITED STATES DISTRICT COURT
FOR THE DISTRICT OF DELAWARE**

INTELLECTUAL VENTURES I LLC, :

Plaintiff, :

v. :

C.A. No. 13-1668-LPS

AT&T MOBILITY LLC; AT&T
MOBILITY II LLC; and NEW
CINGULAR WIRELESS SERVICES,
INC., :

Defendants, :

and :

ERICSSON INC. AND
TELEFONAKTIEBOLAGET LM
ERICSSON :

Intervenors. :

INTELLECTUAL VENTURES I LLC, :

Plaintiff, :

v. :

C.A. No. 13-1669-LPS

LEAP WIRELESS INTERNATIONAL,
INC. and CRICKET
COMMUNICATIONS, INC., :

Defendants, :

and :

ERICSSON INC. AND
TELEFONAKTIEBOLAGET LM
ERICSSON :

Intervenors. :

INTELLECTUAL VENTURES I LLC, :

Plaintiff, :

v. :

C.A. No. 13-1670-LPS

NEXTEL OPERATIONS, INC. and :

SPRINT SPECTRUM L.P., :

Defendants, :

and :

ERICSSON INC. AND :

TELEFONAKTIEBOLAGET LM :

ERICSSON :

Intervenors. :

INTELLECTUAL VENTURES I LLC, :

Plaintiff, :

v. :

C.A. No. 13-1671-LPS

T-MOBILE USA, INC. and T-MOBILE :

US, INC., :

Defendants, :

and :

ERICSSON INC. AND :

TELEFONAKTIEBOLAGET LM :

ERICSSON :

Intervenors. :

INTELLECTUAL VENTURES I LLC,

Plaintiff,

v.

UNITED STATES CELLULAR
CORPORATION,

Defendant,

and

ERICSSON INC. AND
TELEFONAKTIEBOLAGET LM
ERICSSON

Intervenors.

C.A. No. 13-1672-LPS

INTELLECTUAL VENTURES II LLC,

Plaintiff,

v.

AT&T MOBILITY LLC; AT&T
MOBILITY II LLC; and NEW
CINGULAR WIRELESS SERVICES,
INC.,

Defendants,

and

ERICSSON INC. AND
TELEFONAKTIEBOLAGET LM
ERICSSON

Intervenors.

C.A. No. 14-1229-LPS

INTELLECTUAL VENTURES II LLC, :

Plaintiff, :

v. :

C.A. No. 14-1230-LPS

LEAP WIRELESS INTERNATIONAL, :
INC. and CRICKET :
COMMUNICATIONS, INC., :

Defendants, :

and :

ERICSSON INC. AND :
TELEFONAKTIEBOLAGET LM :
ERICSSON :

Intervenors. :

INTELLECTUAL VENTURES II LLC, :

Plaintiff, :

v. :

C.A. No. 14-1231-LPS

NEXTEL OPERATIONS, INC. and :
SPRINT SPECTRUM L.P., :

Defendants, :

and :

ERICSSON INC. AND :
TELEFONAKTIEBOLAGET LM :
ERICSSON :

Intervenors. :

INTELLECTUAL VENTURES II LLC, :
:
Plaintiff, :
:
v. :
:
T-MOBILE USA, INC. and T-MOBILE :
US, INC., :
Defendants, :
and :
:
ERICSSON INC. AND :
TELEFONAKTIEBOLAGET LM :
ERICSSON :
:
Intervenors. :

C.A. No. 14-1232-LPS

INTELLECTUAL VENTURES II LLC, :
:
Plaintiff, :
:
v. :
:
UNITED STATES CELLULAR :
CORPORATION, :
:
Defendant, :
and :
:
ERICSSON INC. AND :
TELEFONAKTIEBOLAGET LM :
ERICSSON :
:
Intervenors. :

C.A. No. 14-1233-LPS

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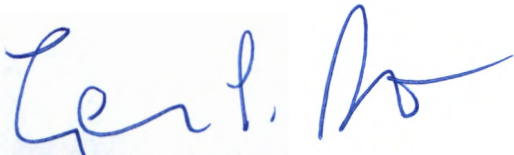
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MEMORANDUM OPINION

August 12, 2016
Wilmington, Delaware



STARK, U.S. District Judge:

Plaintiffs Intellectual Ventures I LLC and Intellectual Ventures II LLC (“Plaintiffs”) filed this patent infringement suit against AT&T Mobility LLC, AT&T Mobility II LLC, New Cingular Wireless Services, Inc., Cricket Communications, Inc., Nextel Operations, Inc., Sprint Spectrum L.P., T-Mobile USA, Inc., T-Mobile US, Inc., and United States Cellular Corporation (collectively, “Defendants”) on October 7, 2013. (D.I. 1)¹ Pending is the issue of claim construction for several disputed terms in the patents-in-suit: U.S. Patent No. 5,602,831 (“the ‘831 patent”), U.S. Patent No. 6,952,408 (“the ‘408 patent”), U.S. Patent No. 6,640,248 (“the ‘248 patent”), U.S. Patent No. 7,385,994 (“the ‘994 patent”), and U.S. Patent No. 7,787,431 (“the ‘431 patent”).²

The parties submitted a joint claim construction brief (“JCCB”) on March 9, 2016. (D.I. 208) The Court held a claim construction hearing on April 4, 2016. (D.I. 239) (“Tr.”) After the hearing, the Court ordered additional briefing regarding the ‘408 patent (D.I. 226), which was completed on April 25, 2016 (D.I. 230, 232, 236, 237).

¹All references to the Docket Index (“D.I.”) are to C.A. No. 13-1668.

²The patents can be found in the record at D.I. 175. While claim construction was pending, the Patent Trial & Appeal Board (PTAB) invalidated two of the patents that had been included in the claim construction briefing for this case: U.S. Patent Nos. 6,370,153 and 5,963,557. (See D.I. 216) Subsequently, the parties indicated that the Court did not need to consider those patents during claim construction. (D.I. 221)

I. LEGAL STANDARDS

Claim construction is a question of law. See *Teva Pharm. USA, Inc. v. Sandoz, Inc.*, 135 S. Ct. 831, 837 (2015) (citing *Markman v. Westview Instruments, Inc.*, 517 U.S. 370, 388-91 (1996)). “It is a bedrock principle of patent law that the claims of a patent define the invention to which the patentee is entitled the right to exclude.” *Phillips v. AWH Corp.*, 415 F.3d 1303, 1312 (Fed. Cir. 2005) (internal quotation marks omitted). “[T]here is no magic formula or catechism for conducting claim construction.” *Id.* at 1324. Instead, the court is free to attach appropriate weight to sources “in light of the statutes and policies that inform patent law.” *Id.*

“[T]he words of a claim are generally given their ordinary and customary meaning [This 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 1312-13 (internal citations and quotation marks omitted). “[T]he ordinary meaning of a claim term is its meaning to the ordinary artisan after reading the entire patent.” *Id.* at 1321 (internal quotation marks omitted). The patent specification “is always highly relevant to the claim construction analysis. Usually, it is dispositive; it is the single best guide to the meaning of a disputed term.” *Vitronics Corp. v. Conceptor, Inc.*, 90 F.3d 1576, 1582 (Fed. Cir. 1996).

While “the claims themselves provide substantial guidance as to the meaning of particular claim terms,” the context of the surrounding words of the claim also must be considered.

Phillips, 415 F.3d at 1314. Furthermore, “[o]ther claims of the patent in question, both asserted and unasserted, can also be valuable sources of enlightenment . . . [b]ecause claim terms are normally used consistently throughout the patent” *Id.* (internal citation omitted).

It is likewise true that “[d]ifferences among claims can also be a useful guide For example, the presence of a dependent claim that adds a particular limitation gives rise to a presumption that the limitation in question is not present in the independent claim.” *Id.* at 1314-15 (internal citation omitted).

It is also possible that “the specification may reveal a special definition given to a claim term by the patentee that differs from the meaning it would otherwise possess. In such cases, the inventor’s lexicography governs.” *Id.* at 1316.

It bears emphasis that “[e]ven when the specification describes only a single embodiment, the claims of the patent will not be read restrictively unless the patentee has demonstrated a clear intent to limit the claim scope using words or expressions of manifest exclusion or restriction.” *Liebel-Flarsheim Co. v. Medrad, Inc.*, 358 F.3d 898, 906 (Fed. Cir. 2004) (internal quotation marks omitted).

In addition to the specification, a court “should also consider the patent’s prosecution history, if it is in evidence.” *Markman v. Westview Instruments, Inc.*, 52 F.3d 967, 980 (Fed. Cir. 1995), *aff’d*, 517 U.S. 370 (1996). The prosecution history, which is “intrinsic evidence,” “consists of the complete record of the proceedings before the PTO [Patent and Trademark Office] and includes the prior art cited during the examination of the patent.” *Phillips*, 415 F.3d at 1317. “[T]he prosecution history can often inform the meaning of the claim language by demonstrating how the inventor understood the invention and whether the inventor limited the invention in the course of prosecution, making the claim scope narrower than it would otherwise be.” *Id.*

In some cases, “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*, 135 S. Ct. at 841. Extrinsic evidence “consists of all evidence external to the patent and prosecution history, including expert and inventor testimony, dictionaries, and learned treatises.” *Markman*, 52 F.3d at 980. For instance, expert testimony can be useful “to ensure that the court’s understanding of the technical aspects of the patent is consistent with that of a person of skill in the art, or to establish that a particular term in the patent or the prior art has a particular meaning in the pertinent field.” *Id.* Nonetheless, courts must not lose sight of the fact that “expert reports and testimony [are] generated at the time of and for the purpose of litigation and thus can suffer from bias that is not present in intrinsic evidence.” *Id.* Overall, while extrinsic evidence “may be useful” to the court, it is “less reliable” than intrinsic evidence, and its consideration “is unlikely to result in a reliable interpretation of patent claim scope unless considered in the context of the intrinsic evidence.” *Id.* at 1318-19. Where the intrinsic record unambiguously describes the scope of the patented invention, reliance on any extrinsic evidence is improper. *See Pitney Bowes, Inc. v. Hewlett-Packard Co.*, 182 F.3d 1298, 1308 (Fed. Cir. 1999) (citing *Vitronics*, 90 F.3d at 1583).

Finally, “[t]he 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.” *Renishaw PLC v. Marposs Societa’ per Azioni*, 158 F.3d 1243, 1250 (Fed. Cir. 1998). It follows that “a claim interpretation that would exclude the inventor’s device is rarely the correct interpretation.” *Osram GmbH v. Int’l Trade Comm’n*, 505 F.3d 1351, 1358 (Fed. Cir. 2007)

(quoting *Modine Mfg. Co. v. United States Int'l Trade Comm'n*, 75 F.3d 1545, 1550 (Fed. Cir. 1996)).

II. PERSON OF ORDINARY SKILL IN THE ART

The parties do not agree on who a person of ordinary skill in the art (“POSA”) would be in the context of the patents-in-suit. Plaintiffs contend that a POSA “would have been a person with a bachelor’s degree in electrical engineering, computer engineering, or computer science with 3-4 years’ experience in communications” or, alternatively, “would have a master’s degree in electrical engineering, computer engineering, or computer science with coursework in digital communications theory and 1-2 years’ experience in communications.” (JCCB at 5) Defendants disagree, but do not contend that their disagreements would make a material difference for purposes of claim construction. (JCCB at 6 n.5) Accordingly, the Court will use Plaintiffs’ proposed definition of a POSA.³

III. CONSTRUCTION OF THE DISPUTED TERMS

A. The ‘831 patent

U.S. Patent No. 5,602,831, entitled “Optimizing Packet Size to Eliminate Effects of Reception Nulls,” was filed on March 31, 1995 and issued on February 11, 1997. The patent generally discloses methods that enable communication systems to send and receive messages despite the presence of signal “nulls” that introduce errors into messages. (*See* ‘831 patent at Abstract) The methods primarily involve reordering and interleaving data in order to reduce the frequency of consecutive errors. (*See id.* at Figs.6 & 9, 5:66-6:56) (explaining why it is easier to

³Defendants identify a different level of ordinary skill for each patent. (*See* JCCB at 6 n.5) Because the different conceptions of the POSA “do not impact” the claim construction dispute (*id.*), the Court does not need to resolve this disagreement.

correct non-consecutive errors and showing how reordering data reduces number of consecutive errors))

1. “identifying changes in signal drop-out characteristics”
 (‘831 patent, claim 1)

Plaintiffs’ Proposed Construction	Plain and ordinary meaning or “indicator of signal quality or loss in a communication system”
Defendants’ Proposed Construction	“more than one characteristic of a signal drop-out”
Court’s Construction	“more than one characteristic of a signal drop-out”

Plaintiffs argue that this term should be construed according to its plain and ordinary meaning or, alternatively, as an “indicator of signal quality or loss in a communication system.” Defendants argue that a signal drop-out characteristic is simply a characteristic of a signal drop-out. The Court agrees with Defendants.

Defendants’ construction is supported by intrinsic evidence. Figures 1, 3, 4, 5, and 7 explicitly equate signal drop-out characteristics with traits of a signal drop-out. (*See* ‘831 patent at Figs.1, 3-5, 7, and at 2:61-3:9 (explaining that figures depict signal drop-out characteristics), 1:22-29, 5:5-11 (“When the receiver is moving at 15 MPH (FIG. 3), nulls have a relatively wide time duration and have a relatively long time period between adjacent nulls”)) By contrast, Plaintiffs’ alternate construction replaces the claim language with terms that are neither referenced nor discussed in either the patent specification or the claims.

Plaintiffs further argue that a “change” to a single trait qualifies as a change to the “signal drop-out characteristics” as a whole (JCCB at 12), while Defendants contend that the claim term requires a change in multiple characteristics (JCCB at 13). The Court agrees with Defendants.

The disputed claim term requires “changes” to “signal drop-out characteristics.” Both “changes” *and* “characteristics” are plural. Plaintiffs’ claim differentiation argument (based on a comparison of claims 1 and 2) does not alter this conclusion, as claim 2 (unlike claim 1) limits the possible “signal drop-out characteristics” to “duration(s)” or “time period(s).”

2. “encoding packets into packet blocks”
 (‘831 patent, claim 1)

Plaintiffs’ Proposed Construction	Plain and ordinary meaning or “forming blocks from packet data converted to compensate for signal drop-out”
Defendants’ Proposed Construction	“forming blocks by interleaving a discrete number of packets together”
Court’s Construction	“forming blocks by interleaving a discrete number of packets together”

The parties disagree about whether this claim term requires a discrete number of packets. Defendants argue that the term requires a discrete number of packets, while Plaintiffs argue that the claim should be construed to allow packet segmentation – a technique that would place *fractions* of packets into packet blocks. The Court agrees with Defendants.

Defendants’ construction is supported by the language of claim 1, which refers to “packets” and not “packet data.” Other claims (such as 10) refer to “portions of . . . packets,” but this language does not appear in claim 1. Similarly, the specification only speaks of “packets” making up “packet blocks” and does not discuss partial packet data. Consistent with the Court’s conclusion is the PTAB’s determination that, even under a broadest reasonable interpretation claim construction standard, “packet blocks” mean “a block of data including a discrete number

of packets.” (D.I. 207-17 Ex. O at 8) Plaintiffs’ extrinsic evidence – presented to this Court but not to the PTAB – does not change the Court’s conclusion.⁴

3. **“an encoder for combining and varying the number of packets transmitted in each of the packet blocks”**
 (‘831 patent, claim 9)

Plaintiffs’ Proposed Construction	Plain and ordinary meaning
Defendants’ Proposed Construction	“an encoder for forming blocks by interleaving a discrete number of packets together and varying the number of packets transmitted in each of the blocks”
Court’s Construction	“an encoder for forming blocks by interleaving a discrete number of packets together and varying the number of packets transmitted in each of the blocks”

The disputes relating to this term are identical to those involving the previous term. (*See* JCCB at 40-41) Accordingly, the Court adopts Defendants’ construction.⁵

B. The ‘408 Patent

U.S. Patent No. 6,952,408, entitled “Method of Baseband Frequency Hopping Utilizing

⁴The parties originally disagreed about whether the claim requires interleaving, but this dispute was resolved at the hearing. (*See* Tr. 40-41 (explaining that Plaintiffs would support construction that required “interleaving” as that term was articulated by patentee in IPR); *see also id.* at 47-48)

⁵Plaintiffs offer one argument that is unique to this term. They argue that a construction requiring interleaving would violate the doctrine of claim differentiation by eliminating any distinction between claims 9 and 10. *See Starhome GmbH v. AT&T Mobility LLC*, 743 F.3d 849, 858-59 (Fed. Cir. 2014 (describing claim differentiation)). But the presence of interleaving is not the only difference between claims 9 and 10. Claim 10 also requires a “register for storing packets” and requires only that “portions” of each of the packets are interleaved. (*See* ‘831 patent at 9:27-38) These differences undermine Plaintiffs’ claim differentiation argument. *See Starhome*, 743 F.3d at 858-59 (explaining that claim differentiation is based on presumption that two claims will not have identical scope). Moreover, Plaintiffs’ agreement that claim 1 requires interleaving appears to extend to claim 9. (*See* Tr. 40-41)

Time Division Multiplexed Mapping Between a Radio Transceiver and Digital Signal Processing Resources,” was filed on February 20, 2001 and issued on October 4, 2005. The patent generally discloses methods of “frequency hopping” that enable basestations to communicate more efficiently with mobile subscribers. (See ‘408 patent at abstract)

4. “frequency hopping”
 (‘408 patent, claims 1, 2)

Plaintiffs’ Proposed Construction	Preamble is not limiting. To the extent it is found to be limiting, “frequency hopping” should be construed as “allowing mobile stations to communicate with basestations on different transmission frequencies, the transmission frequency changing between bursts of information” or as “switching the frequency in a non-sequential sequence”
Defendants’ Proposed Construction	This preamble term limits the claim and should be construed as “varying the frequency used at predetermined intervals using different hop sequences that are non-correlated between basestations using a subset of the same frequencies”
Court’s Construction	The preamble term limits the claim and means “switching the frequency in a non-sequential sequence”

The term “frequency hopping” appears in the preamble to claim 1 of the ‘408 patent. The parties disagree about whether the preamble is limiting and, if so, how it should be construed.⁶

The Court concludes that the preamble is limiting and adopts the construction of “frequency

⁶At first, the parties disagreed only as to whether the term should be viewed as a limiting preamble. (See JCCB at 79-82) At the hearing, however, it became clear that the parties also disagreed as to the substantive meaning of the term. (See Tr. 89-104) The Court ordered additional post-hearing briefing relating to this term. (See D.I. 226)

hopping” that was offered by Plaintiffs during an IPR of the ‘408 patent: “switching the frequency in a non-sequential sequence.” (See D.I. 175-35 Ex. GG at 15)

While preambles generally do not limit the scope of a patent’s claims, see *Summit 6, LLC v. Samsung Elecs. Co.*, 802 F.3d 1283, 1292 (Fed. Cir. 2015), a preamble can be limiting if it is relied upon to distinguish the claimed invention from the prior art, see *Catalina Mktg. Int’l. Inc. v. Coolsavings.com, Inc.*, 289 F.3d 801, 808 (Fed. Cir. 2002). During the IPR of the ‘408 patent, Plaintiffs did just that. (See D.I. 175-35 Ex. GG at 3, 28 (describing frequency hopping as a “key element of the claims” and arguing that prior art failed to “sufficiently address ‘frequency hopping’”)) During the IPR, Plaintiffs also argued that “construction of ‘frequency hopping’ is useful in understanding and interpreting the features recited in independent claim 1 of the ‘408 patent.” (*Id.* at 16)

Furthermore, the term “frequency hopping” appears in the patent’s title and throughout the specification. The term is needed to “give life, meaning, and vitality to the claim.” Thus, again, it is limiting. See *Catalina*, 289 F.3d at 808.

As it will be treated as a claim limitation, and the parties’ dispute its meaning, the Court construes “frequency hopping” as “switching the frequency in a non-sequential sequence.” This construction was offered by Plaintiffs during the IPR (D.I. 175-35 Ex. GG at 15) and is supported by Defendants (D.I. 232 at 3). This construction is also consistent with the claim language and the specification. (See ‘408 patent at 2:42-54, 11:43-56 (describing frequency hopping)) By contrast, Defendants’ proposed construction seems to require multiple base stations and a hop sequence that is “non-correlated” between those multiple basestations – requirements that are at odds with the claim, which contemplates that frequency hopping can be used even if there is only

a single basestation. (See ‘408 patent at 13:18-20 (“A method for frequency hopping in a cellular communications system . . . with *a* basestation . . .”) (emphasis added))

5. **“a structure for allocating ones of baseband outputs from a digital channelizer to ones of logical inputs of digital signal processors and allocating ones of baseband inputs of a digital combiner to ones of logical outputs of said digital signal processors according to said mapping signal”**
(‘408 patent, claim 2)

<p>Plaintiffs’ Proposed Construction</p>	<p>Not a means-plus-function limitation.</p> <p>To the extent it is found to be a means plus function limitation, it has the following construction:</p> <p>Function: allocating ones of baseband outputs from a digital channelizer to ones of logical inputs of digital signal processors and allocating ones of baseband inputs of a digital combiner to ones of logical outputs of said digital signal processors according to said mapping signal.</p> <p>Structure: Bus.</p>
<p>Defendants’ Proposed Construction</p>	<p>Means-plus-function limitation under § 112 ¶ 6</p> <p>Function: (1) allocating ones of baseband outputs from a digital channelizer to ones of logical inputs of digital signal processors and (2) allocating ones of baseband inputs of a digital combiner to ones of logical outputs of said digital signal processors according to said mapping signal</p> <p>Structure: time division multiplexed bus</p>
<p>Court’s Construction</p>	<p>Means-plus-function limitation under § 112 ¶ 6</p> <p>Function: (1) allocating ones of baseband outputs from a digital channelizer to ones of logical inputs of digital signal processors and (2) allocating ones of baseband inputs of a digital combiner to ones of logical outputs of</p>

said digital signal processors according to said mapping signal

Structure: time division multiplexed bus

The parties disagree about whether this claim term should be construed as a means-plus-function limitation and, if so, what accompanying structure is disclosed in the specification. The Court agrees with Defendants' on both disputes.

To determine whether means-plus-function claiming applies, the Court considers whether the words of the claim would be “understood by persons of ordinary skill in the art to have a sufficiently definite meaning as the name for structure.” *Williamson v. Citrix Online, LLC*, 792 F.3d 1339, 1349 (Fed. Cir. 2015). When the claim term lacks the words “means,” there is a presumption that means-plus function claiming does not apply. *See id.* This presumption can be overcome “if the challenger demonstrates that the claim term fails to ‘recite sufficiently definite structure.’” *Id.*

Defendants have shown that the claim fails to recite sufficiently definite structure. In fact, the claim does not recite **any** structure. Instead, the claim merely describes the structure as “a structure.” (‘408 patent at 13:30) The claim does not contain any additional details or limitations that provide guidance as to meaning. Hence, the term “structure” amounts to a nonce word that imparts no more meaning than words like “means,” “mechanism,” “element,” or “device.” *See Williamson*, 792 F.3d at 1350 (listing words that “typically do not connote sufficiently definite structure”).

Construing a means-plus-function claim term involves two steps. “First, the court must determine the claimed function. Second, the court must identify the corresponding structure in

the written description of the patent that performs that function.” *Applied Med. Res. Corp. v. U.S. Surgical Corp.*, 448 F.3d 1324, 1332 (Fed. Cir. 2006) (internal citation omitted). While the parties agree about the function disclosed by the present term, they disagree about the recited structure. Plaintiffs contend that the specification discloses a generic bus. Defendants, however, persuasively show that the corresponding structure is a “time division multiplexed bus.” When describing how the functions are performed, the specification refers exclusively to a time division multiplex; there is no mention or discussion of any other kind of bus. (*See* ‘408 patent 5:25-40, 6:48-52)

In defending their proposed construction, Plaintiffs point to specification language indicating that the time division multiplex bus “operates as a time division multiplexed cross-bar switch.” (*Id.* 5:34-39) Plaintiffs then argue that any bus can function as a cross-bar switch and, thus, that the structure for this claim term includes *any* bus. (JCCB at 90) But means-plus-function claims are limited to the structure disclosed in the patent specification and corresponding to the claimed function. *See Med. Instrumentation & Diagnostics Corp. v. Elekta AB*, 344 F.3d 1205, 1219 (Fed. Cir. 2003). The fact that one can identify non-disclosed structures that can perform the disclosed function does not change this rule. The specification does not disclose a generic bus structure.

C. The ‘248 Patent

U.S. Patent No. 6,640,248, entitled “Application-Aware, Quality of Service (QoS) Sensitive, Media Access Control (MAC) Layer,” was filed on July 9, 1999 and issued on October 28, 2003. The patent discloses an application aware media access control layer that can detect

applications of different types and can allocate a network resource to those applications based on application type. (See ‘248 patent at abstract)

6. **“allocating resources”/ “allocates bandwidth resource”/ “allocates resources”**
 (‘248 patent, claims 1, 20)

Plaintiffs’ Proposed Construction	Plain and ordinary meaning.
Defendants’ Proposed Construction	“[allocating / allocates] an amount of bandwidth”
Court’s Construction	“[allocating / allocates] an amount of bandwidth”

The parties do not appear to have a material dispute with respect to these claim terms. At oral argument, Plaintiffs were unable to articulate a relevant difference between the plain and ordinary meaning of the disputed terms and Defendants’ proposed construction. (See Tr. 117 (“I don’t know whether we’re fighting over anything.”))

To the extent that there is a difference between the proposed constructions, the Court will adopt Defendants’ proposal. Defendants’ construction is supported by the patent specification, which equates allocating bandwidth with allocating an amount of bandwidth. (‘248 patent at 64:19-23 (“Different applications have different QoS requirements in order to provide an acceptable end-user experience. For example, bandwidth allocation (i.e., allocating an appropriate amount of bandwidth) is important to an application performing FTP file transfer downloads”)); see also *SkinMedica, Inc. v. Histogen Inc.*, 727 F.3d 1187, 1201 (Fed. Cir. 2013) (stating that “i.e.” “signals an intent to define the word to which it refers”).

7. “application aware resource allocator at the MAC layer” /
 “application-aware media access control (MAC) layer”
 (‘248 patent, claims 1, 20)

Plaintiffs’ Proposed Construction	Plain and ordinary meaning, except the preamble of claim 20 is not limiting, or “[a resource allocator at the MAC layer/a MAC layer] that allocates resources based on application type”
Defendants’ Proposed Construction	<p>“a [resource allocator/ media access control layer] that has knowledge of the type of data application and further takes into account, when allocating bandwidth, information about applications at International Standards Organization’s Open Systems Interworking (OSI) application layer 7”</p> <p>In Claim 20, this term appears in the preamble and limits the claim, and thus should be construed as set forth above.</p>
Court’s Construction	<p>“a [resource allocator/ media access control layer] that has knowledge of the type of data application and further takes into account, when allocating bandwidth, information about applications at International Standards Organization’s Open Systems Interworking (OSI) application layer 7”</p> <p>In Claim 20, this term appears in the preamble and limits the claim, and thus should be construed as set forth above.</p>

The parties have two disputes with respect to this claim term. First, the parties dispute whether the resource allocator must “take into account” information about applications at OSI application layer 7. Defendants argue that the term should be construed to require the resource allocator to take layer 7 information into account. Plaintiffs acknowledge that the resource

allocator must have access to layer 7 information, but have argued that the allocator need not take that information into account when allocating network resources.

This portion of the parties' dispute appears to have been resolved at oral argument, during which Plaintiffs agreed with the substance of Defendants' construction. In an exchange, the Court asked, "Do the claims require that information about applications at layer 7 be accounted for?" (Tr. 141) In response, Plaintiffs answered "I think they do, Your Honor, yes. I think the MAC layer has to account for in some fashion the information." (*Id.*) Accordingly, the Court will adopt Defendants' proposed construction.⁷

The parties also dispute whether the preamble in which this term appears should be construed as limiting in the context of claim 20. As explained above, a preamble can be limiting where a patentee "reli[ed] on the preamble during prosecution to distinguish the claimed invention from the prior art." *Catalina*, 289 F.3d at 808. Defendants have shown that the patentee relied on the preamble during prosecution to distinguish claim 20 from the prior art. (*See* JCCB at 117) In particular, during prosecution the patent applicant argued that claim 20 was patentable over the prior art "[f]or at least the reasons discussed above with reference to independent claim 1." (D.I. 175-40 Ex. LL at 12) When distinguishing the prior art, the applicant argued that claim 1 requires that the invention is "aware of layer 7 application information" and that claim 1 uses information from upper level layers when allocating resources. (*Id.* at 10) Because the applicant relied on the layer-7 requirement when

⁷Defendants' position is also supported by the prosecution history, during which the patentee distinguished its invention from prior art based on the fact that the invention is "aware of layer 7 application information" and, further, that the resource allocator must "be able to take into account, when allocating bandwidth, information at . . . layer 7." (D.I. 175-40 Ex. LL at 10; D.I. 175-39 Ex. KK at 9)

distinguishing claim 20 from the prior art, the preamble should be construed as limiting.

Accordingly, the Court will adopt Defendants’ proposed construction.

8. **“a module operative to recognize an application type of said software application associated with said IP flow” / “identifying means for identifying an application type of a software application associated with an IP flow”**
 (‘248 patent, claims 17, 20)

<p>Plaintiffs’ Proposed Construction</p>	<p>Means-plus-function limitation under § 112 ¶ 6</p> <p>Function: to recognize an application type of said software application associated with said IP flow</p> <p>Function: identifying an application type of a software application associated with an IP flow</p> <p>Structure: Packet header identification component 1502 or 1602.</p>
<p>Defendants’ Proposed Construction</p>	<p>Means-plus-function limitation under § 112 ¶ 6</p> <p>Function: to recognize an application type of said software application associated with said IP flow</p> <p>Structure: None</p> <p>Function: identifying an application type of a software application associated with an IP flow</p> <p>Structure: None</p>
<p>Court’s Construction</p>	<p>Means-plus-function limitation under § 112 ¶ 6</p> <p>Function: to recognize an application type of said software application associated with said IP flow</p>

Function: identifying an application type of a software application associated with an IP flow

Structure: Packet header identification component 1502 or 1602

The parties agree that these terms should be construed as means-plus-function terms pursuant to § 112 ¶ 6 and agree on the functions. They disagree, however, about the corresponding structure. Defendants contend that the patent's specification does not disclose sufficient structure and, consequently, that the claims are invalid as indefinite.⁸ Plaintiffs argue that packet header identification components 1502 and 1602 form the corresponding structure. The Court agrees with Plaintiffs.

The specification contains a detailed discussion of components 1502 and 1602, explaining what they are and how they function. Specifically, Figures 15A and 16A provide a flow chart indicating how the packet header components are used to identify an application type associated with an IP flow. The specification further provides a detailed explanation of how components 1502 and 1602 recognize an application type. (*Id.* at 62:41-64:43, 68:23-38, 69:5-36) The specification explains:

An IP flow packet stream from data network 142, including packets from various IP flows (where each IP flow is associated with a single data "call") is received at packet header identification

⁸Throughout the briefing, Plaintiffs attempt to defend their patent claims from attacks of indefiniteness by pointing out that one or more of the Defendants proposed constructions of the disputed claim terms during IPR proceedings. (*See, e.g.*, JCCB at 94 (defending '408 patent), 124 (defending '248 patent), 168 (defending '994 patent), 222 (defending '431 patent)) The Court is unpersuaded by this argument. The PTAB does not consider whether a claim is indefinite. *See* 35 U.S.C. § 311(b). The fact that Defendants proposed constructions in order to facilitate IPR challenges on grounds of obviousness and anticipation is not a concession that a POSA would arrive at those constructions with "reasonable certainty."

component 1502. . . . For IP flows known to the system, so-called “existing IP flows,” there are entries in a table 1526. An IP flow is in the system if there is an existing characterized IP data call. In module 1522, it is determined if there is a match between the incoming packet and an existing IP flow call in an entry in existing IP flow identification table 1526. If so, then the IP flow is known to the system, and control passes to module 1530 of the packet characterization component 1504.

If not, meaning that the IP flow is a new IP data flow, then control passes to module 1524, where the packet header fields are analyzed. Module 1524 analyzes the packet header source field and determines from source application packet header data table 1528 the type of source application making the data call or transmitting the IP packet. . . . If the IP flow is not known to the system, then the IP flow is given an IP flow identifier number, and control passes to module 1526 where the IP flow identifier number is added to the existing IP flow identification table 1526.

(‘248 patent at 63:14-54) This is adequate corresponding structure for both of the claimed functions.

Accordingly, the Court will adopt Plaintiffs’ proposed construction.

9. **“allocating means for allocating resources to said IP flow . . . so as to optimize end user application IP QoS requirements of said software application”**
(‘248 patent, claim 20)

<p>Plaintiffs’ Proposed Construction</p>	<p>Means-plus-function limitation under § 112 ¶ 6</p> <p>Function: allocating resources to said IP flow . . . so as to optimize end user application IP QoS requirements of said software application</p> <p>Structure: MAC downlink subframe scheduler module 1566 or MAC uplink subframe scheduler 1666.</p> <p>To the extent necessary, the algorithm is</p>
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	“assigning future slots to data packets based on the priority of the IP data flow with which the packet is associated”
Defendants’ Proposed Construction	Means-plus-function limitation under § 112 ¶ 6 Function: Indefinite/ allocating resources to said IP flow . . . so as to optimize end user application IP QoS requirements of said software application Structure: None
Court’s Construction	Means-plus-function limitation under § 112 ¶ 6 Function: Indefinite Structure: The Court does not reach this issue

While the parties agree that this term should be construed as a means-plus-function term pursuant to § 112 ¶ 6, they disagree about the scope of the claimed function and about the sufficiency of the structure disclosed in the specification. Defendants argue that the term “optimize,” as used in the claimed function, is indefinite, since the specification does not provide any objective boundaries that would allow a POSA to know whether a given system is optimized. The Court agrees.

In *Nautilus, Inc. v. Biosig Instruments, Inc.*, 134 S. Ct. 2120, 2124 (2014), the Supreme Court held that a patent “is invalid for indefiniteness if its claims, read in light of the specification . . . fails to inform, with reasonable certainty, those skilled in the art about the scope of the invention.” “[A] term of degree fails to provide sufficient notice of its scope if it depends on the unpredictable vagaries of any one person’s opinion.” *Interval Licensing LLC v. AOL, Inc.*, 766 F.3d 1364, 1371 (Fed. Cir. 2014) (citing *Nautilus*, 134 S. Ct. at 2130).

In explaining what it means to “optimize” end user QoS, the specification indicates that QoS is subjective and that QoS can vary from user to user based on individual preferences. (*See* ‘248 patent at 13:20-27 (explaining that system seeks to “provide[] user[s] with optimal service, in whatever manner the user defines it”); *see also id.* at 12:62-65 (explaining that QoS is continuum that is “defined by what network performance characteristic is most important to a particular user”)) This subjective, user-based understanding would make it difficult, if not impossible for a POSA to ascertain, with reasonable certainty, whether the claim limitation is satisfied by any particular embodiment. As Defendants’ expert opined, the specification “provides no objective boundaries” and leaves the standard for measuring optimization “completely unbounded.” (D.I. 210-6 Ex. A5 ¶¶ 78-81)

In response to these arguments, Plaintiffs identify portions of the specification that “provide[] specific examples of which QoS criteria are the ‘best measure’ of end-user QoS for particular applications.” (JCCB at 144 (citing ‘248 patent at 2:54-62, 14:43-50)) The cited portions of the specification, however, do not provide adequate guidance as to the meaning of “optimize,” nor do they rectify the indefiniteness of the portions of the specification indicating that QoS is subjective and varies by user. Based on the intrinsic and extrinsic evidence, the Court is persuaded, by clear and convincing evidence, that the term “optimize,” as it is used in the ‘248 patent is indefinite.⁹

Because the Court concludes that the recited function for this term is indefinite, the Court does not reach the disputes relating to the adequacy of the recited structure and algorithm.

⁹This conclusion is consistent with previous decisions relating to similar terms. *See, e.g., Netgear, Inc. v. Ruckus Wireless, Inc.*, 5 F. Supp. 3d 592, 610 (D. Del. 2013) (concluding that term “optimal conditions” was indefinite).

D. The '994 Patent

U.S. Patent No. 7,385,994, entitled "Packet Data Queuing and Processing," was filed on October 23, 2002 and issued on June 10, 2008. The patent generally relates to methods and means for allocating a limited bandwidth resource to many users in a shared network setting.

The invention involves four structures: data, data packets, data packet queues, and data packet queue tiers. Data refers to information that users want to send over a network. In order to be sent, the data must be organized into data packets. ('994 patent at 1:67-2:4 ("In packet-switched data networks, information or messages are divided into . . . data packets for transmission.")) These data packets are placed into data packet queues, which are used to determine the order in which data packets will be sent. (*Id.* at 2:52-57 ("Hence, a number of data packets are 'queued' until the gateway transfers the data packet The gateway includes a gateway queue algorithm that determines how [bandwidth] is to be shared between queued data packets from the respective clients."))

The network systems implicated by the '994 patent typically have several data packet queues that share the same bandwidth resource. (*See id.* at 2:67-3:1) The invention shares the bandwidth across different queues by assigning each queue to a tier. Each tier is assigned a weight that is used to determine what proportion of bandwidth resources will be allocated to each tier. (*See id.* at 4:13-29)

10. **“allocating a proportion of said total number of data packets to a number of the tiers of service to allow individual packet data queues on a number of tiers to share a communication resource”**
 (‘994 patent, claims 1, 11)

Plaintiffs’ Construction	Plain and ordinary meaning
Defendants’ Construction	“allocating a known fraction of said total number of data packets to each of a number of tiers of service to share a communication resource among individual data packet queues on a number of tiers”
Court’s Construction	Plain and ordinary meaning

Plaintiffs argue that the Court need only say that the plain and ordinary meaning applies to this term. Defendants, by contrast, seek to modify the claim term in several ways. First, Defendants ask the Court to construe “proportion” as “a known fraction.” The Court agrees with Plaintiffs that this improperly reads in a limitation from an embodiment in the specification and confusingly raises the issue of “known to whom?” Second, Defendants ask the Court to read the claim language “a number of the tiers” to mean “each of a number of tiers.” But nothing in the specification requires that each tier receives an allocation. In fact, the specification contemplates that at least some tiers will be left out. (See ‘994 patent at 4:44-47 (explaining that method “provid[es] [a] communication resource to queued packet data users . . . such that [the] communication resource is made available to **a substantial number of tiers**”) (emphasis added)) Moreover, the patentee used the word “each” elsewhere in the claims impacted by this dispute, and in other claims. (See, e.g., ‘994 patent at 7:23, 9:19, 10:23) It follows that the patent’s use of “a number” rather than “each” was intentional, thereby cautioning against reading “each” into the claim where it does not appear. See *Philips*, 415 F.3d at 1314. Finally, Defendants’

construction would rearrange certain words in the claim and replace certain words with others. The parties have not shown they have any material dispute with respect to this portion of Defendants’ proposal, which is a reason for the Court to refrain from adopting it. In sum, as Defendants’ proposed construction is unsupported by the intrinsic evidence and might be confusing to the jury, the Court adopts Plaintiffs’ position.

11. **“means for allocating a tier of service for each of a plurality of individual packet data queues, wherein the means for allocating allocates different weights to each tier of service based on a number of users requiring access to the available communication resource”**
 (‘994 patent, claim 11)

<p>Plaintiffs’ Proposed Construction</p>	<p>Means-plus-function limitation under § 112 ¶ 6</p> <p>Function: allocating a tier of service for each of a plurality of individual packet data queues, wherein the means for allocating allocates different weights to each tier of service based on a number of users requiring access to the available communication resource</p> <p>Structure: RNC236-240 and/or Logic 248-250 implementing algorithm: $\varphi_{\text{tier}_i} = (N_{\text{tier}_i} * S_{\text{tier}_i}) / (\sum_{k=1 \text{ to } L} N_{\text{tier}_k} * S_{\text{tier}_k})$</p>
<p>Defendants’ Proposed Construction</p>	<p>Means-plus-function limitation under § 112 ¶ 6</p> <p>Function: allocating a tier of service for each of a plurality of individual packet data queues, wherein the means for allocating allocates different weights to each tier of service based on a number of users requiring access to the available communication resource</p> <p>Structure: None</p>

<p>Court's Construction</p>	<p>Means-plus-function limitation under § 112 ¶ 6</p> <p>Function: allocating a tier of service for each of a plurality of individual packet data queues, wherein the means for allocating allocates different weights to each tier of service based on a number of users requiring access to the available communication resource</p> <p>Structure: RNC236-240 and/or Logic 248-250 implementing algorithm: $\varphi_{\text{tier}_i} = (N_{\text{tier}_i} * S_{\text{tier}_i}) / (\sum_{k=1 \text{ to } L} N_{\text{tier}_k} * S_{\text{tier}_k})$</p>
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The parties agree that this term should be construed as a means-plus-function term, and agree on the function, but they disagree about the disclosed structure. Plaintiffs argue that the specification discloses an algorithm ($\varphi_{\text{tier}_i} = (N_{\text{tier}_i} * S_{\text{tier}_i}) / (\sum_{k=1 \text{ to } L} N_{\text{tier}_k} * S_{\text{tier}_k})$) to implement the stated function. Defendants argue that the algorithm identified by Plaintiffs is not sufficiently linked to the stated function and that no other algorithm is disclosed. The Court agrees with Plaintiffs.

The specification teaches that “weights” are used to control or determine the “relative proportions of system bandwidth allocated to each tier.” (‘994 patent at 6:59-63) The specification further explains that “weight” can be denoted with a “ φ ” symbol. (*See id.* at 3:6-7 (explaining that one can define “parameters $\varphi_1 \dots \varphi_N$ (weights) that set the number of bits allocated to each user per round”)) Hence, the equation identified by Plaintiffs performs the function described by the claim term: it assigns a weight (a φ value) to each tier based on the number of users operating at that tier (N_i) and in the system as a whole.

Defendants argue that Plaintiffs’ equation is not clearly linked to the stated function. (Tr.

165 (“[T]he specification does not clearly link IV’s identified φ_{tier_j} formula to the different weight function.”); D.I. 209 at 4-5) Defendants’ argument is based on the patent’s somewhat inconsistent use of the terms “weight” and “proportion.” At one point, the patent associates “ φ ” with weight (‘994 patent at 3:6-7) , while at another point it describes “ φ ” as a “proportion” (*id.* at 7:34-44 (“Thus, the proportion of the entire system resource, allocated to the *l*th tier . . . can be defined by [Plaintiffs’ equation].”)) While these criticisms seem to show that the patent is not a model of drafting perfection, they do not, in the Court’s view, amount to reason to disregard the specification’s language clearly associating “ φ ” with tier weight.

As the Court has found that “ φ ” can be used to define tier weights, it follows that Plaintiffs’ equation provides sufficient structure. A person of ordinary skill in the art would recognize that Plaintiffs’ equation is the only structure in the specification that performs the identified function – no other equation assigns weight-values based on the number of users attempting to access a bandwidth resource. (*See also* PMX 24 ¶¶ 36-38 (expert report indicating that Plaintiffs’ equation is based on number of users))

12. “means for determining a total number of data packets that can use an available communication resource”
 (‘994 patent, claim 11)

Plaintiffs’ Proposed Construction	Means-plus-function limitation under § 112 ¶ 6 Function: determining a total number of data packets that can use an available communication resource Structure: RNC236-240 and/or Logic 248-250 using the method disclosed at 6:29-37.
Defendants’ Proposed Construction	Means-plus-function limitation under § 112 ¶ 6

	<p>Function: determining a total number of data packets that can use an available communication resource</p> <p>Structure: None</p>
Court's Construction	<p>Means-plus-function limitation under § 112 ¶ 6</p> <p>Function: determining a total number of data packets that can use an available communication resource</p> <p>Structure: RNC236-240 and/or Logic 248-250 using the method disclosed at 6:29-37.</p> <p>Specifically, the total number of data packets is equal to the bandwidth speed*round duration/packet size. This structure, and thus the claim, only applies where data packets are of a fixed size.</p>

The parties agree that this term should be construed as a means-plus-function term pursuant to § 112 ¶ 6, and agree on the function, but once again disagree as to the corresponding structure. Plaintiffs argue that the specification discloses an algorithm that can be used to calculate the number of data packets: bandwidth speed*round duration/packet size. (See '994 patent at 6:29-37 (providing example)) Defendants respond that the specification does not provide sufficient structure and the limited structure contained in the specification applies only when data packets are of the same size.

In the Court's view, the specification contains sufficient detail to satisfy the structural requirements of the means-plus-function claim term. An algorithm need not be presented in any particular form in order to provide sufficient corresponding structure. So long as the specification provides sufficient detail, the algorithm may be expressed "in any understandable terms including as a mathematical formula, in prose, or as a flow chart, or in any other manner

that provides sufficient structure.” *See Noah Systems, Inc.*, 675 F.3d 1302, 1312 (Fed. Cir. 2012).

The ‘994 patent uses an illustrative example to describe how to determine the number of packets that can be sent during a period. (*See* ‘994 patent at 6:29-37) The specification states: “[I]f users compete for a 10 Mbps link, the users transmit data packets of length 1 kbit and . . . the round period is 10 msec . . . [then] in each round 100 packets are allocated.” That is, the number of packets that can be sent is equal to the total number of bits that can be transferred divided by the number of bits in a packet. (*See* D.I. 211-1 Ex. A8 (Rubin 2nd Supp. Decl.) ¶ 28 (describing equation))¹⁰

While the algorithm provided in the specification works for systems with a fixed packet length, it cannot be used to determine how many packets can be sent in an environment with a variable packet length. (*See id.* ¶¶ 29-31) Because means-plus-function claims are limited to the structure disclosed in the specification, *see Med. Instrumentation & Diagnostics Corp.*, 344 F.3d at 1219, the scope of the disputed claim term must be limited to systems having a fixed packet length.

It is true that the specification states that “the inventive concepts could still be applied when non-fixed length packets are employed.” (*Id.* at 6:38-41; Tr. 155 (suggesting that one could use same equation in variable-packet-size environment by using average, minimum, or maximum, packet size)) While this statement arguably hints at an algorithm that could be

¹⁰This is consistent with the patent’s example. When one converts the units involved in the example, the problem involves a link that can send 10,000,000 bits per second, with data packets having a length of 1,000, and a period lasting .01 seconds. This yields an equation of $10,000,000 \cdot .01 / 1,000 = 100,000 / 1,000 = 100$.

provided to allow the invention to work with non-fixed length packets, it is not the algorithm itself, and the algorithm to do so does not appear in the patent.

13. **“scheduling means to provide said communication resource to queued packet data users on a tier-by-tier basis, such that said resource is made available to all tiers”**
 ('994 patent, claim 11)

<p>Plaintiffs' Proposed Construction</p>	<p>Means-plus-function limitation under § 112 ¶ 6</p> <p>Function: provide said communication resource to queued packet data users on a tier-by-tier basis, such that said resource is made available to all tiers</p> <p>Structure: RNC236-240 and/or Logic 248-250 adapted to facilitate packet queuing and scheduling in a round-robin fashion as disclosed in the patent at 7:53-8:14</p>
<p>Defendants' Proposed Construction</p>	<p>Means-plus-function limitation under § 112 ¶ 6</p> <p>Function: provide said communication resource to queued packet data users on a tier-by-tier basis, such that said resource is made available to all tiers</p> <p>Structure: None</p>
<p>Court's Construction</p>	<p>Means-plus-function limitation under § 112 ¶ 6</p> <p>Function: provide said communication resource to queued packet data users on a tier-by-tier basis, such that said resource is made available to all tiers</p> <p>Structure: RNC236-240 and/or Logic 248-250 adapted to facilitate packet queuing and scheduling in a round-robin fashion as disclosed in the patent at 7:53-8:14</p>

The parties agree that this term should be construed as a means-plus-function term pursuant to § 112 ¶ 6, and agree as to the function, but disagree about the disclosed structure. Defendants argue that the specification does not disclose an algorithm that performs the identified function. Plaintiffs disagree. The Court sides with Plaintiffs.

The specification provides a detailed explanation of how the communication resource is distributed to each user and to all tiers. (See ‘994 patent at 7:53-8:14) Specifically, the patent explains that θ_i packets are allocated to each tier in succession and that, within each tier, the θ packets are distributed in a round-robin fashion. (See *id.*) This is a sufficient algorithm.

14. **“means . . . for allocating a proportion of said total number of data packets to a number of the tiers of service to allow individual packet data queues on a number of tiers to share a communication resource”**
 (‘994 patent, claim 11)

Plaintiffs’ Proposed Construction	Means-plus-function limitation under § 112 ¶ 6 Function: allocating a proportion of said total number of data packets to a number of the tiers of service to allow individual packet data queues on a number of tiers to share a communication resource Structure: RNC236-240 and/or Logic 248-250 implementing the algorithm $\theta_i = \phi_{i,j} - * \beta$
Defendants’ Proposed Construction	Means-plus-function limitation under § 112 ¶ 6 Function: allocating a proportion of said total number of data packets to a number of the tiers of service to allow individual packet data queues on a number of tiers to share a communication resource Structure: None
Court’s Construction	Means-plus-function limitation under § 112 ¶ 6 Function: allocating a proportion of said total

number of data packets to a number of the tiers of service to allow individual packet data queues on a number of tiers to share a communication resource

Structure: RNC236-240 and/or Logic 248-250 implementing the algorithm $\theta_i = \varphi_{tier} \cdot \beta_i$

Once again, the parties agree that this term should be construed as a means-plus-function term pursuant to § 112 ¶ 6, and agree on the function, but disagree about the corresponding structure. Plaintiffs argue that the specification discloses an algorithm that can be used to allocate a proportion of data packets to a number of tiers of service. (See '994 patent at 7:47-51 (explaining that number of packets allocated to each tier is $\theta_i = \varphi_{tier} \cdot \beta_i$)) Defendants argue that Plaintiffs' proposed structure is inadequate because it is not sufficiently linked to the agreed-upon function. Specifically, Defendants argue that Plaintiffs' proposed algorithm is insufficient because it relates to a **number** of data packets, rather than a **proportion** of data packets. (Tr. 176 (arguing that θ_i "defines the actual number of packets that can be allocated to a tier . . . not a proportion . . ."); D.I. 211 at 8-9)

The Court agrees with Plaintiffs. The number of data packets allocated to each tier (θ_i) is equal to a proportion (φ_{tier}) of the total number of data packets. (See '994 patent at 7:44-51) This means that allocating θ_i packets necessarily allocates a proportion of the total number of data packets to tier i . (See '994 patent at 8:1-2 (explaining that packets are distributed "in the pre-allocated proportions for each tier"))

Therefore, the specification discloses sufficient corresponding structure and the Court will adopt Plaintiffs' proposed construction.

E. The ‘431 Patent

U.S. Patent No. 7,787,431, entitled “Methods and Apparatus for Multi-Carrier Communications with Variable Channel Bandwidth,” was filed on April 29, 2005 and issued on August 31, 2010. The patent generally discloses methods that enable multi-carrier communication with variable channel bandwidth. (‘431 patent at abstract)

15. “primary preamble sufficient to enable radio operations”
(‘431 patent, claims 8, 18)

Plaintiffs’ Proposed Construction	Plain and ordinary meaning.
Defendants’ Proposed Construction	“information at the beginning of a transmission that alone enables data channels and control channels in the coreband to be received and processed” Alternatively, this claim term is indefinite.
Court’s Construction	“information at the beginning of a transmission that alone <u>enables</u> radio operations”

The parties have three disputes relating to this claim term. Defendants contend that the primary preamble must be located at the beginning of a transmission, that the preamble “alone” should be able to enable radio operations, and that “radio operations” should be limited to receiving and processing data channels and control channels. Plaintiffs disagree on each of these issues and argue that the claim term should be construed according to its plain and ordinary meaning. The Court agrees with Defendants with respect to the first two issues, but agrees with

Plaintiffs on the third.¹¹ Alternatively, Defendants contend the term is indefinite, but they have failed to prove this contention.

First, the Court concludes that the primary preamble must be located at the beginning of a transmission. This conclusion is supported by the plain and ordinary meaning of “preamble” and by the specification. The plain and ordinary meaning of a “preamble,” in the context of the pertinent art, is an introductory or preliminary statement. Indeed, Plaintiffs acknowledge that, “in common parlance, a ‘preamble’ is something that precedes something else.” (JCCB at 201) Consistent with this plain and ordinary meaning, the specification states that “[t]he downlink transmission in each frame begins with a downlink preamble” and that “uplink transmission[s] can begin with an uplink preamble.” (‘431 patent at 3:51-52, 56-60 (explaining that uplink preamble is used for “initial ranging during power up”)) Although unnecessary to consider, Defendants’ construction of “preamble” is further supported by extrinsic evidence. (See D.I. 210-2 Ex. A2 (engineering dictionary defining preamble as “a sequence of bits at the start of each new transmission.”))

The Court also agrees with Defendants that the primary preamble must be sufficient, in and of itself, to enable radio operations. The plain and ordinary meaning of “sufficient,” as understood in this art, supports this conclusion. If something is “sufficient” to perform a task, then that something is adequate, in and of itself, to perform the task. It thus follows that the

¹¹With respect to this claim term, the PTAB stated: “We determine that, in the context of the ‘431 patent, ‘a primary preamble sufficient for basic radio operation’ means a primary preamble sufficient for a mobile station to operate in its primary state..” (See D.I. 210-33 PMX25 at 13)

primary preamble *alone* must be able to enable basic radio operations. This construction is supported by at least one embodiment in the specification. (See ‘431 patent at 5:19-22)

On the third dispute, the Court agrees with Plaintiffs that “radio operations” should be construed according to its plain and ordinary meaning. Defendants would have the Court construe “radio operations” as “receiving and processing data channels and control channels.” Defendants’ position is based on a statement in the specification that “a set of data channels and their related dedicated control channels are placed within the [core band] to *maintain* basic radio operation.” (*Id.* at 5:8-18) (emphasis added) But “maintaining” basic radio operation is not the same thing as “enabling” radio operation (the latter being part of the term being construed). Also, the portion of the specification on which Defendants rely relates to “basic radio operation,” while the claim term in dispute references “radio operations,” which may be a broader term. Where claims use different terms to identify similar claim limitations, there is a presumption that those different terms have different meanings. *See Bancorp Servs., L.L.C v. Hartford Life Ins. Co.*, 359 F.3d 1367, 1373 (Fed. Cir. 2004). All of this leaves the Court unpersuaded that it should adopt the last part of Defendants’ proposed construction.

16. **“an autocorrelation having a large correlation peak with respect to sidelobes; a cross-correlation with other primary preambles having a small cross-correlation coefficient with respect to power of other primary preambles; and a small peak-to-average ratio; and wherein a large number of primary preamble sequences exhibit the properties”** (‘431 patent, claims 8, 18)

Plaintiffs’ Proposed Construction	Plain and ordinary meaning.
Defendants’ Proposed Construction	Indefinite
Court’s Construction	Indefinite

The claim language in dispute here uses terms of degree: “large” two times and “small” two times. Defendants argue that each of these terms is indefinite because, in the context of the claims here, a POSA would not understand the terms “large” and “small” with “reasonable certainty.” *See Nautilus, Inc.*, 134 S. Ct. at 2124.

The Court agrees with Defendants. The claim limitation “a large number of primary preamble sequences exhibit the properties” is illustrative. Nothing in the claim language, specification, or prosecution history provides any guidance as to the meaning of the phrase “a large number.” (*See* ‘431 patent at 5:35-36, 49-50 (indicating only that number of primary preamble sequences must be “relatively large”)) Turning to the extrinsic evidence, *see Teva*, 135 S. Ct. at 841, Defendants’ expert, Jeffrey Fischer, opined that a POSA would not understand what constitutes a “large number.” (D.I. 210-4 Ex. A4 ¶¶ 65-69) Fischer explained that “the patent does not provide any guidance that would allow one of ordinary skill in the art to determine with reasonable certainty when a count of sequences becomes ‘large.’” (*Id.* ¶ 65) Fischer also opined that the specification’s use of the phrase “relatively large” increases uncertainty by “impl[ying] that the number of sequences should be compared to something else, without explaining what that is.” (*Id.* ¶ 68) The Court finds Fischer’s analysis persuasive.

By contrast, Plaintiffs’ expert’s declaration is conclusory and fails to explain how a POSA would be able to distinguish between large numbers and almost-large numbers. (*See* PMX 12

¶ 18) The PTO Examiner statements on which Plaintiffs rely are also generally unpersuasive, both because the Examiner did not expressly address the terms and because the patent was prosecuted under the less exacting, pre-*Nautilus* standard for indefiniteness.¹²

Overall, the totality of evidence, intrinsic and extrinsic, clearly and convincingly demonstrates that the claim terms listed here, all of which include “large” or “small,” are invalid as indefinite.

17. **“wherein the core-band is substantially centered at an operating center frequency”**
(‘431 patent, claims 8, 18)

Plaintiffs’ Proposed Construction	Plain and ordinary meaning.
Defendants’ Proposed Construction	Indefinite
Court’s Construction	Plain and ordinary meaning

Defendants have failed to present clear and convincing evidence that the term “substantially centered” is indefinite. Defendants argue there is a lack of guidance in the claim language and in the patent specification. (JCCB at 230-31) However, the prosecution history supports Plaintiffs, as it shows the Examiner viewed this claim language as “balanc[ing] clarity with the fact that real-world systems have process and operational tolerances whereby a core-band may not be exactly centered . . . despite efforts to center the core band.” (D.I. 207-46 Ex. RR at IV-DEL 6279) Based on this reasoning, the Examiner expressly concluded that “one of ordinary skill in the relevant art would understand [the patent’s] use of ‘substantially.’” (*Id.*)

¹²In any case, the question of indefiniteness needs to be decided by the Court, even though any issued patent will, by definition, not have been found indefinite by the PTO.

Defendants have not persuaded the Court to reach a different conclusion.¹³

III. CONCLUSION

An appropriate Order follows.

¹³Defendants correctly note that the patent was prosecuted prior to the *Nautilus* decision. Still, with respect to this term, the Court agrees with the Examiner's express conclusion that a POSA "would understand" the term.

**IN THE UNITED STATES DISTRICT COURT
FOR THE DISTRICT OF DELAWARE**

INTELLECTUAL VENTURES I LLC, :

Plaintiff, :

v. :

C.A. No. 13-1668-LPS

AT&T MOBILITY LLC; AT&T
MOBILITY II LLC; and NEW
CINGULAR WIRELESS SERVICES,
INC., :

Defendants, :

and :

ERICSSON INC. AND
TELEFONAKTIEBOLAGET LM
ERICSSON :

Intervenors. :

INTELLECTUAL VENTURES I LLC, :

Plaintiff, :

v. :

C.A. No. 13-1669-LPS

LEAP WIRELESS INTERNATIONAL,
INC. and CRICKET
COMMUNICATIONS, INC., :

Defendants, :

and :

ERICSSON INC. AND
TELEFONAKTIEBOLAGET LM
ERICSSON :

Intervenors. :

INTELLECTUAL VENTURES I LLC, :

Plaintiff, :

v. :

C.A. No. 13-1670-LPS

NEXTEL OPERATIONS, INC. and :

SPRINT SPECTRUM L.P., :

Defendants, :

and :

ERICSSON INC. AND :

TELEFONAKTIEBOLAGET LM :

ERICSSON :

Intervenors. :

INTELLECTUAL VENTURES I LLC, :

Plaintiff, :

v. :

C.A. No. 13-1671-LPS

T-MOBILE USA, INC. and T-MOBILE :

US, INC., :

Defendants, :

and :

ERICSSON INC. AND :

TELEFONAKTIEBOLAGET LM :

ERICSSON :

Intervenors. :

INTELLECTUAL VENTURES I LLC, :
:
Plaintiff, :
:
v. :
:
UNITED STATES CELLULAR :
CORPORATION, :
:
Defendant, :
and :
:
ERICSSON INC. AND :
TELEFONAKTIEBOLAGET LM :
ERICSSON :
:
Intervenors. :

C.A. No. 13-1672-LPS

INTELLECTUAL VENTURES II LLC, :
:
Plaintiff, :
:
v. :
:
AT&T MOBILITY LLC; AT&T :
MOBILITY II LLC; and NEW :
CINGULAR WIRELESS SERVICES, :
INC., :
Defendants, :
and :
:
ERICSSON INC. AND :
TELEFONAKTIEBOLAGET LM :
ERICSSON :
:
Intervenors. :

C.A. No. 14-1229-LPS

INTELLECTUAL VENTURES II LLC, :

Plaintiff, :

v. :

C.A. No. 14-1230-LPS

LEAP WIRELESS INTERNATIONAL, :
INC. and CRICKET :
COMMUNICATIONS, INC., :

Defendants, :

and :

ERICSSON INC. AND :
TELEFONAKTIEBOLAGET LM :
ERICSSON :

Intervenors. :

INTELLECTUAL VENTURES II LLC, :

Plaintiff, :

v. :

C.A. No. 14-1231-LPS

NEXTEL OPERATIONS, INC. and :
SPRINT SPECTRUM L.P., :

Defendants, :

and :

ERICSSON INC. AND :
TELEFONAKTIEBOLAGET LM :
ERICSSON :

Intervenors. :

INTELLECTUAL VENTURES II LLC, :
 :
 Plaintiff, :
 :
 v. : C.A. No. 14-1232-LPS
 :
 T-MOBILE USA, INC. and T-MOBILE :
 US, INC., :
 Defendants, :
 and :
 :
 ERICSSON INC. AND :
 TELEFONAKTIEBOLAGET LM :
 ERICSSON :
 :
 Intervenors. :

INTELLECTUAL VENTURES II LLC, :
 :
 Plaintiff, :
 :
 v. : C.A. No. 14-1233-LPS
 :
 UNITED STATES CELLULAR :
 CORPORATION, :
 :
 Defendant, :
 and :
 :
 ERICSSON INC. AND :
 TELEFONAKTIEBOLAGET LM :
 ERICSSON :
 :
 Intervenors. :

ORDER

At Wilmington, this **12th** day of **August, 2016**:

For the reasons set forth in the Memorandum Opinion issued this date,

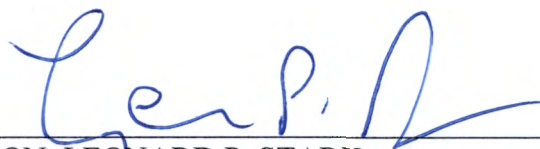
IT IS HEREBY ORDERED that the disputed claim terms of U.S. Patent Nos. 5,602,831

(“the ‘831 patent”), 6,952,408 (“the ‘408 patent”), 6,640,248 (“the ‘248 patent”), 7,385,994 (“the ‘994 patent”), and 7,787,431 (“the ‘431 patent”) are construed as follows:

<p>“identifying changes in signal drop-out characteristics”</p> <p>[‘831 patent, claim 1]</p>	<p>“more than one characteristic of a signal drop-out”</p>
<p>“encoding packets into packet blocks”</p> <p>[‘831 patent, claim 1]</p>	<p>“forming blocks by interleaving a discrete number of packets together”</p>
<p>“an encoder for combining and varying the number of packets transmitted in each of the packet blocks”</p> <p>[‘831 patent, claim 9]</p>	<p>“an encoder for forming blocks by interleaving a discrete number of packets together and varying the number of packets transmitted in each of the blocks”</p>
<p>“frequency hopping”</p> <p>[‘408 patent, claims 1, 2]</p>	<p>The preamble term limits the claim and means “switching the frequency in a non-sequential sequence”</p>
<p>“a structure for allocating ones of baseband outputs from a digital channelizer to ones of logical inputs of digital signal processors and allocating ones of baseband inputs of a digital combiner to ones of logical outputs of said digital signal processors according to said mapping signal”</p> <p>[‘408 patent, claim 2]</p>	<p>Means-plus-function limitation under § 112 ¶ 6</p> <p>Function: (1) allocating ones of baseband outputs from a digital channelizer to ones of logical inputs of digital signal processors and (2) allocating ones of baseband inputs of a digital combiner to ones of logical outputs of said digital signal processors according to said mapping signal</p> <p>Structure: time division multiplexed bus</p>
<p>“allocating resources”/ “allocates bandwidth resource”/ “allocates resources”</p> <p>[‘248 patent, claims 1, 20]</p>	<p>“[allocating / allocates] an amount of bandwidth”</p>
<p>“application aware resource allocator at the MAC layer” / “application-aware media access control (MAC) layer”</p> <p>[‘248 patent, claims 1, 20]</p>	<p>“a [resource allocator/ media access control layer] that has knowledge of the type of data application and further takes into account, when allocating bandwidth, information about applications at International Standards Organization’s Open Systems Interworking (OSI) application layer 7”</p> <p>In Claim 20, this term appears in the preamble and limits the claim, and thus should be construed as set forth above.</p>
<p>“a module operative to recognize an application type of said software application associated with said IP flow” / “identifying means for identifying</p>	<p>Means-plus-function limitation under § 112 ¶ 6</p> <p>Function: to recognize an application type of said</p>

<p>an application type of a software application associated with an IP flow”</p> <p>[‘248 patent, claims 17, 20]</p>	<p>software application associated with said IP flow</p> <p>Function: identifying an application type of a software application associated with an IP flow</p> <p>Structure: Packet header identification component 1502 or 1602</p>
<p>“allocating means for allocating resources to said IP flow . . . so as to optimize end user application IP QoS requirements of said software application”</p> <p>[‘248 patent, claim 20]</p>	<p>Means-plus-function limitation under § 112 ¶ 6</p> <p>Function: Indefinite</p> <p>Structure: The Court does not reach this issue</p>
<p>“allocating a proportion of said total number of data packets to a number of the tiers of service to allow individual packet data queues on a number of tiers to share a communication resource”</p> <p>[‘994 patent, claims 1, 11]</p>	<p>Plain and ordinary meaning</p>
<p>“means for allocating a tier of service for each of a plurality of individual packet data queues, wherein the means for allocating allocates different weights to each tier of service based on a number of users requiring access to the available communication resource”</p> <p>[‘994 patent, claim 11]</p>	<p>Means-plus-function limitation under § 112 ¶ 6</p> <p>Function: allocating a tier of service for each of a plurality of individual packet data queues, wherein the means for allocating allocates different weights to each tier of service based on a number of users requiring access to the available communication resource</p> <p>Structure: RNC236-240 and/or Logic 248-250 implementing algorithm:</p> $Q_{\text{tier}_i} = (N_{\text{tier}_i} * S_{\text{tier}_i}) / (\sum_{k=1 \text{ to } I} N_{\text{tier}_k} * S_{\text{tier}_k})$
<p>“means for determining a total number of data packets that can use an available communication resource”</p> <p>[‘994 patent, claim 11]</p>	<p>Means-plus-function limitation under § 112 ¶ 6</p> <p>Function: determining a total number of data packets that can use an available communication resource</p> <p>Structure: RNC236-240 and/or Logic 248-250 using the method disclosed at 6:29-37.</p> <p>Specifically, the total number of data packets is equal to the bandwidth speed*round duration/packet size. This structure, and thus the claim, only applies where data packets are of a fixed size.</p>
<p>“scheduling means to provide said communication resource to queued packet data users on a tier-by-tier basis, such that said</p>	<p>Means-plus-function limitation under § 112 ¶ 6</p> <p>Function: provide said communication resource to</p>

<p>resource is made available to all tiers”</p> <p>[‘994 patent, claim 11]</p>	<p>queued packet data users on a tier-by-tier basis, such that said resource is made available to all tiers</p> <p>Structure: RNC236-240 and/or Logic 248-250 adapted to facilitate packet queuing and scheduling in a round-robin fashion as disclosed in the patent at 7:53-8:14</p>
<p>“means . . . for allocating a proportion of said total number of data packets to a number of the tiers of service to allow individual packet data queues on a number of tiers to share a communication resource”</p> <p>[‘994 patent, claim 11]</p>	<p>Means-plus-function limitation under § 112 ¶ 6</p> <p>Function: allocating a proportion of said total number of data packets to a number of the tiers of service to allow individual packet data queues on a number of tiers to share a communication resource</p> <p>Structure: RNC236-240 and/or Logic 248-250 implementing the algorithm $\theta_i = \phi_{i,n} - * \beta_i$</p>
<p>“primary preamble sufficient to enable radio operations”</p> <p>[‘431 patent, claims 8, 18]</p>	<p>“information at the beginning of a transmission that alone enables radio operations”</p>
<p>“an autocorrelation having a large correlation peak with respect to sidelobes; a cross-correlation with other primary preambles having a small cross-correlation coefficient with respect to power of other primary preambles; and a small peak-to-average ratio; and wherein a large number of primary preamble sequences exhibit the properties”</p> <p>[‘431 patent, claims 8, 18]</p>	<p>Indefinite</p>
<p>“wherein the core-band is substantially centered at an operating center frequency”</p> <p>[‘431 patent, claims 8, 18]</p>	<p>Plain and ordinary meaning</p>



HON. LEONARD P. STARK
UNITED STATES DISTRICT COURT