United States District Court,
D. Delaware.

CIF LICENSING, LLC, d/b/a GE Licensing,
Plaintiff.
v.
AGERE SYSTEMS INC,
Defendants.

Civil Action No. 07-170-JJF

July 10, 2008.

Background: Owner of patents relating to technology used to optimize the rate at which data could be transmitted across communication channels brought infringement action against competitors. Parties disputed claim construction of certain terms and phrases.

Holdings: The District Court, Farnan, J., held that:
(1) term "receiver" meant any structure capable of receiving an electrical signal;
(2) term "selector" meant any structure that ran a decision algorithm;
(3) term "constellation" meant a finite set of points selected from an N-dimensional space, where N could be any positive integer;
(4) term "constellation switching" meant change between two constellations having different number of points;
(5) term "can be" was permissive, rather than mandatory;
(6) term "frame selector" meant a structure that could select the length of data in a frame; and
(7) term "zero insertion unit" meant a structure that could insert a zero when required.

Ordered accordingly.

5,446,758, 6,198,776. Cited.

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MEMORANDUM OPINION

FARNAN**, District Judge.**

Plaintiff CIF Licensing, LLC, d/b/a GE Licensing ("GE") filed this patent infringement action against Defendants Agere Systems, Inc. ("Agere") on March 23, 2007. GE's Complaint alleges infringement of U.S. Patent Nos. 5,048,054 (filed May 12, 1989) ("the '054 Patent"), 5,428,641 (filed Jul. 23, 1993) ("the '641 Patent"), 5,446,758 (filed Jul. 8, 1993) ("the '758 Patent,") and 6,198,776 (filed Dec. 29, 1997) ("the '776 Patent"). Presently before the Court is the parties' claim construction dispute regarding terms and phrases used in the '054 and '641 Patents. The parties also briefed, but subsequently agreed upon, the construction of terms and phrases in the '758 and '776 Patents. The Court held a Markman hearing on June 11, 2008 regarding construction of the terms and phrases that remain in contention, and this Memorandum Opinion provides the Court's construction of those claim terms and phrases.

I. BACKGROUND

The patents at issue relate to technology used to optimize the rate at which data can be transmitted across communication channels. The '054 Patent claims a "Line Probing Modem," which, after receiving a "line probing signal" from a remote device, can process that signal to determine which of several available frequency bands will provide for the most efficient communication between the two devices. The '641 Patent relates to a device and method for mapping a digital data sequence for transmission in a digital communications system.

II. Discussion

A. *Legal Standard*

[1] A patent specification must include a written description of the invention detailed enough to enable someone skilled in the art to make and use the invention, and it must include one or more claims that distinctly point out and claim the subject matter the patentee regards as his invention. 35 U.S.C. s. 112. Claim construction is a question of law. Markman v. Westview Instruments, Inc., 52 F.3d 967, 977-78 (Fed.Cir.1995), *aff'd,* 517 U.S. 370, 388-90, 116 S.Ct. 1384, 134 L.Ed.2d 577 (1996). A claim term should be construed to mean "what one of ordinary skill in the art at the time of the invention would have understood the term to mean." Markman, 52 F.3d at 986.

[2] [3] [4] [5] [6] The process of claim construction begins with an analysis of the claims themselves. Vitronics Corp. v. Conceptronic, Inc., 90 F.3d 1576, 1582 (Fed.Cir.1996); *see also* Pitney Bowes, Inc. v. Hewlett-Packard Co., 182 F.3d 1298, 1305 (Fed.Cir.1999) (stating that "[t]he starting point for any claim construction must be the claims themselves."). Although the words in a claim are generally to be given their ordinary and customary meaning, a patentee may choose to supply his own meaning for a term, as long as any specially defined words are clearly set forth in the patent. Vitronics, 90 F.3d at 1582. The Court must then review the patent specification to determine whether a term must be construed with a definition that varies from its ordinary meaning. Id. The specification is "the single best guide to the meaning of the disputed term." Id. However, "[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 intention 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) (quoting Teleflex, Inc. v. Ficosa N. Am. Corp., 299 F.3d 1313, 1327 (Fed.Cir.2002)). Further, where a patent drawing is set forth as a preferred embodiment of the invention, such a drawing is "not meant to represent 'the' invention or to limit the scope of coverage defined by the words used in the claims themselves." Gart v. Logitech, Inc., 254 F.3d 1334, 1342 (Fed.Cir.2001). The Court must also consider the patent's prosecution history, if in evidence. Vitronics, 90 F.3d at 1582.

[7] [8] [9] Extrinsic evidence may be properly consulted *only* if ambiguity as to the disputed terms' meaning remains after consideration of the claims themselves, the specification, and the prosecution history. Id. at 1583. If needed, "[e]xtrinsic evidence is to be used for the court's understanding of the patent, not for the

purpose of varying or contradicting the terms of the claims." Markman, 52 F.3d at 981. Prior art may be used to shed light on the patentee's understanding of a term as he used it in the patent. Arthur A. Collins, Inc. v. Northern Telecom Ltd., 216 F.3d 1042, 1045 (Fed.Cir.2000).

B. ***Construction of the Disputed Terms of the*** '054 Patent

The '054 Patent claims a "line probing modem," a device which addresses the challenge posed by the increased error rates that accompany high-speed data transfers across a digital communications network. The claimed device can receive a modulated signal from a remote device over any one of a multitude of frequency bands which may be concurrently available on a network. The modem uses a line probing signal to measure the characteristics of the various frequency bands, and it chooses to receive the data over the band that will yield the optimal signal-to-noise ratio for the data transfer. The modem also reduces the effects of impairments along the communication channel. The parties disagree over the proper construction of the following terms, which, for purposes of illustration, are highlighted in bold where they appear in claims 1, 12, and 46 of the '054 patent.

1. A modem for receiving data sent from a remote device over a communication channel by using a single carrier modulated signal, the modem comprising:

a. a **receiver** for receiving the modulated signal and for receiving a line probing signal sent by the remote device over the channel, the receiver being capable of receiving the modulated signal over any one of a plurality of frequency bands, said line probing signal simultaneously stimulating more than one of said plurality of frequency bands;

b. a **line probing processor** for measuring characteristics of the channel based upon the received line probing signal; and

c. a **selector for selecting one of the plurality of frequency bands,** said selection being based upon the measured characteristics of the channel, said selected frequency band to be used for receiving the modulated signal from the remote device.

....

12. A modem for receiving data sent from a remote device over a communication channel by using a single carrier modulated signal, the modem comprising:
a. a **receiver** for receiving the modulated signal and for receiving a line probing signal sent by the remote device over the channel, the receiver being capable of receiving the modulated signal over any one of a plurality of frequency bands, each one of said. plurality of frequency bands being characterized by a corresponding baud rate and carrier frequency;

b. a **line probe processor** for measuring characteristics of the channel based upon the received line probing signal; and

c. a **selector for selecting one of the plurality of frequency bands,** said selection being based upon the measured characteristics of the channel, the modulated signal from the remote device being received at the corresponding baud rate associated with said selected frequency band.

....

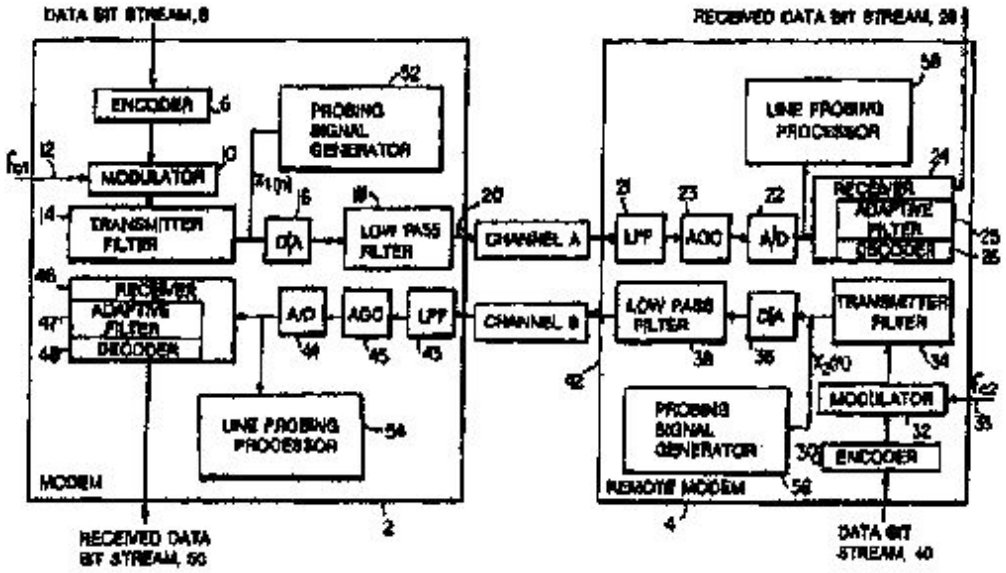
46. A modem for receiving data sent from a remote device over a communication channel by using a single carrier modulated signal, the modem comprising:
a. a **receiver** for receiving the modulated signal and for receiving a line probing signal sent by the remote

device over the channel, the receiver being capable of receivingthe modulated signal over any one of a plurality of bit rates;

b. a **line probing processor** for measuring characteristics of the channel based upon the received line probing signal; and

c. a **selector for selecting one of the plurality of bit rates,** said selection being based upon the measured characteristics of the receiver channel, the selected bit rate to be used for receiving the modulated signal from the remote device.

U.S. Patent No. 5,048,054, at col. 15 l. 21-38; col. 16 l. 17-36; col. 19 l. 40-56. Figure 1 is "a block diagram of a communications system which embodies the invention," and is described in the Patent under the heading, "Description of the Preferred Embodiment." '054 Patent, col. 4 l. 5-12. The patent states that "Other embodiments are within [the Patent's] claims." Id. at col. 15 l. 19.



1. "***receiver,*** " "***line probing processor,*** " ***and*** "***line probe processor***"

Term	GE Proposed Construction	Agere's Proposed Construction
"receiver"	any structure capable of receiving an electronic signal	a hardware device for accepting signals from a remote device
"line probing processor"	structure that processes a line probing signal	a hardware component that processes a line probing signal
"line probe processor"	[not briefed separately from the construction of "line probing processor"]	"line probe processor" is interchangeable with "line probing processor"

[10] [11] The parties dispute the meaning of the terms "receiver," which appears, used in nearly identical contexts, in claims 1, 12, and 46 of the ' 054 Patent, "line probing processor," which appears in claims 1 and 46, and "line probe processor," which appears in claim 12. '054 Patent, col. 15 l. 24, 31; col. 16 l. 12, 28; col. 19 l. 43, 48. The terms "line probe processor" and "line probing processor" appear in virtually identical

contexts in claims 1 and 46 ("line probing processor") and claim 12 ("line probe processor"). '054 Patent col. 15 l. 31, col. 16 l. 28, col. 19 l. 48.

The parties' contentions regarding these three terms center on essentially the same issue. Agere contends that the terms each describe a discreet component of the modem and that each component is comprised exclusively of hardware. To support its argument, Agere refers the Court to the specifications of the patent. Specifically, Agere contends that Figure 1 must be interpreted to depict individual hardware components of the claimed device, and that such depiction indicates a limitation on the claim. Agere notes, for example, that on Figure 1, the line probing processor (labeled "58") is illustrated separately from the receiver ("46"), while other components of the modem ("47" and "48") are displayed as parts of the receiver. Agere further contends neither the specification nor the claims themselves suggest that "any of the components on Figure 1 might be implemented as software components running on a digital signal processor" (or other general service processor) (D.I. 87 at 14-15.).

In response, GE argues that the limitations on the patent claims cannot be drawn from the specification, and that, even if they could, Figure 1 is "a block diagram of a communication system which embodies the invention," ('054 Patent, col. 4 l. 11-12), rather than a circuit-level schematic that necessarily represents hardware. The claims themselves, GE contends, contain no reference to hardware, and no indication that the functions carried out by the invention must be performed exclusively by hardware components, rather than, perhaps, software running on other hardware, such as digital signal processor or CPU.

Having considered these contentions in view of the applicable case law, the Court concludes that the terms "receiver," "line probing processor," and "line probe processor" are not limited to purely hardware embodiments. Neither the language of the claims themselves nor the specifications support such limitations, and the prior art relied upon by the '054 inventor suggests that he actively avoided language that would have limited his invention to hardware embodiments.

The Court finds no evidence that the claim language implies that a "receiver" must be comprised entirely of hardware. Instead, viewing the Patent as a whole, the text is chiefly concerned with the function of, and the process employed by, the claimed invention, rather with than the specific form the device must take. The inventor describes the receiver as being capable of receiving both a modulated signal and a line probing signal-the claims do not specify whether the receiver must consist of hardware alone or whether its function might also be carried out by hardware that runs software. '054 Patent at col. 15 l. 21-38. Similarly, and as Agere recognizes, the language itself provides no indication of the specific form the line probing processor must take. Id. at col. 16 l. 17-36.

Further, the prior art cited by the '054 Patent suggests that the '054 patentee did not intend to limit his claims to hardware-only embodiments. The claimed modem of a patent cited as prior art ('054 Patent, References Cited) describes particular hardware components (ROM memory chips, for example) that comprise the modem. U.S. Patent No. 4,679,227, col. 18 l. 41-43 (filed May 20, 1985). The specifications of that patent make extensive references to hardware, including the types of physical connections (RS-232 serial connections, for example) to be used between components of the hardware embodiment. Id. at col. 16 l. 3-30. The '054 inventor's description of his invention differs markedly from the one he cited as prior art in that he completely avoided any such references to hardware. His choice of nonlimiting language, where the prior art included such limitations, supports the Court's finding that he believed, at the time the he made his application, that his invention could be embodied in other than a purely hardware configuration.

Lacking indications in the language of the claims in the '054 Patent that the named components of the modem must each be a discreet, physical piece of hardware, Agere may not import such limitations from the depiction of a preferred embodiment of the invention that it believes represents a purely hardware system. *See* Gart, 254 F.3d at 1342. This is certainly true where the patentee, after describing the preferred

embodiment, specifically states that "[o]ther embodiments are within the ... claims." '054 Patent at col. 15 l. 19. The Court concludes that, regardless of whether it depicts hardware or not, Figure 1 does not foreclose the possibility that a different embodiment, perhaps one including both hardware and also software running on a separate processor, could be covered by the patent claims.

Accordingly, Court construes "receiver" to mean "any structure capable of receiving an electrical signal." Given the identical contexts in which they are used, and a lack of textual evidence of disparate meanings, the Court is satisfied that "line probe processor" and "line probing processor" have equivalent meanings for the purposes of the asserted claims. The Court construes both to mean a "structure that processes a line probing signal."

2. "*selector*"

GE Proposed Construction	Agere's Proposed Construction
any structure that runs a decision algorithm	Invalid based on indefiniteness; invalid based on lack of enablement.

[12] The parties dispute the meaning of the term "selector," which also appears in claims 1, 12, and 46. Here, Agere contends that neither the language of the claims themselves nor the remainder of the specifications adequately disclose the "selector," and that, therefore, the claim term is invalid, pursuant to 35 U.S.C. s. 112. In response, GE contends that the meaning of "selector" is clear from the plain language of the claims. Further, GE contends that in the preferred embodiment, the line probing processor executes a "decision algorithm" and thereby acts, additionally, as the selector. GE contends that this both enables "selector" and demonstrates that the claimed components need not be discreet hardware devices.

The Court agrees with GE that the claimed "selector" is adequately disclosed. First, the function of the selector is apparent from a plain reading of the claims. Further, the specifications do not support Agere's contention that every component of the modem must be a discreet hardware device devoted exclusively to its named function. Although a distinct block labeled "selector" does not appear on Figure 1, the function of the selector is described extensively in text of the preferred embodiment of the invention. In the preferred embodiment of the invention, the "line probe processor" additionally acts as the "selector" by carrying out functions of that component in that it selects the appropriate frequency band and baud rate to use in communicationwith the second modem. '054 Patent, col. 14 l. 8-53.

To reiterate, while the description of a preferred embodiment helps to define what the patent does claim, absent a specific declaration, it does not indicate the *limits* of what the patent claims. *See* Liebel-Flarsheim, 358 F.3d at 906. The Court finds no such specific limitations in the language of the claim or the specifications. Accordingly, the Court construes "selector" to mean "any structure that runs a decision algorithm."

3. "*for selecting one of the plurality of frequency bands*" and "*for selecting one of the plurality of bit rates*"

Term	GE Proposed Construction	Agere's Proposed Construction
"for selecting one of the plurality of frequency bands"	plain meaning	"for determining a frequency band to be used for receiving a modulated signal from the remote device, based upon channel characteristics measured by the line probing processor."
"for selecting one of the plurality of bit rates"	plain meaning	"for determining a bit rate to be used for receiving a modulated signal from the remote device, based upon

		channel characteristics measured by the line probing processor."

[13] The parties offer substantively identical contentions regarding the phrases "for selecting one of the plurality of frequency bands" (appearing in claims 1 and 12) and "for selecting one of the plurality of bit rates" (appearing in claim 46). Agere contends that the phrase "measured characteristics of the channel," which appears in all three claims following the disputed phrases, is "somewhat ambiguous," with the result that the disputed phrases should be given a construction that makes clear that such characteristics are measured by the line processor. (D.I. 87 at 16-17.) Agere further contends that the phrase must be given a consistent meaning in each of the claims, and that this requires reading a limitation from claim 1 ("to be used for receiving the modulated signal from the remote device") into claims 12 and 46. (*Id*. at 17-18.) GE contends in response that the meaning of the disputed phrases is plain and that the phrase "measured characteristics of the channel" is not at issue between the parties.

The Court has not been asked to construe the phrase "measured characteristics of the channel," which is the phrase that Agere's contentions aim at clarifying. The Court is satisfied that the meaning of the disputed phrases themselves, however, would be clear to one with ordinary skill in the art upon a reading of the plain language. No special knowledge is required to understand "for selecting one of a plurality," which is written in clear, everyday language. "Frequency bands" and "bit rates," on the other hand, are technical terms. However, they are technical terms which are each thoroughly explained and used consistently throughout the patent itself. *See, e.g.,* ' 054 Patent, col. 1 l. 12-28. Accordingly, the court declines to construe these phrases with meanings other than those indicated by their plain language.

C. ***Construction of the Disputed Terms of the*** '641 Patent

The '641 Patent claims a device and method for mapping a digital data sequence so it can be transmitted across a digital communications system. In general, data is transmitted across a digital network through "symbols," which contain bits of binary data. The claimed device and method can employ "frame mapping" to enable the transmission of a fractional number of data bits per symbol across a digital communication system using less power than other methods require. For purposes of illustration, claims 1, 3, 5, and 7 are presented below, with the disputed terms shown in bold.

1. A frame-mapping method for mapping N-symbol frames of data, N a predetermined integer (N>1), such that a fractional number Q of bits per frame **can be** transmitted without **constellation switching,** comprising the steps of:

A) selecting a number of bits for each frame to be one of: J-1, J, where J is an integer such that J-1<Q<J, where Q = N*B/S, B is a predetermined bit rate, and S is a predetermined symbol rate,

B) in frames of J-l bits, inserting a zero in a most significant bit (MSB) position,

C) selecting a signal **constellation** with 2^{J} possible signal combinations per N symbols, and

D) mapping the frame bits such that for MSB = 0, one of the 2^{J-1} N-point combinations with least average energy is selected from the signal **constellation.**

....

3. A frame-mapping device for mapping N-symbol frames of data, N a predetermined integer (N>1), such that a fractional number of bits per frame **can be** transmitted without **constellation switching,** comprising:
A) a **frame selector, operably coupled** to receive the data, for selecting a number of bits for each frame of

data to be one of: J-1, J, where J is an integer such that J-1<Q<=J, where Q = N*B/S, B is a predetermined bit rate, and S is a predetermined symbol rate,

B) a **zero insertion unit, operably coupled** to the frame selector, for, in frames of J-1 bits, inserting a zero in a most significant bit (MSB) position,

C) a **signal constellation selector/mapper, operably coupled** to the zero insertion unit, for selecting a signal **constellation** with at least 2^J possible signal combinations per N symbols, and mapping the frame bits such that for MSB = 0, one of 2^{J-1} combinations of N points with least average energy is selected from the signal constellation.

....

5. A frame-mapping method for mapping successive frames of data to groups of N symbols, N a predetermined integer (N>1), such that, on average, a fractional number Q of bits are mappable per frame without **constellation switching,** comprising the steps of:
A) selecting a number of bits for each frame to be one of: J-1, J, where J is an integer such that J-1<Q<J, according to a predetermined pattern,

B) in frames of J-1 bits, inserting a zero in a most significant bit (MSB) position,

C) selecting a set of 2^J possible combinations of N symbols, where each symbol is chosen from a signal **constellation** and

D) mapping the frame bits such that for MSB = 0, one of the 2^{J-1} possible combinations of N symbols of least average energy is selected from the 2^J possible combinations.

....

7. A frame-mapping device for mapping successive frames of data to groups of N symbols, N a predetermined integer (N>1), such that, on average, a fractional number Q of bits are mappable per frame without **constellation switching,** comprising:
A) a **frame selector, operably coupled** to receive the data, for selecting a number of bits for each frame of data to be one of: J-1, J, where J is an integer such that J-1<Q<J, according to a predetermined pattern,

B) a **zero insertion unit, operably coupled** to the frame selector, for, in frames of J-1 bits, inserting a zero in a most significant bit (MSB) position,

C) a **signal constellation selector/mapper, operably coupled** to the zero insertion unit, for selecting a set of 2^J possible combinations of N symbols, where each symbol is chosen from a signal **constellation,** and mapping the frame bits such that for MSB = 0, one of 2^{J-1} possible combinations of N symbols of least average energy is selected from the set of 2^J possible combinations.

U.S. Patent No. 5,428,641 col. 8 l. 27-43, 61-68; col. 4 l. 31-47; col. 5 l. 14-34. Figure 5, below, is "a block diagram of a frame mapping device in accordance with an embodiment of the present invention." '641 Patent col. 2 l. 37-40.

FIG. 5

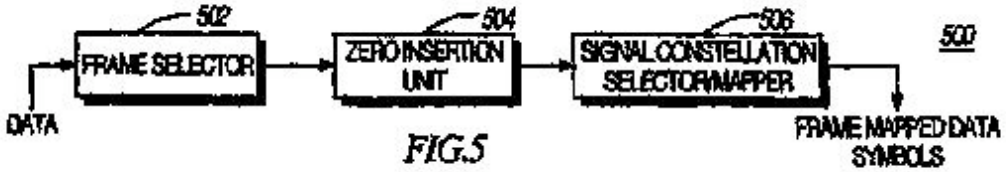


FIG.5

1. "constellation"

GE Proposed Construction	Agere's Proposed Construction
a finite set of points in space	the set of 2^n multi-dimensional signal points used to represent a mapping frame of n input data bits

[14] The parties agree that "constellation" is a term of art in the modem field. Agere contends that "constellation" should be construed in view of the actual constellations which are described in the specification of the '641 patent. Thus, where the specification states that "a signal constellation has at least 2^J possible signal point combinations per N symbols ...," ('641 Patent col. 4 l. 31-32), Agere draws the conclusion that "constellation" must be construed to have those characteristics for the purposes of this patent. GE contends that "constellation" must be construed generally, and that Agere's more specific definition improperly draws limitations from the specification. Both Agere and GE propose constructions that were formulated,at least in part, with the goal of making sure the definition could be easily understood not only by a person of ordinary skill in the art, but also by a jury. (D.I. 107 at 22; D.I. 109 at 16.).

The Court cannot accept Agere's invitation to import limitations on a claim term from the specifications. Agere attempts to define what a "constellation" *is* based on the content of particular constellations that are discussed in the specifications. Further, in the sentences quoted by Agere, the inventor does not refer merely to "constellations," but to "signal constellations." '641 Patent col. 2 l. 63-65; col. 4 l. 31-32; col. 7 l. 13-19. This indicates that the concept the inventor was trying to convey in those sentences could not be encompassed by the word "constellation" alone. Agere's definition of the term, laden with content describing signals from the specifications, would thus be inappropriate because it would reduce the word "signal" in those sentences to surplusage. Accordingly, the Court concludes that the meaning of "constellation" in the '641 Patent does not depart from the plain meaning it has in general for one of ordinary skill in the modem field. GE's briefing indicates that, but for a desire to avoid "burden[ing] the jury," it would agree that such a plain reading of the term would be "a finite set of points selected from an N-dimensional space, where N can be any positive integer." (D.I. 87 at 25.) The Court will adopt this definition, as the Court's task is to construe claim terms for one of ordinary skill in the art, rather than for the general public. *See* Markman, 52 F.3d at 986.

2. "constellation switching"

Term	GE Proposed Construction	Agere's Proposed Construction
"constellation switching"	The preamble of claims 1, 3, 5, and 7 is not limiting.	"using constellations with varying numbers of points for mapping multiple frames of data bits"
	If the preamble is found to be limiting, "constellation switching" means a "change between two constellations having different numbers of points."	

"can be"	The preamble of claims 1 and 3 is not limiting. If the preamble is found to be limiting, "can be" should be given its plain meaning.	"are" or "must be". As used in the preamble, this term creates a required or limiting condition for the claim. Thus the phrase "can be transmitted without constellation switching" must be read as "are transmitted without constellation switching."

a. Whether the preambles of claims 1, 3, 5, and 7 are limiting.

[15] [16] The Court must only construe the above terms if it first finds that the preambles of the asserted claims are separate limitations on those claims. *See* Symantec Corp. v. Computer Assocs. Int'l, Inc., 522 F.3d 1279, 1288 (Fed.Cir.2008). A preamble is limiting if its language is necessary to give meaning to a claim. Catalina Marketing International, Inc. v. Coolsavings.com, Inc., 289 F.3d 801, 808 (Fed.Cir.2002). "Conversely, a preamble is not limiting 'where a patentee defines a structurally complete invention in the claim body and uses the preamble only to state a purpose or intended use for the invention.' " Id. (quoting Rowe v. Dror, 112 F.3d 473, 478(Fed.Cir.1997)). No bright line test determines whether a preamble is limiting, but, generally, if the preamble is necessary to understand claim terms, or if the inventor uses both the preamble and the claims to define the scope of an invention, the preamble is limiting. Id. "Further, when reciting additional structure or steps underscored as important by the specification, the preamble may operate as a claim limitation." Id.

Agere contends that the preambles to claims 1, 3, 5, and 7 are necessary to give meaning to the claims themselves, and are, therefore, limiting. Agere contends that the specification identifies the avoidance of constellation switching as the "central importance" of the invention claimed by the '641 patent, and further contends that the preambles to the asserted claims recite that important feature. (D.I. 107 at 25.) GE contends that the claims are "structurally complete" and that the preambles merely state an intended use of the invention. (D.I. 109 at 19.).

The Court agrees with Agere that a fair reading of the specification clearly indicates that the claimed method and device's ability to transmit a fractional number of bits per frame rate without employing "constellation switching" is an important feature of the invention. *See* '641 Patent, col. 11.53-col. 21.24. Equally clear is that the preambles to the asserted claims use the term "constellation switching" to underscore the importance of the invention's ability to avoid the disadvantages of said constellation switching as they are laid out in the specification. The Court does not read Symantec to indicate that any preamble is non-limiting where the claims are structurally complete even where other indications of a limiting preamble are satisfied. *See* Symantec, 522 F.3d at 1288. Thus, pursuant to Catalina, the Court concludes that the preambles of claims 1,3,5, and 7 of the '641 Patent represent an additional limitation on those claims, and the Court will proceed to construe the disputed terms of the preambles.

b. "constellation switching"

[17] Agere contends that the meaning of "constellation switching"-a method which the inventor says was used in prior art to facilitate transmission of a fractional number of data bits per symbol-can be drawn from the inventor's discussion of the disadvantages of that method as compared to the claimed method. Specifically, Agere contends that, as used in the '641 Patent, constellation switching is only meaningful where it involves shifts between constellations of different size. To this point, GE's and Agere's analyses of the term are similar. Agere's construction, however, also contains an additional element ("for mapping multiple frames of data bits"). (D.I. 87 at 23.) Agere's briefing does not explain why it includes this phrase.

The Court finds no support for the inclusion of the limitation "for mapping multiple frames of data bits" in the definition of "constellation switching." As GE points out, the specifications use constellation switching with regard to both symbols and frames. '641 Patent, col. 1 l. 47-53; col. 2 l. 16-19; col. 4 l. 19-24. The

parties largely agree on the remaining language, but the Court concludes that GE's construction better captures the idea that "constellation switching" concerns not a single constellation that changes the number of its data points, but different constellations that each have different numbers of data points. Accordingly, the Court construes "constellation switching" to mean "change between two constellations having different numbers of points."

c. "can be"

[18] Agere argues that the context in which the phrase "can be" appears in the preambles to claims 1 and 3 indicates that the phrase indicates a mandate: "such that a fractional number Q of bits per frame can be transmitted without constellation switching...." '641 Patent, col. 8 l. 29-32. Agere contends that the clause indicates that the avoidance of constellation switching is the main purpose of the invention, and that therefore a permissive construction of "can be" would "ignore the plain intent of the inventor and a central aspect of the invention." (D.I. 107 at 28.) GE contends that the plain meaning of the phrase "can be" is permissive in nature, and that language from the specification indicates that while the invention can avoid constellation switching, in need not do so at all times.

The Court finds no indication in the claims or specifications of the '641 patent that the claimed invention may *never* employ constellation switching. The inventor states that his invention "eliminates the necessity for constellation switching." '641 Patent at col. 2 l. 51-52. This certainly indicates that the invention is *capable* of achieving its objective without the use of constellation switching-it does not specify that the objective must be achieved without constellation switching in every instance.

The inventor identifies features of constellation switching that are undesirable in "many" applications, rather than in *all* applications, and states that difficulties occur in constellation switching "often" or "generally," rather than *always*. Id. at col. 1 l. 57-col. 2 l. 16. The inventor notes that his invention avoids the "implementation *difficulties* of constellation switching" rather than that it avoids "constellation switching" per se. Id. at col. 2 l. 24-25 (emphasis added). The inventor's language does not indicate that constellation switching must be avoided even where it poses no such difficulties.

The plain meaning of the phrase "can be" is permissive, rather than mandatory, and the Court concludes that the language of the claims specifications does not demonstrate a clear intention on the part of the inventor to depart from that plain meaning. Thus, the Court construes "can be" with its plain, permissive meaning.

4. "*frame selector,*" "*zero insertion unit,*" "*sign al constellation selector/mapper,*" and "*operably coupled*"

Term	GE Proposed Construction	Agere's Proposed Construction
"frame selector"	"structure that can select the length of data in a frame"	"a hardware device for selecting a number of data bits to fill a frame. Frame selector does not include devices storing of executing software such as a central processing unit (CPU) or a digital signal processor (DSP)"
"zero insertion unit"	"structure that can insert a zero when required"	"a hardware device for adding a zero to a frame of data bits. Zero insertion unit does not include devices storing of executing software such as a central processing unit (CPU) or a digital signal processor (DSP)"
"signal constellation selector/	"structure that can select a signal constellation and can map frame bits onto constellation points"	"a hardware device for selecting a constellation and mapping frames of data bits to signal points in such constellation. Signal constellation selector/mapper does

mapper"		not include devices storing of executing software such as a central processing unit (CPU) or a digital signal processor (DSP)"
"operably coupled"	whose input is derived from the output of another stage or structure	"physically connected to allow interoperation"

Similar to their disputes over several terms in the '054 patent, the parties' contentions regarding the phrases "frame selector," "zero insertion unit," and "signal constellation selector/mapper" in the '641 Patent turn on the issue of whether this patent's claims are limited to purely hardware embodiments of these components. The construction of "operably coupled" will flow from the resolution of this threshold issue: if the named structures may be composed of hardware only, then there must be a physical connection between them. If they may be composed of software, then they could be coupled through software means.

[19] [20] [21] [22] As with Figure 1 of the '054 Patent, Agere contends that Figure 5 of the '641 Patent clearly depicts hardware structures, and that such a depiction of a hardware embodiment indicates that only purely hardware embodiments are claimed by the patent. Further Agere contends that words such as "unit," "selector," and "mapper" all imply physical devices. (D.I. 87 at 27.) Lastly, Agere contends that the hardware components of the '641 Patent may not include CPUs or DSPs that run software. GE contends that Figure 5 is a block diagram depicting functions rather than hardware devices, and that the names of the components themselves do not indicate that the structures must be composed of hardware only. Further, GE has argued that evidence from the prosecution history indicates that the PTO examiner accepted the inventor's explanation that an unclear equation in the patent referred to "terminology specific to *computer software technology* and is known to those skilled in the art." '641 patent file history, *Supplementary Amendment and Response under* 37 C.F.R 1.115, Feb. 1, 1995 (GE 000497) (emphasis added); '641 Patent File History, *Notice of Allowability,* Feb. 3 1995 (GE 000513).

The Court is unpersuaded that the '641 inventor demonstrated an intention to disavow all but purely hardware embodiments of his invention. Figure 5 is part of a "Detailed Description of a Preferred Embodiment." '641 Patent, col. 2 l. 41-42 (emphasis added). Assuming, *arguendo,* that Figure 5 depicts purely hardware components, the Court could not use that depiction to impose limitations on the claims without a clear indication that the inventor so intended. *See* Liebel-Flarsheim, 358 F.3d at 906. No such clear indication exists in the description of the preferred embodiment.

Indeed, the prosecution history that GE cites indicates that both the inventor and the PTO believed that some functions of the '641 patent involved computer software, not *just* hardware components. The Court thus concludes that the inventor was aware that modem functions could be carried out through software at the time he applied for the patent and that he did not specifically disavow embodiments of his invention that included software. It follows that, because components of the claimed device need not be compose entirely of hardware, actual, physical connectivity is not required between the components, and that they could be "operably coupled" through software means where appropriate.

Accordingly, the Court construes the remaining disputed terms of the '641 patent as follows. "Frame selector" means, a "structure that can select the length of data in a frame." "Zero insertion unit" means a "structure that can insert a zero when required." "Signal constellation selector/mapper" means a "structure that can select a signal constellation and can map frame bits onto constellation points." "Operably coupled" means "whose input is derived from the output of another stage or structure."

III. CONCLUSION

For the reasons discussed, the Court construes the disputed terms of the '054 and '641 Patents as follows.

Patent	claim term	Court's construction
'054	receiver	any structure capable of receiving an electrical signal
	line probing processor	structure that processes a line probing signal
	line probe processor	structure that processes a line probing signal
	selector	any structure that runs a decision algorithm
	for selecting one of the plurality of frequency bands	plain meaning
	for selecting one of the plurality of bit rates	plain meaning
'641	constellation	a finite set of points selected from an N-dimensional space, where N can be any positive integer
	preambles of claims 1, 3, 5, and 7	The preambles are limiting.
	constellation switching	change between two constellations having different numbers of points
	can be	plain meaning (not mandatory)
	frame selector	structure that can select the length of data in a frame
	zero insertion unit	structure that can insert a zero when required
	signal constellation selector/ mapper	structure that can select a signal constellation and can map frame bits onto constellation points
	operably coupled	whose input is derived from the output of another stage or structure

An Order consistent with this Memorandum Opinion will be entered.

ORDER

NOW THEREFORE, IT IS HEREBY ORDERED that the disputed claims of United States Patent Nos. 5,048,054 (the "'054 patent") and 5,428,641 (the "'641 patent") are interpreted to mean:

Patent	claim term	Court's construction
'054	receiver	any structure capable of receiving an electrical signal
	line probing processor	structure that processes a line probing signal
	line probe processor	structure that processes a line probing signal
	selector	any structure that runs a decision algorithm
	for selecting one of the plurality of frequency bands	plain meaning
	for selecting one of the plurality of bit rates	plain meaning
'641	constellation	a finite set of points selected from an N-dimensional space, where N can be any positive integer
	preambles of claims 1, 3, 5, and 7	The preambles are limiting.
	constellation switching	change between two constellations having different numbers of points
	can be	plain meaning (not mandatory)
	frame selector	structure that can select the length of data in a frame

	zero insertion unit	structure that can insert a zero when required
	signal constellation selector/ mapper	structure that can select a signal constellation and can map frame bits onto constellation points
	operably coupled	whose input is derived from the output of another stage or structure

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