United States District Court,
E.D. Texas, Marshall Division.

AGERE SYSTEMS, INC,
v.
SONY CORP.

No. 2:06-CV-079

May 15, 2008.

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MEMORANDUM OPINION AND ORDER

CHARLES EVERINGHAM IV, United States Magistrate Judge.

1. Introduction

In this case, Agere Systems, Inc. ("Agere") contends that the defendants FN1 infringe various claims of U.S. Patent Nos. 6,452,958 to van Nee, 6,707,867 to Diepstraten, 5,448,585 to Belenky, 5,670,730 to Grewe, 5,599,739 to Merchant, 6,472,304 to Chittipeddi, and 6,340,827 to Choi. FN2 The patents-in-suit were originally assigned to AT & T Bell Laboratories, and have been assigned to Agere, AT & T's successor, via intermediary Lucent Technologies. The patents-in-suit are directed to wireless technology, laser technology, audio recording technology, and semiconductor technology. None of the patents-in-suit is related, but some the patented technologies overlap to a limited extent.

FN1. The defendants in this case include Sony Corp., Sony Computer Entertainment, Inc., Sony Computer Entertainment America, and Sony Electronics, Inc. (collectively "Sony").

FN2. Agere originally asserted U.S. Patent No. 5,989,637 to Rizzo, and the parties advocated proposed claim constructions for this patent during the *Markman* hearing. The parties have since stipulated to the dismissal of this patent from the case. *See* Dkt. No. 169. Therefore, the Rizzo '637 patent is not addressed herein.

2. General Principles Governing Claim Construction

"A claim in a patent provides the metes and bounds of the right which the patent confers on the patentee to exclude others from making, using or selling the protected invention." Burke, Inc. v. Bruno Indep. Living Aids, Inc., 183 F.3d 1334, 1340 (Fed.Cir.1999). Claim construction is an issue of law for the court to decide. Markman v. Westview Instruments, Inc., 52 F.3d 967, 970-71 (Fed.Cir.1995) (*en banc*), *aff'd,* 517 U.S. 370, 116 S.Ct. 1384, 134 L.Ed.2d 577 (1996).

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

Nonetheless, it is the function of the claims, not the specification, to set forth the limits of the patentee's claims. Otherwise, there would be no need for claims. SRI Int'l v. Matsushita Elec. Corp., 775 F.2d 1107, 1121 (Fed.Cir.1985) (*en banc*). The patentee is free to be his own lexicographer, but any special definition given to a word must be clearly set forth in the specification. Intellicall, Inc. v. Phonometrics, 952 F.2d 1384, 1388 (Fed.Cir.1992). And, although the specification may indicate that certain embodiments are preferred, particular embodiments appearing in the specification will not be read into the claims when the claim language is broader than the embodiments. Electro Med. Sys., S.A. v. Cooper Life Scis., Inc., 34 F.3d 1048, 1054 (Fed.Cir.1994).

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

The primacy of claim terms notwithstanding, *Phillips* made clear that "the person of ordinary skill in the art is deemed to read the claim term not only in the context of the particular claim in which the disputed term appears, but in the context of the entire patent, including the specification." *Id*. Although the claims themselves may provide guidance as to the meaning of particular terms, those terms are part of "a fully integrated written instrument." *Id*. at 1315 (quoting Markman, 52 F.3d at 978). Thus, the *Phillips* court emphasized the specification as being the primary basis for construing the claims. *Id*. at 1314-17. As the Supreme Court stated long ago, "in case of doubt or ambiguity it is proper in all cases to refer back to the descriptive portions of the specification to aid in solving the doubt or in ascertaining the true intent and

meaning of the language employed in the claims." Bates v. Coe, 98 U.S. 31, 38, 25 L.Ed. 68 (1878). In addressing the role of the specification, the *Phillips* court quoted with approval its earlier observations from Renishaw PLC v. Marposs Societa' per Azioni, 158 F.3d 1243, 1250 (Fed.Cir.1998):

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

Consequently, *Phillips* emphasized the important role the specification plays in the claim construction process.

The prosecution history also continues to play an important role in claim interpretation. The prosecution history helps to demonstrate how the inventor and the PTO understood the patent. Phillips, 415 F.3d at 1317. Because the file history, however, "represents an ongoing negotiation between the PTO and the applicant," it may lack the clarity of the specification and thus be less useful in claim construction proceedings. *Id*. Nevertheless, the prosecution history is intrinsic evidence. That evidence is relevant to the determination of how the inventor understood the invention and whether the inventor limited the invention during prosecution by narrowing the scope of the claims.

Phillips rejected any claim construction approach that sacrificed the intrinsic record in favor of extrinsic evidence, such as dictionary definitions or expert testimony. The *en banc* court condemned the suggestion made by Tex. Digital Sys., Inc. v. Telegenix, Inc., 308 F.3d 1193 (Fed.Cir.2002), that a court should discern the ordinary meaning of the claim terms (through dictionaries or otherwise) before resorting to the specification for certain limited purposes. *Id*. at 1319-24. The approach suggested by *Tex. Digital*-the assignment of a limited role to the specification-was rejected as inconsistent with decisions holding the specification to be the best guide to the meaning of a disputed term. *Id*. at 1320-21. According to *Phillips,* reliance on dictionary definitions at the expense of the specification had the effect of "focus[ing] the inquiry on the abstract meaning of words rather than on the meaning of the claim terms within the context of the patent." *Id*. at 1321. *Phillips* emphasized that the patent system is based on the proposition that the claims cover only the invented subject matter. *Id*. What is described in the claims flows from the statutory requirement imposed on the patentee to describe and particularly claim what he or she has invented. *Id*. The definitions found in dictionaries, however, often flow from the editors' objective of assembling all of the possible definitions for a word. *Id*. at 1321-22.

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

3. Background of the Technology and Discussion of Claim Term Constructions

A. The van Nee '958 Patent

The van Nee '958 patent is directed to techniques for transmitting data in wireless networks. The van Nee

'958 patent discloses a digital modulation/demodulation system that uses an extended code set to encode/decode data at a rate of 10 Mbps. The invention uses a larger code set of M codes for N length codes to provide an increased data transmission rate while maintaining the coding gain. The code sets of the invention are derived from orthogonal and/or complementary codes such that a non-zero cross-correlation value results between the different codes of the code set. The magnitude of both cross-correlation values and auto-correlation sidelobes is preferably low, *e.g.* below one half of a code length. The resulting noise and multipath performance degradation is minimized by choosing code sets with small cross-correlation values, *i.e.* nearly orthogonal code sets.

The '958 patent describes two modes of operation-a full data rate mode of transmitting codes, and a fallback, or half data rate mode. In the full data rate mode, two separate codes are transmitted at the same time, one code on each of two channels (so-called "I" and "Q" channels). In the fallback mode, a single code is transmitted on both the I and Q channels.

1. code

Agere contends that the term "code" means "a spreading sequence to be used to phase modulate a single carrier frequency." Sony contends that a "code" is "a sequence of real-valued chips." The parties' disagree on whether a "code" is 1) a "spreading sequence," 2) limited to "real-valued chips," and 3) "to be used to phase modulate a single carrier frequency." The court will address each point of contention in turn.

Agere contends that a "code"should be limited to a "spreading sequence." In support of its proposed limitation, Agere cites to one sentence in the written description, as well as the deposition transcript of Sony's expert. *See* '958 patent at 6:63-65 ("That is why the length 11 Barker code is used in the current IEEE 802.11 standard for direct sequence spread-spectrum in the 2.4 GHz band"). In response, Sony contends that the written description of the '958 patent fails to limit a "code" to a "spreading sequence." In support of its contention, Sony cites to a portion of the written description that describes a "code" as including a number of bits that are known as chips. *See* '958 patent at 2:57-58 ("Chips are actually code bits, but they are called chips to distinguish them from data bits."). The court concludes that the single "spreading sequence" excerpt cited by Agere, combined with the proffered extrinsic evidence, is insufficient to limit this term as proposed. The court therefore concludes that a "code" includes "a sequence of chips." FN3

FN3. The parties agree that a "code" includes a "sequence."

Sony contends that a "code" should be limited to "real-valued chips." In its argument, Sony concedes that the written description of the '958 patent "never expressly uses the term 'real codes.' " Sony's Brief at 3. At oral argument, Sony explained that the invention disclosed in the specification will operate in both the full data rate mode and the fallback data rate mode only when the codes are real-valued codes. *See* Transcript at 154-155. In this regard, Figure 4 depicts an embodiment of the invention which constitutes the fallback data rate mode for the embodiment of Figure 3. '958 Patent at 7:66-8:8:1. For its part, Agere provides alternative interpretations of the teachings of the preferred embodiments that include the use of complex or imaginary values. For example, Agere points to Figure 3 and contends that the modulation of the in-phase channel ("I channel") by using a cosine signal and the modulation of the quadrature channel ("Q channel") using a sine signal corresponds to the elements of Euler's equation. As such, Agere contends that codes used in systems with I and Q channels may therefore be described with complex numbers.

After considering the parties' arguments, the court agrees with Sony and concludes that, in the context of the '958 patent specification, "codes" are "real" codes and cannot therefore be "complex" codes (real part plus imaginary part). Although Agere supports its broader construction with reference to the Figure 3 embodiment, it fails to adequately explain how the corresponding fallback operation of the Figure 3 embodiment (as depicted in Figure 4) accommodates complex codes. Because the fallback mode requires the transmittal of the same code over both the I and Q channels, it is clear that Mr. van Nee intended for his invention to include the use of only real-valued codes. *See* Transcript at 154-155; '958 patent at 7:66-8:30.

Agere contends that a "code" is "used to phase modulate a single carrier frequency." Unfortunately, the parties provided the court with very limited briefing and argument on their respective positions regarding this limitation. During the *Markman* hearing, Sony contended that this limitation is unnecessary because the claims separately include this limitation. In view of the written description, the court cannot find sufficient reason to incorporate Agere's proposed limitation. Therefore, in light of the above, the court concludes that a "code" is "a sequence of chips representing a real value."

2. selecting a code having N chips from a code set that includes M codes, wherein M>N; a code set that includes M codes, each code having N chips, wherein M>N

The term "selecting a code having N chips from a code set that includes M codes, wherein M>N" appears in claims 1 and 10 of the van Nee '958 patent. The term "a code set that includes M codes, each code having N chips, wherein M>N" appears in claims 13, 19, 44, and 47 of the van Nee '958 patent. Agere contends that no construction of these terms is necessary. Sony suggests that these terms mean "the number of codes in the set from which a selected code is chosen must at all times exceed the number of bits in each code of the set." In his written description, van Nee stated "[i]n the present invention, the number M of codes is always larger than the code length N." '958 Patent at 4:63-64. This statement is consistent with all of the embodiments disclosed in the ' 958 Patent. Sony contends that this limitation is part of the character of van Nee's invention, and is therefore an appropriate limitation on all of the claimed embodiments. *See* Sony's Brief at 12 (citations omitted). In response, Agere directs the court to embodiments that were disclosed in the parent patent application that contradict Sony's proposed limitation, *e.g.* embodiments where M=N. In view of the language of the claims and the unequivocal statements in the written description, the court concludes that van Nee limited the claims of the '958 patent to require the number of codes to always be larger than the code length. Therefore, the court construes these terms to mean "the number of codes in the set from which a selected code is chosen must always exceed the number of bits in each code of the set."

3. the code set is derived from a complementary code

Agere's proposed construction of this term is "each code in the code set is the product of a sequence of elements multiplied by a complementary code." Sony's counter-construction is "a set of real codes is generated by performing a cyclic shift on two or more complementary codes."

The '958 patent generally discloses two methods for deriving a code set. The first method, disclosed in Table 1, involves the cyclical shifting of two complementary codes, such as Barker codes. The second method, disclosed in Table 3, involves multiplying an extended Walsh code set (a Walsh code set is an orthogonal code set) with a complementary code sequence.

Sony contends that van Nee surrendered the second method above in view of a double patenting rejection over van Nee's parent patent application, which has a serial number of 09/057,310 and issued as U .S. Patent

No. 6,404,732. In response to this rejection, van Nee stated "[t]here is no double patenting issue because the 057,310 case claims Walsh codes and complementary codes. The 064,188 case [which issued as the '958 patent] claims extended codes and complementary codes." Sony's Brief, Exhibit Q at AGE0001517. Sony contends that these terse statements, made on the cover sheet of a facsimile, clearly surrendered the formation of an extended code from a Walsh code. The court rejects Sony's contention. The '732 patent is not directed to extended code sets, and did not disclose the use of Walsh codes in the formation of extended code sets. The court concludes that van Nee's statements were meant to distinguish the '732 patent because it did not disclose the use or formation of extended code sets, rather than disclaiming the use of Walsh codes to form extended code sets.

During oral argument, Agere stated that it agreed with the substance of Sony's proposed limitation, *i.e.* the formation of code sets by performing a cyclical shift on two or more complementary codes, but that it disagreed with Sony's attempt to exclude other methods of code set formation from its construction. Transcript at 19. Also during oral argument, Sony stated that its main point of contention with respect to this limitation is that this limitation must be construed to require the formation of extended code sets, *i.e.* where M>N. Transcript at 161. This extended code set limitation, however, is already separately required by the claims. *See e.g.,* '958 patent, claim 1 ("[B]ased on the grouping, selecting a code having N chips from a code set that includes M codes, *wherein M>N,* and wherein the code set is derived from a complementary code ....") (emphasis added). Therefore, the court concludes that this term means "the code set is made using a complementary code sequence."

4. suitable for multipath environments

Agere contends that this term means "suitable for environments that can reflect transmitted signals, such as an indoor environment." Sony contends that this term is indefinite under the second paragraph of Section 112. The court concludes that this term is definite, and construes this term to mean "suitable for environments that can reflect transmitted signals, such as an indoor environment."

B. The Diepstraten '867 Patent

The '867 patent discloses and claims ways to synchronize receivers and transmitters on wireless networks. The apparatus and methods claimed by the ' 867 patent are advantageous for power management applications in which low power portable wireless stations are employed in a basic service area. '867 patent at 1:51-54. In this setting, the wireless stations periodically switch between a low power consumption state, in which their transceivers are de-energized, and a high power consumption state, in which their transceivers are energized and can thereby receive periodic signals transmitted from some other station. Id. at 1:54-59. Improved synchronization allows for operation of the stations in a wireless LAN with reduced power consumption, which is particularly important for stations having an on-board power supply. Id. at 1:63-67. Moreover, the invention may be used to control other timing relationships between receivers and transmitters. Specifically, the methods and apparatus may be used in frequency-hopping devices, to help receivers synchronize to a change in frequency employed by the transmitter. Id. at 2:1-10.

In the preferred embodiment of the invention, a transmitter includes a timing means which generates a timestamp. The timestamp is included in a packet of data and transmitted to a receiver. The receiver uses the timestamp to determine whether and to what extent the message transmission was delayed due to network congestion. This facilitates the synchronization of the receiver and the transmitter because the receiver can use the information to determine the time at which it should be listening for the transmitter's next message.

1. wireless receivers and transmitters

a. receiver

Claim 1 of the '867 patent uses the term "receiver." Agere's proposed construction for this term is "portion of a wireless local area network (WLAN) station for receiving packets from wireless signals." Sony's proposed counter-construction is "circuitry in a wireless local area network station for processing received wireless signals." Although the constructions are similar, a dispute regarding the scope of the claims exists, which is not evident from the competing constructions. Specifically, Agere contends that the court should define "receiver" in a way that the term necessarily includes antennas or antenna structures. Sony contends that its construction, by using the word "circuitry," would exclude antenna structures from the definition of "receiver." Although the dispute is not important for infringement or invalidity purposes, it is important to the resolution of Sony's license defense.

In support of its construction, Agere points to Figure 5 of the '867 patent and the accompanying written description. Figure 5 illustrates a receiver "for use in an apparatus embodying the present invention." '867 patent at 2:26-27. As shown, Figure 5 depicts an antenna structure connected to radio modem 50. Agere contends that Sony's construction of the term "receiver" is intended to "improperly import a negative limitation into the claims," by excluding antennas. Viewed correctly, however, it is Agere's construction that improperly imports limitations from the preferred embodiment into the definition of receiver. The specification describes Figure 5 as simply an embodiment of the invention. Id. at 6:33-34 ("Referring again to the embodiment illustrated in FIG. 5...."); Id. at 7:55-56 ("The invention is not restricted to the details of the foregoing power-management embodiment."). Agere's construction of "receiver" to include only receiver devices that utilize antenna structures improperly imports limitations from the preferred embodiment into the claims of the '867 patent. Contrary to Agere's argument, the court is not imposing a negative limitation into the claims such that the scope of those claims excludes receivers with antennas. Rather, the court holds only that the presence of an antenna is not necessary to satisfy infringement of a limitation calling for a receiver. As such, the court defines a receiver to mean "a device or circuitry that receives a signal from a transmitter."

b. transmitter

The same dispute arises in connection with the term "transmitter ." Agere contends that this term means "portion of a wireless local area network (WLAN) access point for transmitting packets using wireless signals." Sony contends that this term means "circuitry in a wireless local area network station for processing signals for wireless transmission." Through these constructions, Agere contends that a transmitter must include an antenna structure, and Sony disagrees. For essentially the reasons set forth above, the court rejects Agere's attempt to import the antenna structure depicted in Figure 2 into the definition of "transmitter." The court defines this term to mean "a device or circuitry that transmits a signal to a receiver."

2. phrases including "the timestamp"

Several asserted claims in the '867 patent use the word "timestamp. " These include claims 1 and 9 ("wherein the timestamp represents a value within a count sequence of a timer in the transmitter"); claims 20 and 34 ("the timestamp represents a value m within a count sequence of the transmitter timer"); claim 44 ("the timestamp representing a value within a count sequence of a timer in the transmitter at the time of transmission of the transmission signal"); claims 1, 9 and 44 ("the timestamp field including a timestamp

having a value m for synchronizing a receiver timer with a transmitter timer"); claim 20 and 34 ("the timestamp field including a timestamp having a value m for synchronizing the receiver counter with a transmitter timer"); and claim 49 ("the transmission signal including a timestamp for synchronizing the receiver timer with a transmitter timer that counts up to n counts"). The parties dispute the construction of all of these limitations. The proper construction of the term "timestamp" forms the basis of the dispute.

Agere argues that the limitations do not warrant construction. Alternatively, Agere advances constructions that it contends "streamline the claim language to highlight its plain meaning." Agere Brief at 10. For its part, Sony relies on the prosecution history to urge that the applicants defined the claimed "timestamp" as "the timestamp contains the value of a modulo n counter in the transmitter at the time of transmission of the transmission signal, wherein n is the period between successive TIM messages." Sony's Brief at 24. Under Sony's argument, the timestamp claimed in the patent is limited to a specific timestamp generated by the modulo n counter 22 referenced in the preferred embodiment.

During prosecution, the examiner issued a final rejection of all of the claims of the '867 patent as obvious over Nagata et al. (U .S. patent No. 4,745,408) in view of Wieczorek et al. (U.S. Patent No. 5, 150,361). The applicants appealed the final rejection to the Board of Patent Appeals and Interferences. Their brief on appeal urged the non-obviousness of the pending claims, including claim 11, which formed the cornerstone of the applicants' argument on appeal. At the time of the appeal, claim 11 read as follows:

11. A method of synchronizing a timer of a receiver in a first station with a timer of a transmitter in a second station, comprising the steps of:

generating a time stamp in the transmitter by the transmitter timer;

transmitting the time stamp from the transmitter to the receiver; and synchronizing the receiver timer with the transmitter timer based on the time stamp.

Sony's Brief, Exhibit AA at AGE0000597 (Appeal Brief dated July 17, 1995).

The applicants urged on appeal that:

The term "time stamp" is well defined in Appellants' specification (see e.g. Appellants' specification at page 10, lines 14-15; page 8, lines 19-22; and page 13, lines 9-11). The "time stamp" represents a value m within a count sequence* of the counter 22 of the transmitter 20 at a time of transmission of a TIM packet. This value m is loaded into a TIM packet. The TIM packet is then transmitted from the transmitter 20 to the receiver 48. The receiver retrieves the "time stamp" from the TIM packet and loads it in its own counter 58 which then commences its count sequence at value m. As a result, the two counters 22 and 58 remain in synchronization as they cyclically count up to value n. (See e.g. Appellants' specification at page 13, lines 6-16).

Sony's Brief, Exhibit AA at AGE0000586-87. Elsewhere, the applicants argued that "Nagata's 'sync code' does not represent a value m within a count sequence of a counter of a transmitter ... at a time of transmission of a TIM packet...." *Id*. at AGE0000589. Similarly, the applicants pointed to pending claim 5, which included the limitation that "said transmitter timer includes a counter, and further wherein the time stamp represents a value within a count sequence of the counter at the time of transmission of the respective one of the signals." *Id*. at AGE0000592. According to the applicants, "[c]laim 5 expressly recites that the

'time stamp' represents a value within a count sequence of the counter at the time of transmission of the respective one of the signals." *Id*. They contended that "neither Nagata nor Wieczorek discloses or suggests, alone or in combination this important feature." *Id*. at AGE0000592-93.

Read as a whole, the cited portions of the prosecution history indicate that the applicants indicated that the "time stamp" of the '867 patent was a value within a count sequence of a counter or timer in the transmitter at the time of a transmission that is used by the receiver to synchronize the timer in the receiver. Although some portions of the prosecution history suggest that the applicants referred to the time stamp in the context of the specific modulo n counter in the preferred embodiment, these statements must be read in the context of then-pending claim 11, which contained no additional claim language defining what was meant by the term "timestamp." As issued however, the '867 patent includes a total of 74 claims. All (or nearly all) of the asserted independent claims in this case contain additional claim language clarifying, to varying degrees, the "timestamp" feature of the claims. The sole exception to this statement appears to be asserted claim 49, which provides:

A wireless local area network receiver, comprising:

a receiver timer that counts up to n counts, and

a radio modem capable of periodically receiving a transmission signal from a transmitter, *the transmission signal including a timestamp for synchronizing the receiver timer with a transmitter timer that counts up to n counts, the timestamp being a value m which accounts for a delay between a start of a process to transmit the transmission signal from the transmitter and an actual time of transmitting the transmission signal,*

wherein the receiver retrieves the timestamp and the receiver timer commences a count sequence based on the value m as to synchronize the receiver timer with the transmitter timer.

'867 patent, claim 49 (emphasis added).

The claim language of claim 49 is ambiguous on the issue whether the timestamp must be a value m in a count sequence of the transmitter timer, as indicated by the specification and the prosecution history. As a result, the court will construe the phrase "the transmission signal including a timestamp for synchronizing the receiver timer with a transmitter timer that counts up to n counts" to mean "the transmission signal including a timestamp which represents a value within a count sequence of the transmitter timer for synchronizing the receiver with a transmitter timer that counts up to n counts." The balance of the language of the asserted claims needs no construction, as the claim language sufficiently informs one of ordinary skill in the art what is claimed by the timestamp limitations. The court expressly disapproves, however, of Agere's proposed constructions, because they appear to broaden the scope of the claims beyond their plain language. Likewise, the court rejects Sony's proposed constructions because the applicants did not clearly and unmistakably limit the scope of their invention to transmitters that include modulo n counters as described in the preferred embodiment and the cited portions of the prosecution history.

3. periodically receiving a transmission signal from a transmitter

The parties agree that "periodically" should be construed to mean "at regular intervals." Agere contends that the balance of the claim language needs no construction, and Sony has not argued otherwise. The court therefore adopts the parties' agreed construction and determines that the balance of the phrase does not

require construction.

4. wherein the timestamp accounts for delays due to a busy signal on a medium access protocol

Claim 1 of the '867 patent includes the limitation:

periodically receiving a transmission signal from a transmitter, the transmission signal including a timestamp field, the timestamp field including a timestamp having a value m for synchronizing a receiver timer with the transmitter timer, wherein the timestamp represents a value within a count sequence of a timer in the transmitter and *wherein the timestamp accounts for delays due to a busy signal on a medium access protocol*.

'867 patent, claim 1 (emphasis added). Agere contends that the phrase "wherein the timestamp accounts for delays due to a busy signal on a medium access protocol" means "wherein the timestamp accounts for time deferred for transmission of the transmission signal due to a sensed energy level above a threshold value on the wireless medium." Sony contends that the phrase means "the timestamp contains a value representing the amount of delay resulting from the medium access protocol being busy."

As Sony suggests, the parties generally agree on the meaning of the phrase; however, there is a dispute concerning what is meant by the terms "accounts for." Sony asks the court to clarify that the value stored in the timestamp "represents" the amount of delay in the transmission of the signal that is caused by the busy signal on the medium access protocol. Once again, Sony refers to the prosecution history, in which the applicants stated that the timestamp "informs the receiver of the length of the delay (i.e. m counts) and causes the counter 58 to begin its count within the count sequence at the value m, thus facilitating synchronization of the counter of the transmitter with the counter of the receiver." Sony's Brief at AGE0000587. Agere argues that Sony's construction is too narrow, and contends that the claim simply requires the timestamp to "account for" the delay due to the busy signal. Unfortunately, Agere does not otherwise attempt to define the words "account for."

Based on the claim language, the specification, and the prosecution history, the court is persuaded that the inventors used the phrase "wherein the timestamp accounts for" to mean "wherein the timestamp indicates the amount of." As such, the court construes the phrase as a whole to mean "wherein the timestamp indicates the amount of time deferred for transmission of the transmission signal due to a sensed energy level above a threshold value on the wireless medium."

5. wherein the transmission signal further includes a header field, which is transmitted before the timestamp and the traffic pending field

Agere contends that the court should construe this term to mean "wherein the transmission signal further includes a header field, which is transmitted before the timestamp and a traffic pending field." Agere argues that the court should correct an obvious error in this phrase to conform the language of the claim to the prosecution history, which removed the antecedent basis for "the traffic pending field" through an amendment. Otherwise, Agere contends that the phrase needs no construction. Sony's brief does not respond to this argument. The court, having considered Agere's argument, construes the phrase as proposed by Agere to mean "wherein the transmission signal further includes a header field, which is transmitted before the timestamp and a traffic pending field."

6. a broadcast pending field

The parties agree that this term does not need construction.

C. The Belenky '585 Patent

The Belenky '585 patent is directed to quantum well semiconductor lasers. Quantum well semiconductor lasers typically comprise an active region that contains one or more quantum wells that are sandwiched between two waveguide layers. This combination is, in turn, sandwiched between two cladding layers. Any adjacent quantum wells are separated by barrier layers. *See* '585 patent at 1:11-16. The disclosed invention is generally directed to a multilayer semiconductor laser that includes the following respective layers: a p-side cladding layer, a p-side waveguide layer, an electron stopper layer, an active region, a hole stopper layer, an n-side waveguide layer, and an n-side cladding layer. *See id.* at 2:3-23. The hole and electron stopper layers provide a potential barrier to the respective flow of holes and electrons from the active region to the n-side and p-side waveguide and cladding layers. *See id.* at 2:52-55. The hole and electron stopper layers do not serve as a complete barrier to the flow of electrons and holes, but rather serve to substantially lower the flow of the relevant charge carrier from the active region to the relevant waveguide layer. *See id.* at 2:42-51. The disclosed lasers may exhibit relatively low temperature dependence of, *e.g.,* threshold current and external quantum efficiency. *See id.* at 1:58-64.

1. waveguide layer

Agere contends that this term should not be construed independent from the terms "n-side waveguide layer" and "p-side waveguide layer," but offers "a layer in a semiconductor laser structure which helps to confine and guide the lasing light" as an alternative construction. Sony contends that this term should be separately construed to mean "a layer within a pair of layers or layer structures disposed on opposite sides of the active region of a semiconductor laser that confine and guide the lasing light towards the active region."

Sony contends that a waveguide layer is one layer out of a pair of waveguide layers. In support of its position, Sony states that two waveguide layers are needed in order to confine and guide the lasing light, and that this functional attribute should be reflected in the court's construction of this term. In response, Agere contends that Sony is attempting to limit the claims to a preferred embodiment and suggests that its proposed construction, which requires a waveguide layer to only *help* confine and guide lasing light, is not ambiguous because the claimed laser has other attributes that assist in confining and guiding lasing light, such as the difference in the refractive index between a waveguide layer and its adjacent cladding layer.

The '585 patent uses a variety of terms in describing different aspects of lasers. Those terms appear to be used in the '585 patent according to their ordinary meanings in the art. While Agere may be correct that the claimed laser, or lasers in general, have multiple attributes that assist in confining and guiding lasing light, the waveguide layer has as its primary or principal function that of confining and guiding lasing light. While other structures, including the cladding layer, may in fact confine and guide the lasing light, those structures are distinguished from a waveguide layer because their primary functions are other than confining and guiding the lasing light.

Sony's proposed construction goes too far, in that it includes a requirement of a "pair" of waveguide layers. While at least two waveguide layers may be needed in a laser, the claims address that issue by calling for n-side and p-side waveguide layers. Additionally, Sony's proposed construction of this term incorporates several limitations that are distinctly claimed in the patent. For example, the independent claims of the patent require the n-side waveguide layer and the p-side waveguide layer to be disposed on opposite sides of

the active region. The court concludes that Sony's proposed redundancy is unnecessary in light of the simplicity of the claim language. Also, Sony's proposed construction could be confusing and even misleading to a jury, as it calls for "a layer within a pair of layers or layer structures." Sony's proposed construction could improperly suggest to a jury that, to find a waveguide layer in an accused device or in a prior art reference, they must first find a "pair" of waveguide layers, or that they must find waveguide layers only in pairs.

The court therefore concludes that a "waveguide layer" means "a layer in a semiconductor laser structure which helps to confine and guide the lasing light."

2. n-side waveguide layer

In light of the above construction of a "waveguide layer," the court concludes that construction of this term is not necessary.

3. p-side waveguide layer

In light of the above construction of a "waveguide layer," the court concludes that construction of this term is not necessary.

D. The Grewe '730 Patent

The '730 patent is directed toward a protocol for labeling various types of data contained in a music chip. '730 patent, Abstract. The data protocol includes a hierarchical arrangement of headers for storing information about selections on the chip and the method in which they were coded in the memory of the chip. *Id*. at 1:48-51. A global header located at the start of the memory specifies certain information needed to successfully decode the content of the chip, such as bit rate and encoding algorithm. *Id*. at 1:51-56. Each music chip also has a section of memory devoted to a table of contents, which includes information on play times, song titles, music category, and artist. The individual track selections are listed as part of the table of contents by individual headers, which contain a music genre or category corresponding to the track, the artist, and information for addressing each track selection. *Id*. at 1:60-65. The header information is automatically downloaded or self-registered when a chip is inserted into an associated audio player. *Id*. at 1:65-67. The self-registration of the general information included within the headers permits a user to make selections by the type of music to be played over a period of time. *Id*. at 1:67-2:3.

Claim 1 is a representative independent claim:

A data format for use in an audio system wherein pre-recorded music is digitally encoded in memory of an integrated circuit music chip, and said music is decoded and reproduced by means of an associated audio player, said data format for storing information pertaining to the contents of said music chip, wherein individual tracks of audio are stored in designated locations in said music chip, said data format including:

first header having parameters stored therein for use by said audio player in decoding said digitally encoded music stored in said memory; and

at least one second header, said second header including selectable categorical information relating to said individual tracks of audio stored in said memory.

The parties have raised several disputed claim terms with respect to the '730 patent. Each is discussed below.

1. pre-recorded music; pre-recorded audio

Agere contends that these terms need no construction. Sony, however, seeks to limit the scope of these terms to music or "audio that has been recorded in memory of a solid state semiconductor device prior to placement in an audio player." The court concludes that these limitations are improper. The court defines "pre-recorded music" to mean "music that has been recorded prior to playback by the associated music player." The court defines "pre-recorded audio" to mean "audio that has been recorded prior to playback by the associated audio player."

2. an associated audio player

Claim 1 requires that the music is reproduced "by means of an associated audio player." Agere contends that this term needs no construction. Alternatively, Agere suggests that this term means "an audio player associated with the integrated circuit music chip for playback of the prerecorded music stored in the music chip." Sony argues that the term means "equipment adapted for *receipt* of an integrated circuit music chip and playback of pre-recorded music stored thereon." (emphasis added). The crux of the dispute is whether the audio player must be separate from the music chip such that the chip must be insertable into or "received" by the audio player.

Sony relies heavily on one portion of the specification, which states that "[t]he music chip 10 is essentially a memory component which is adapted *to be received into an accompanying solid state audio player* for playing music contained on the chip." '730 patent at 2:24-27 (emphasis added). However, as Agere observes, the portion of the specification immediately preceding this sentence states that "[r]eferring to FIG. 1, there is shown one preferred embodiment of a music chip 10, *for use with the present invention data protocol*." *Id*. at 2:22-24 (emphasis added).

Two things become clear from these passages. First, the concept of a removable chip is a preferred embodiment of a music chip. Second, the claimed invention is actually a data protocol. *See also id*. at 1:47-48 ("The present invention is a protocol for labeling various types of data contained in a music chip."); 2:10-12 ("FIG. 1 shows a top plan view of one preferred embodiment of a music chip used in connection with the present invention data protocol."). Sony's effort to limit this term to the preferred embodiment is improper, and it is not necessary that the chip be removable from the player. The court construes "an associated audio player" to mean "an audio player associated with the integrated circuit music chip for playback of the pre-recorded music stored in the music chip."

3. tracks; tracks of audio; tracks of said pre-recorded audio

Agere contends that these terms mean "complete and distinct songs which are digitally encoded and compressed and capable of storage in the memory of the music chip." Sony contends that the terms mean "distinct segments of digital audio separately addressable in the memory of the chip."

The parties' primary dispute is whether these terms are limited to "complete and distinct songs." Contrary to Agere's narrowing construction, nothing in the specification requires the tracks to be limited to "complete and distinct songs." Rather, the patentee used the broader term "tracks" which might include portions of songs or compilations of more than one song. Moreover, the patentee's use of the term "audio," in claims 18

and 31, and "music," in claim 1, counsels against limiting each of these terms to complete and distinct songs. In light of the claim language, the court concludes that Sony's construction is proper. The court therefore construes these terms to mean "distinct segments of digital audio separately addressable in the memory of the chip."

4. digitally encoded; digitally encoded music

Agere contends that the term "digitally encoded" means "compressed using an audio compression algorithm." Sony contends that the term "digitally encoded" means "translated into a digital representation of."

Agere contends that the term "digitally encoded music" means "one or more songs which have been compressed into music tracks using an audio compression algorithm." Sony contends that the term "digitally encoded music" means "digital representation translated from all pre-recorded music."

As indicated by the proposed constructions, the parties' disagreement is whether the term "encoding" implies that the music or other audio file is in a compressed format. The court concludes that one of skill in the art reading the patent would conclude that encoding is synonymous with compressing and that decoding is synonymous with decompressing. The patent refers to the prerecorded music as being stored "in a compressed digital format." '730 patent at 2:34-36. Likewise, the patent describes the global header parameter information and states that "[t]he parameter information of the global header 22 is advantageously included because as compression technology evolves, it may be possible to encode more on a single chip using different algorithms, and almost certainly at different bit rates." *Id*. at 2:55-59. In addition, the patent describes a technique for abbreviating the artist's name as a "kind of encoding scheme" which lends itself to arithmetic coding techniques used for text compression. *Id*. at 4:36-38. Although these statements are used in the context of the description of the preferred embodiment, the court concludes that the inventors used the term "encoding" throughout the patent to mean stored in a compressed format. As a result, the court defines "digitally encoded" to mean "digitally stored in a compressed format" and "digitally encoded music" to mean "music that has been digitally stored in a compressed format."

5. encoding technique(s) used for storing said pre-recorded music in memory

Because the court is persuaded that "encoding," as used in the claims of the '730 patent, implies compression, the court concludes that an "encoding technique" used for storing said prerecorded music in memory is a "technique for digitally storing said pre-recorded music in memory in a compressed format."

6. algorithm used to encode said contents

The court defines "algorithm used to encode said contents" to mean "a compression algorithm used to encode said contents."

7. pre-recorded music is digitally encoded in memory of an integrated circuit music chip

Agere contends that no construction of this term is necessary. Sony contends that the phrase as a whole means "a digital representation of music is stored in read only memory of a solid state semiconductor device prior to placement in an associated audio player." In light of the constructions previously set forth, the court construes this term to mean "music that has been previously recorded is digitally stored in a compressed format in memory of an integrated circuit music chip."

8. first header having parameters stored therein for use by said audio player in decoding said digitally encoded music in said memory; global header; global header having parameters stored therein corresponding to an encoding technique used for storing said pre-recorded audio in memory and used by said audio player in decoding said audio; storing in a global header parameters corresponding to encoding techniques used in storing said pre-recorded audio in memory

The parties have grouped these terms together, essentially agreeing that the "first header" term means the same thing as the "global header" term. Agere contends that the term "first header having parameters stored therein for use by said audio player in decoding said digitally encoded music in said memory" means "a data structure on a music chip which includes information relating to the way the music tracks were encoded in the memory of the music chip for use by the audio player in decoding the stored music." Agere sponsors a similar construction for the term "global header having parameters stored therein corresponding to an encoding technique used for storing said pre-recorded audio in memory and used by said audio player in decoding said audio."

Sony structures its argument slightly differently. Sony equates the two terms but relies heavily on the use of the term "global" in the context of the global header limitation contained in claims 18 and 31. Sony contends that "global header" means "*a single data structure* that contains information corresponding to the way in which *all* pre-recorded audio tracks are encoded for storage in memory, which is used by the audio player to decode *all* tracks for playback." (emphasis added). In support of its construction, Sony points to the specification, which recites:

A global header located at the very start of memory will specify information needed to successfully decode *the content of the music chip*. This will include, for example, the necessary bit rate, as well as information pertaining to the specific encoding algorithm employed in recording audio on the chip.

'703 patent at 1:51-56 (emphasis added). Sony extends this argument to the "first header" term and argues that "first header" means "a *single* data structure that contains information used by the audio 27 player in decoding *all* digitally encoded music stored in memory." (emphasis added). The primary difference between the parties' constructions is that Sony seeks to limit the first and global headers to single data structures that contain information used by the player to decode *all* of the digitally encoded music.

Despite the parties' efforts to group these terms together, the court construes them separately. With respect to the "global header" term, the court is persuaded that Sony's construction is correct. The patentees used the term "global," and that is a more restrictive term than "first." As the claim language and cited portion of the specification suggest, a "global header" is a header that includes information common to all of the music on the chip. The term "first header," however, is entitled to a broader scope, and the court concludes that Sony's proposed construction is too limiting. As such, the court construes the "global header" term to mean "a single data structure that contains information corresponding to the way in which all pre-recorded audio tracks are encoded for storage in memory, which is used by the audio player to decode all tracks for playback." The court construes the "first header" term to mean "a data structure on a music chip which includes information relating to the way the music tracks were encoded in the memory of the music chip for use by the audio player in decoding the stored music."

9. storing in a global header parameters corresponding to encoding techniques used in storing said pre-recorded audio in memory

Consistent with the construction of "global header," the court construes this term to mean "storing in a single data structure information corresponding to the way in which all pre-recorded audio tracks are encoded for storage in memory."

10. second header including selectable categorical information

Agere contends that this term means "a data structure on a music chip which includes information related to category of music (*e.g.,* type of music, genre, etc.) and which can be used to select individual tracks of music." Sony contends that this term means "a data structure, separate from the first header, that includes category data that can be selected by a user to choose an individual track of audio." As reflected by the constructions, the dispute is whether the second header must be separate from the first or global header.

Sony points to the claims, which recite the limitations of a first and second header. Agere concedes that, "[t]o the extent that they contain different information, these headers may be considered 'distinct' " but argues that "the claims, specification and prosecution history of the '730 Patent do not limit the headers to being 'separate.' " Agere's Reply Brief at 24. Agere's argument is correct. Although the claims require a first header and a second header, neither the claims, the specification, nor the prosecution history requires the first and second headers to be "separate" from one another. Instead, the patent explains that the second header contains different information from that contained in the first header. Specifically, the second header includes information about the audio track, such as the artist or category of the music. Consistent with its purpose, the court construes the term "second header including selectable categorical information" to mean "a data structure on a music chip, which includes information distinct from the information in the first header, related to category of music (*e.g.,* type of music, genre, etc.) and which can be used to select individual tracks of music."

11. individual header

Agere contends this term means "a data structure on a music chip which includes general description information relating to an individual music track." Consistent with its suggested construction of "second header," Sony contends that this term means "a data structure, separate from the global header, that includes general description information relating to an individual track of audio." For essentially the reasons discussed above, the court rejects Sony's effort to impose the limitation that the individual header be "separate from" the global header. The court construes this term to mean "a data structure on a music chip which includes general description information, distinct from the information in the global header, relating to an individual music track."

12. said data format for storing information pertaining to the contents of said music chip

Agere contends that this term needs no construction. Alternatively, Agere contends that the court should construe this term to mean "the data format stores information regarding the music stored in the music chip." Sony contends that the court should construe the phrase to mean that "the data format applies to all pre-recorded music that can be stored on the music chip." The court is not persuaded that Sony's proposed limitation is proper. The court construes this term to mean "the data format stores information regarding the music stored in the music chip."

13. a code representative of an artist; a data field representative of an artist

The parties agree that the terms "a code representative of an artist" and "a data field representative of an

artist" each mean "a unique bit assignment, or abbreviation, corresponding to an artist's name." The court adopts that construction.

14. said individual header includes a preamble including displayable graphics

The parties agree that this term means "the data structure constituting the individual header has a first location containing displayable graphics." The court adopts that construction.

E. The Chittipeddi '304 Patent

The Chittipeddi '304 patent is directed to the manufacture of semiconductor integrated circuits, and discloses techniques for wire bonding gold wires to copper metallization in semiconductor integrated circuits. The invention generally includes forming a barrier layer on the copper metallization, and thereafter forming an aluminum pad on the barrier layer. *See* '304 patent at 1:51-53. Gold wire is then thermocompression bonded to the aluminum pad. The claimed invention enables the use of copper as an interconnect metallization layer because it prevents the copper in the metallization layer from deleteriously alloying with the gold from the bonding wire and weakening the wire bond.

1. planar barrier layer; planar aluminum layer; planar barrier layer pad; planar aluminum layer pad

During prosecution, in response to a rejection, the applicants of the '304 patent amended their claims by adding the word "planar" in front of the words "barrier layer," "aluminum layer," "barrier layer pad," and "aluminum layer pad." Because the parties' claim construction dispute is, in part, based in these amendments, the court will address the above terms together. Agere proposes that the above terms do not require construction. Alternatively, however, Agere contends that each term should be construed to require that each of the above layers is deposited over a planar surface. Sony contends that each of the above terms should be construed to require that the entire surface of each of the above layers is flat. For the foregoing reasons, the court rejects each party's contention, and concludes that the term "planar" means "flat."

In a preliminary amendment, the applicants cancelled all pending claims and added six new claims, claims 18 to 23,FN4 for examination. Two of the newly added claims were independent claims, each generally drawn to one of the two preferred embodiments disclosed in the written description. Claim 18 of the application was directed to the embodiment disclosed in Figures 13-20 of the application, which permits the capping layer of the integrated circuit to be formed above the bonding pad, *i.e.* the capping layer is formed on the bonding pad. Claim 21 was directed to the embodiment disclosed in Figures 21-24 of the application, which requires the capping layer to be formed before the bonding pad, *i.e.* the bonding pad is formed on the capping layer. *See* Sony's Brief, Exhibit PP (Preliminary Amendment dated May 24, 1001).

FN4. During prosecution, the applicants referred to these claims at claims 18 to 23, but the Examiner referred to these claims as claims 12 to 17.

During prosecution, the Examiner rejected all of the pending claims as obvious in view of U.S. Patent No. 6,117,769 ("the Nogami reference") in view of several other patents. *See* Sony's Brief, Exhibit QQ (Office Communication dated December 21, 2001). In response to this rejection, the inventors cancelled claims 21 to 23, and amended independent claim 18 to include several limitations directed to the planar nature of certain semiconductor layers. In addition to the amendments discussed above, the applicants amended step (f) of their remaining claims to require the surface planarization of the copper layer, formed in step (e), to

leave a "planar copper plug in a planar surface." *See* Sony's Brief, Exhibit SS at SNY14010.

In their remarks, the applicants supported the patentability of their amendments by arguing that:

The claim now calls for a sequence of steps that results in the final layers of the structure formed being planar. Since the last several layers of the device are formed over a precisely planar (planarized) surface, those layers are also planar. The final layer of consequence, the aluminum layer to which the wire bond is made, is also planar. Significantly, since the aluminum contact regions are formed on a planar blanket deposited layer, the surface of each of the contacts, *over a wide region,* is at a common height. This facilitates automated wire bonding.

See id. at SNY14006-7 (emphasis added). As is evident from this passage, the applicants intended for the surface of the aluminum contacts, or bonding pads, to have a common height. In order for this to occur, it logically follows that each intervening layer between the planarized portion of layer (e) and the aluminum bonding pad must be of uniform height. This limitation is necessarily accomplished by planarizing layer (e) and then depositing uniform layers above it. *See* id. at SNY 14008 ("Here the aluminum contacts are made directly on a planar surface. That planar surface is the necessary result of the planarizing step shown in Fig. 14, and claimed as limitation (f). The subsequent steps, depositing barrier layer 51 (Fig.15), and depositing aluminum layer 52 (Fig.52 [sic]) are both blanket layers formed directly on a planarized surface.").

Although the court concludes that term "planar" means "flat," the court rejects Sony's contention that the entire surface of each layer at issue must be flat. As an initial matter, Sony's proposed limitation is not present in the claims of the Chittipeddi '304 patent. For example, claim 1 requires the planarization of the "surface of the structure," as opposed to the planarization of the *entire* "surface of the structure." *See* '304 patent, cl. 1. As discussed above, it is the planarization of the surface of layer (e) that enables the common height of the bonding pad surfaces. *See* Sony's Brief, Exhibit SS at SNY14008. Therefore, if only a portion of the surface of the layer formed in step (e) is planarized, then only a portion of each of the above claimed layers will be flat. Additionally, the prosecution history does not support Sony's proposed limitation. In fact, the applicants actually cautioned against such a limiting interpretation. For example, when discussing the common surface height of the bonding pads, the applicants stated that the common height would extend only "over a wide region" of the surface of the aluminum layer, as opposed to the *entire* surface of the layer. *See* id. at SNY-14007.

Sony finally contends that the applicants' cancellation of claims 21-23 (which were directed to non-planar bonding pads) in view of the Nogami rejection supports its proposed limitation. As discussed above, however, applicants' statements against Nogami do not so limit the issued claims. Additionally, the cancellation of claims directed to non-planar bonding pads does not necessarily require the entire surface of an underlying layer to be flat. The court therefore rejects Sony's proposed limitation because it is inconsistent with the intrinsic record of the Chittipeddi '304 patent. In view of the above, the court concludes that the term "planar" means "flat" and rejects Sony's effort to further limit this term.

2. planar surface

Agere contends that no construction of this term is necessary but offers an alternative construction of "a surface that has been chemically mechanically polished/planarized." Sony contends that this term means "a surface the entirety of which is flat." Consistent with the above discussion, the court construes this term to mean a "flat surface."

3. planarizing the surface of the structure produced in step (e) using chemical mechanical polishing leaving a planar copper plug in a planar surface

Agere contends that no construction of this term is necessary, but alternatively offers a proposed construction of "using chemical mechanical polishing (CMP) to make at least a portion of the surface flat." Sony's proposed construction of this term is "using chemical mechanical polishing (CMP) to make the surface of the entire structure flat." For the above reasons, the court agrees with Agere and construes this term to mean "using chemical mechanical polishing (CMP) to make at least a portion of the surface flat."

F. The Merchant '739 Patent

The Merchant '739 patent is directed to methods of making tungsten plugs in multilayer semiconductor devices. '739 patent at 1:7-10. In the manufacture of a conventional tungsten plug or stud, a contact hole is first formed in a substrate. A titanium layer and a titanium nitride layer are then sequentially deposited on the substrate, followed by the deposition of tungsten to fill the contact hole and form the plug. Id. at 1:12-19. The chemical vapor deposition of tungsten involves the use of tungsten hexafluoride, which subjects the coated substrate to fluorine and hydrofluoric acid. Id. at 1:23-25. In the event fluorine gas diffuses through a defect in the titanium nitride layer, *e.g.* a rupture, excessive tungsten will be deposited at that location. These regions of excessive tungsten deposits are known as volcanos. The top edge of the contact hole is particularly susceptible to volcano formation due to the thinness of the titanium nitride layer along the edge of the hole. Id. at 1:16-17, 1:29-31. Volcano formation along the edge of the contact hole is undesirable because it may result in incomplete filling of the contact hole and uneven tungsten deposition along the substrate, thereby increasing device-related production costs. Id. at 1:35-48.

The Merchant '739 patent discloses a method for providing tungsten plugs that avoids the formation of volcanos and unwanted, excessive tungsten growths on the surface of the semiconductor device. Id. at 1:45-58. This method includes the formation of a contact hole in the insulator layer of a substrate to expose a portion of a conductive layer of the device. Next, titanium and titanium nitride layers are applied to the substrate. The coated substrate is then passivated by contact with silane (SiH_4) gas. A nucleation or seed layer of WSix is then applied by silane reduction of tungsten hexafluoride at a relatively low pressure, followed by substantially filling the contact hole with tungsten by the hydrogen reduction of tungsten hexafluoride at relatively high pressures. Id. at 2:50-64; cl. 9.

1. contact hole

The parties agree that this term means "an opening that extends to a conductive layer." The court adopts the parties' construction for this term.

2. nucleating

Agere's proposed construction of this term is "allowing nuclei to form." Sony's counter-construction of this term is "applying a seed layer of WSix." The parties disagree on whether the seed layer must include WSix. The written description of the '739 patent readily resolves this issue. The written description states that:

The nucleation step *is believed* to provide a WSix seed layer 50 on the passivated TiN surface (See FIG. 4C). While seed layer 50 is shown in FIG. 4C as a continuous layer, it should be understood that seed layer 50 can be a discontinuous layer applied to the TiN adhesion layer 40.

'739 patent at 4:8-13 (emphasis added). The court rejects Sony's proposed construction in light of the applicants' equivocal statement regarding presence of WSi_x in the seed layer. The court construes the term "nucleating" to mean "the application of a seed layer which may or may not be continuous." FN5

FN5. The plaintiff agreed to this construction during the *Markman* hearing. *See* Transcript at 36-37.

3. annealing

Agere's proposed construction for this term is "heating to a temperature and for a duration sufficient to cause a desired change in the microstructure or in the physical and/or mechanical properties." Sony's proposed construction of this term is "heating to a temperature and for a duration sufficient to cause a desired change in physical properties." The parties' disagreement is over the effect that annealing has on the titanium nitride layer. Agere contends that annealing brings about changes in the microstructure of the layer or in the physical and/or mechanical properties of the layer, whereas Sony contends that only the physical properties of the layer are changed.

In support of its position, Agere cites to the definition of annealing contained in Sony's extrinsic claim construction evidence, which includes changes in the microstructure or physical and/or mechanical properties of a substance. In support of its position, Sony cites to the following passage from the written description: "While not wishing to be bound to any theory, *it is believed* that RTA [rapid thermal annealing] tends to cure pinhole defects in the titanium nitride layer ...." '739 patent at 3:48-50 (emphasis added). Sony contends that the definition cited by Agere is unduly expansive in light of the above written description excerpt. Sony's argument is too restrictive, however, especially in view of the language used by the patentees to explain the effects of the annealing process. The court concludes that one of skill in the art would understand that annealing could serve to change the microstructure of a layer or the physical and/or mechanical properties of the layer. Therefore, the court concludes that this term means "heating to a temperature and for a duration sufficient to cause a desired change in the microstructure or in the physical and/or mechanical properties."

4. the chamber

Agere contends that no construction of this term is necessary, but offers an alternative proposed construction of "an enclosure in which one or more semiconductor fabrication steps are performed." Sony's proposed construction of this term is "the same chamber that is referred to in the initial step of 'placing a substrate within a chamber;' all of the recited steps of the method are performed in the same chamber." The last portion of Sony's proposed construction reveals the dispute between the parties. Sony contends that all of the requisite steps of the method must occur in the same chamber, whereas Agere contends that no such limitation is present, and that the requisite steps may occur in a number of different chambers.

Sony contends that the language of the asserted claims supports its position. For example, claim 9 defines "a chamber," and thereafter recites that certain steps of the method are performed in "the chamber." Sony contends that this language, combined with the recited order of the method steps, suggest that the patentees intended for all of the requisite steps to occur in a common chamber. In response, Agere points to the open-ended nature of the claims at issue, and the well-known principle that the use of the article "a" in an open-ended claim carries the meaning of "one or more," unless the applicants evidenced a clear intent to limit the

article to "one." Free Motion Fitness, Inc. v. Cybex Intern., Inc., 423 F.3d 1343, 1350 (Fed.Cir.2005) (citations omitted). The court cannot find any such intent on the part of the applicants to so limit their claims. This is particularly true in view of the fact that one of skill in the art would readily understand that the annealing and titanium nitride deposition steps would commonly occur in different chambers. Therefore, the court rejects Sony's arguments, and concludes that this term means "an enclosure in which one or more semiconductor fabrication steps are performed."

5. introducing SiH4 gas and WF6 gas into the chamber, whereby WF6 is reduced

Agere contends that no construction of this term is necessary, but offers an alternative construction of "introducing SiH_4 and WF_6 gas into an enclosure for performing semiconductor processing." Sony's proposed construction of this term is "flowing SiH_4 and WF_6 gas into the chamber at the same time ." Sony contends that both gases must simultaneously flow into the chamber in order to satisfy the whereby portion of this limitation, *e.g.* in order to reduce tungsten hexafluoride. During the *Markman* hearing, Agere's counsel conceded this point. *See* Transcript at 40. Counsel maintained Agere's position in light of this concession, however, to accommodate start-up conditions, such as when the introduction of one gas begins before the introduction of the other gas. The language of the claim, however, requires that the gases are introduced into the chamber at the same time in order to reduce tungsten hexafluoride. The court therefore construes this term to mean "introducing SiH_4 and WF_6 gas into the chamber at the same time."

G. The Choi '827 Patent

The Choi '827 patent discloses electronic devices that use tantalum pentoxide as a high dielectric constant material instead of using silicon dioxide. '827 patent at 1:18-21. Tantalum pentoxide is a desirable replacement material because it has a lower deposition temperature than silicon dioxide. It is often desirable to pair tantalum pentoxide with titanium nitride in electron devices. *Id.* at 1:34-40. However, prior art pairings would often lead to the undesirable migration of oxygen from the tantalum pentoxide layer into the titanium nitride layer, thereby forming elemental tantalum within the high dielectric layer. The formation of elemental tantalum within the tantalum pentoxide layer would cause high leakage currents within the resulting electrical devices, and render the devices inoperable. *Id.* at 1:49-61.

The Choi '827 patent is directed to preventing the migration of oxygen from the tantalum pentoxide layer during the manufacture of electrical devices. Choi accomplishes this goal by forming a barrier layer adjacent to the layer of high dielectric constant material. The barrier layer may include one or more layers of metal carbide, metal nitride, metal boride, metal carbo-nitride, or silicon carbide. *Id.* at 3:20-25. The barrier layer prevents the diffusion of oxygen from the high dielectric constant material, and enables the low-temperature construction of electrical devices. '827 patent, 1:14-16, 2:48-51.

1. a diffusion barrier disposed between the titanium nitride layer and the high dielectric constant materials, the diffusion barrier being configured to prevent a diffusion of oxygen from the high dielectric constant material

Agere contends that this term does not need construction, but offers an alternative construction of "a material that prevents migration of oxygen from the high dielectric constant material." Sony's proposed construction is "a material that prevents the migration of oxygen from the high dielectric constant material to the titanium nitride layer." The only substantive difference between the parties' constructions is that Sony's construction requires the barrier material to prevent oxygen from reaching the titanium nitride layer.

Sony contends that the specification of the Choi '827 patent requires the claims to have an inherent positive limitation, *i.e.* that oxygen be prevented from migrating into the titanium nitride layer. Agere contends that Choi's invention is more appropriately directed to preventing oxygen from leaving the dielectric layer, rather than entering the titanium nitride layer as Sony suggests. Agere further supports its construction with reference to the claim language, which fails to contain Sony's proposed limitation.FN6 The court agrees with Agere, and concludes that this term means "a material that prevents migration of oxygen from the high dielectric constant material."

FN6. Additionally, Choi actually removed Sony's proposed limitation from claim 1 during prosecution of the application that issued as the '827 patent. Agere's Opening Brief at 37.

5. Conclusion

The court adopts the above constructions. The parties are ordered that they may not refer, directly or indirectly, to each other's claim construction positions in the presence of the jury. Likewise, the parties are ordered to refrain from mentioning any portion of this opinion, other than the actual definitions adopted by the court, in the presence of the jury. Any reference to claim construction proceedings is limited to informing the jury of the constructions adopted by the court.

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Agere Systems, Inc. v. Sony Corp.

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