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“that modulates a carrier signal in accordance with the chosen code” does so by modulating the phase of the carrier signal.

6. Claim 25

The record evidence shows that the accused products do not satisfy all limitations of claim 25.

a. The digital modulation system according to claim 24,

As shown above, the accused products do not satisfy all limitations of asserted claim 24 under the adopted claim constructions.

b. wherein the phase of the at least one carrier signal is QPSK modulated in accordance with the selected code.

As set forth above, the claim term “code” was construed to mean “a sequence of chips representing a real value.” If, however, Complainant’s proposed construction of “code” were adopted such that the term meant “a sequence of chips,” then the evidence shows that the accused products would satisfy the claim limitation “the phase of the at least one carrier signal is QPSK modulated in accordance with the selected code.” The accused products satisfy this claim limitation for the same reasons discussed above with respect to claim 23. In particular, CCK modulation is a form of QPSK modulation.

7. Claim 26

The record evidence shows that the accused products do not satisfy all limitations of claim 26.

a. The digital modulation system according to claim 22,

As shown above, the accused products do not satisfy all limitations of asserted claim 22 under the adopted claim constructions.

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- b. further comprising a scrambler for scrambling the group of data bits.

The evidence shows that the accused products satisfy the additional claim 26 limitation of “a scrambler for scrambling the group of data bits.”

i. 802.11

[] Respondents’ products include [] See, e.g., CX-0116C (802.11 Standard, Jun. 2007) at §18.2.4; CX-1596C (Negus WS) at Q&A 257. Thus, [

] *Id.*

ii. Ralink

[] JX- , CX-0561C ; CX-1596C .]

iii. Realtek

Datasheets confirm that the features claimed in dependent claim 26 [] See, e.g., CX-0579C [] at 16, 36; CX-0580C [] at 11; CX-0581C [] at 10; CX-0582C [] at 9; CX-0583C [] at 9; CX-1596C (Negus WS) at Q&A 259. In addition, HDL code for Realtek’s chips in the module [] shows that [] See, e.g., CX-0298C (Realtek Source Code) at REA837ITC-SC-00002848-50; REA837ITC-SC-00002844,8,9; CX-1596C (Negus WS) at Q&A 259.

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iv. Funai

For those of Funai's products that interoperate with 802.11 standards devices and comprise at least one of Ralink's chips or Realtek's chips, this limitation is met by structure within Funai's products. CX-1596C (Negus WS) at Q&A 260.

8. Claim 29

- a. **A digital modulation system for modulating data bits, comprising: a serial-to-parallel converter that groups the data bits, and a modulator that chooses a code having N chips in response to the group of data bits, the code being a member of a code set that includes M codes, wherein $M > N$, and wherein the code set is derived from a complementary code,**

As set forth above, the claim term "code" was construed to mean "a sequence of chips representing a real value." If, however, Complainant's proposed construction of "code" were adopted such that the term meant "a sequence of chips," then the evidence shows that the accused products would satisfy each of these claim limitations for the reasons discussed above with respect to claim 22.

- b. **wherein the complementary code is defined by the sequence ABAB', such that A is a sequence of elements and B is a sequence of elements and wherein B' is derived by inverting all elements in the sequence B.**

As set forth above, the claim term "code" was construed to mean "a sequence of chips representing a real value." If, however, Complainant's proposed construction of "code" were adopted such that the term meant "a sequence of chips," then the evidence shows that the accused products would satisfy the claim limitation "the complementary code is defined by the sequence ABAB', such that A is a sequence of elements and B is a sequence of elements and wherein B' is derived by inverting all elements in the sequence B." The following analysis sets forth this evidence showing satisfaction of this limitation under the alternate claim construction.

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i. 802.11 – Analysis Under Alternate Construction

As discussed above, the codes in CCK modulation are derived from the sequence {1,1,1,-1,1,1,-1,1}, which is a sequence in the form ABAB'. [

] See, e.g., CX-0561C (Ralink Source Code) at 837RALINK_SC0000007-8; CX-1596C (Negus WS) at Q&A 267; CX-0561C (Ralink Source Code) at 837RALINK_SC0000007,8; CX-1596C (Negus WS) at Q&A 268. [

] See, e.g., CX-0298C (Realtek Source Code) at REA837ITC-SC-00002857-8; CX-1596C (Negus WS) at Q&A 269. [

] For those of Funai's products that interoperate with 802.11 standards devices and comprise at least one of Ralink's chips or Realtek's chips, this limitation is met by structure within Funai's products. CX-1596C (Negus WS) at Q&A 270.

9. Claim 32

- a. **A digital modulation system for modulating a group of data bits, comprising: a scrambler for scrambling the group of data bits, and a modulator that chooses a code having N chips in response to the group of data bits, the code being a member of a code set that includes M codes, wherein $M > N$, and wherein the code set is derived from a complementary code that provides autocorrelation sidelobes suitable for multipath environments.**

Independent claim 32 recites all elements of claim 22 except "a serial-to-parallel converter that groups the data bits," and has no additional limitations. Under the claim constructions adopted above, Respondents' accused products would not satisfy all limitations of claim 32 for the reasons discussed above with respect to claim 22. If, however, Complainants' proposed construction of "code" were adopted, the evidence would show that the accused

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products satisfy all elements of claim 32, again for the same reasons discussed above with respect to claim 22.

10. Claim 35

- a. **A digital modulation system for modulating a group of data bits, comprising: a scrambler for scrambling the group of data bits, and a modulator that chooses a code having N chips in response to the group of data bits, the code being a member of a code set that includes M codes, wherein $M > N$, and wherein the code set is derived from a complementary code, wherein the complementary code is defined by the sequence ABAB', such that A is a sequence of elements and B is a sequence of elements and wherein B' is derived by inverting all elements in the sequence B.**

Independent claim 35 recites all elements of claim 29 except “a serial-to-parallel converter that groups the data bits,” and has no additional limitations. Under the claim constructions adopted above, Respondents’ accused products would not satisfy all limitations of claim 35 for the reasons discussed above with respect to claim 29. If, however, Complainants’ proposed construction of “code” were adopted, the evidence would show that the accused products satisfy all elements of claim 35, again for the same reasons discussed above with respect to claim 29.

11. Funai / [] Products

In a separate section of their post-hearing brief, Complainants argue that Funai products that contain chips sourced from [] infringe the asserted claims of the ‘958 patent by virtue of their implementation of the 802.11 CCK functionality. *See* Compls. Br. at 595-96. Complainants provide the following table that purports to list the Funai products accused of infringing the ‘958 patent that contain an [] chip, as well as relevant documentation showing 802.11 compatibility:

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[
]]

Compls. Br. at 595-96.

With respect to these products, Complainants argue:

The datasheet for the [] clearly states that it “[

.]” *See*, CX-0994C at 1,

34. All products that claim to have an 11 Mb/s CCK transmit capability that are in compliance or interoperable with any of the IEEE 802.11b, 802.11g, or 802.11n standards are, at minimum, more likely than not, and indeed highly likely, to infringe at least Claims 32 and 35 of the ‘958 Patent. CX-1643C (Negus Rebuttal Witness Statement) at 4, Q&A 11; 8, Q&A 42. Indeed, HDL code for numerous such products from Ralink and Realtek in this case demonstrates that the limitations of the asserted claims of the ‘958 Patent were met by all such products that claimed to have an 11 Mb/s CCK transmit capability in compliance or interoperable with any of the IEEE 802.11b, 802.11g, or 802.11n standards. *See* Section V.B, *supra*.

Accordingly, Funai Products that incorporate the [] Chips are highly likely to infringe Claims 32 and 35 of the ‘958 Patent.

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CX-1643C (Negus Rebuttal Witness Statement) at 4, Q&A 11; 8, Q&A 42.

Compls. Br. at 596.

Complainants have not adduced evidence to show that the Funai/[] products in question infringe the '958 patent. As an initial matter, the administrative law judge denied Complainant's motion to supplement the expert report of Dr. Negus to include infringement opinions related to the Funai/[] products. Order No. 84 (Mar. 28, 2013). The administrative law judge also granted Respondents' motion to strike portions of Dr. Negus' witness statement that opined on the alleged infringement of the Funai/[] products. Order No. 85, at 4 (Mar. 29, 2013). Accordingly, Complainants' infringement arguments are not supported by expert testimony.

Complainants instead generally allege, without evidentiary support, that these products are "more likely than not" and "highly likely" to infringe the asserted claims. *See* Compls. Br. at 596. Such a statement is not enough to prove that the Funai/[] products practice all elements of the asserted '958 claims. Therefore, it is determined that Complainants have not shown that the Funai/[] products infringe the asserted claims of the '958 patent.

D. Validity

1. Priority Date

The parties dispute whether or not the asserted claims of the '958 patent are entitled to the July 30, 1996 priority date of U.S. Patent No. 5,862,182 ("the '182 patent"), which is an ancestor to the '958 patent and matured from Application No. 08/688/574 ("the '574 application"). *See* Compls. Br. at 30-33; Resps. Br. at 51-54. The record evidence shows that the amendment to the '958 patent adding the claim of priority to the '574 application was procedurally proper under the PTO rules in effect at the time. The '958 patent was filed on April

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22, 1998. JX-0003. On January 28, 2002, a Supplemental Amendment was filed with the PTO that included a specification amendment adding a priority claim directly after the invention title. JX-0005 ('958 file history) at 124. The priority claim recites that the '958 patent application is a continuation-in-part ("CIP") of the Application No. 09/057,310 ("the '310 application"), and a further CIP of the '574 application. *Id.* Richard van Nee is listed as an inventor on all of these applications.

The Manual of Patent Examining Procedure ("MPEP") in place at the time provided that such a priority claim to an earlier application was proper if made "before the patenting or abandonment of or termination of proceedings on the first application or on an application similarly entitled to the benefit of the filing date of the first application." MPEP, Eighth Ed., § 201.08. The pendency requirement of the MPEP is based solely on the application filing date, which was before the date on which the first application was issued as a patent. Further, the incorporation of the prior specification did not add "new matter" to the application because the claims of the '958 patent were supported by the application prior to amendment, therefore precluding a finding of "new matter."

Moreover, the asserted claims themselves are supported by the specification of the '182 patent. Respondents assert that the following claim terms are not supported by the '182 patent: (1) serial-to-parallel converter, (2) $M > N$, (3) autocorrelation sidelobes, (4) QPSK, and (5) scrambler. *See* Resps. Br. at 52-54. The record evidence shows otherwise.

a. Serial-to-parallel converter

The concept of "a serial-to-parallel converter that groups the data bits" is disclosed in the '182 patent. The '182 specification describes "a conventional digital signal processor" that "partitions the data stream as it is received into successive groups of twelve bits." CX-0878

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(‘182 patent) at col. 2, lns. 40-55. A person of ordinary skill in the art would have understood this to disclose using a serial-to-parallel converter to group data bits. CX-1641C (Katti RWS) at Q&A 130. The ‘182 patent further discloses that after the encoder circuit encodes the groups of bits into phases, “it then supplies those values for those phases to IFFT processor 40, which may be, for example, a conventional digital signal processor (DSP).” CX-0878 (‘182 patent) at col. 3, lns. 35-38. A person of ordinary skill in the art would have understood “DSP” to include a serial-to-parallel converter. CX-1641C (Katti RWS) at Q&A 131.

b. $M > N$

The ‘182 patent discloses an extended code set in which the number of codes (M) is greater than the length of each code (N), that is $M > N$. The ‘958 patent claims non-orthogonal code sets in which the number of codes in the code set is larger than the length of each code in chips. Specifically, column 4, lines 59-65 of JX-0003 (‘958 patent) states that “ M represents an extended number of codes of length N when compared to conventional M -ary keying systems. In conventional M -ary keying systems, the number of possible codes M is not more than the code length N in chips. In the present invention, the number M of codes is always larger than the code length N .”

An “orthogonal” code set in which the number of codes equals the code length can be expressed as a square matrix in which the number of rows is equal to the number of columns. CX-1641C (Katti RWS) at Q&A 134. Each row represents a code and each column entry represents a chip. *Id.* Thus, in a square matrix $M = N$. An extended code set in which $M > N$ can thus be expressed as a nonsquare matrix. *Id.* Matrix A in column 4 of the ‘182 patent explicitly discloses a set of codes in which the number of codewords is greater than the code length. CX-0878 (‘182 patent) at col. 4, lns. 49-58. There are eight rows and four columns used to

encode phases. CX-1641C (Katti RWS) at Q&A 135. A person of ordinary skill in the art would understand that the ‘182 patent discloses the claim element M>N. *Id.* at Q&A 136.

c. Autocorrelation sidelobes suitable for multipath environments

The ‘182 patent also discloses “autocorrelation sidelobes suitable for multipath environments.” The ‘182 patent discloses the use of the following equation:

$$c = \{e^{j(\phi_1+\phi_2+\phi_3+\phi_4)}, e^{j(\phi_1+\phi_3+\phi_4)}, e^{j(\phi_1+\phi_2+\phi_4)}, -e^{j(\phi_1+\phi_4)}, e^{j(\phi_1+\phi_2+\phi_3)}, e^{j(\phi_1+\phi_3)}, -e^{j(\phi_1+\phi_2)}, e^{j\phi_1}\} \quad (1)$$

CX-0878 (‘182 patent) at col. 2, lns. 21-22. This is identical to Equation 18-1 from the 802.11b standard, which is used to generate codes in CCK modulation that have autocorrelation sidelobes suitable for multipath environments. *See* CX-0116C (802.11 Standard, Jun. 2007) at §18.4.6.5.

The ‘182 patent also discloses the series {111-111-11} as a kernel for generating codes of length 8. CX-0878 (‘182 patent) at col. 1, lns. 62-64. The use of this exact “cover sequence” in CCK modulation provides low autocorrelation sidelobes. CX-1596C (Negus WS) at Q&A 233. Thus, a person of ordinary skill in the art would understand the ‘182 patent to disclose low autocorrelation sidelobes. CX-1641C (Katti RWS) at Q&A 137-138.

A person of ordinary skill in the art likewise would have understood the ‘182 patent to disclose a modulation system suitable for multipath environments. The problems of operating wireless local area networks indoors (*i.e.*, in multipath environments) was well understood at the time of the filing of the application for the ‘182 patent, and a person of ordinary skill in the art would therefore have understood low autocorrelation sidelobes to be suitable for multipath environments. CX-1641C (Katti RWS) at Q&A 139. Further, the ‘182 patent teaches how to design complementary codes with low autocorrelation sidelobes for OFDM. *Id.* at Q&A 140. A

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person of ordinary skill in the art would have known that OFDM is an especially attractive modulation system for tackling multipath, and therefore would have been able to apply the teachings of the '182 patent (specifically its code design) to the problem of communication in multipath environments. *Id.*

d. QPSK

QPSK is a type of Phase Shift Keying. The '182 patent explicitly discusses two variants of Phase Shift Keying, 8-PSK and BPSK. CX-0878 ('182 patent) at col. 7, lns. 39-43. As QPSK is just another variant of Phase Shift Keying such as BPSK and 8-PSK, a person of ordinary skill in the art would have understood the '182 patent to disclose phase shift keying generally, which would include QPSK. CX-1641C (Katti RWS) at Q&A 142.

e. Scrambler

The '182 patent specification does not explicitly disclose a scrambler, but a person of ordinary skill in the art would have understood the '182 patent to disclose an invention in which a data scrambler could be incorporated. *Id.* at Q&A 143. This is supported by the deposition testimony of Respondents' expert, Dr. Heegard, who testified that a scrambler is "pretty much inherent in any kind of digital communication systems." *Id.* at Q&A 144.

2. The Prasad Reference

K.V. Prasad & M. Darnell, "Data Transmission Using Complementary Sequence Sets" (1991) ("Prasad") (RX-0590 (Prasad - Data Transmission)) was published in Fifth International Conference on HF Radio Systems and Techniques, 1991, and was publicly available no later than March 3, 1992. RX-1352 (Ellett Declaration) ¶ 16. Accordingly, Prasad is prior art to the asserted claims of the '958 patent pursuant to 35 U.S.C. § 102(b).

a. Anticipation Analysis

Respondents argue that Prasad anticipates claims 22, 23, and 24 of the '958 patent. Resps. Br. at 105-110. Respondents' position is not supported by the record evidence, however.

Prasad is directed to a system for transmission over a multi-carrier system in which the available bandwidth is divided into several carriers and encodes data across all carriers simultaneously. CX-1641C (Katti RWS) at Q&A 169-170. This is different from the single-carrier system of the '958 patent. *Id.* In a multi-carrier system, one has to design encoding algorithms to map incoming data bits into codewords that are simultaneously modulated over multiple carriers. *Id.* at Q&A 172. The chips in a codeword are therefore spread over multiple carriers and frequencies. *Id.* Prasad maps a group of data bits to a single complementary sequence of chips (a code) that is then modulated in parallel on to all the sub-carriers. *Id.* at Q&A 173. The problem that Prasad addresses is how to map the group of data bits to the complementary sequence that is then modulated on to the sub-carriers and sent over the air. *Id.* In a single carrier system, the codeword is modulated over a single carrier frequency. *Id.* Hence, Prasad applies to a different type of communication system compared to the '958 patent. *Id.*

Prasad fails to teach deriving a code set in which the number of codes is greater than the code length. The solution in Prasad is to map each group of data bits to a codeword (also called a complementary set in the article), where each codeword consists of M sequences of length N that is an integer multiple of 2. *Id.* at Q&A 174. There are M such codewords, and the number of sequences in a codeword is *equal* to the number of codewords. *Id.*

Prasad also teaches that $2M$ codewords can be generated by inverting the sequences in each codeword. *Id.* An example of the code set in Prasad is shown in CDX-0301. In this example, there are 4 codewords ($M=4$) which are complementary to each other, and each

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codeword has 16 chips ($N=16$), where each column of 4 chips would be mapped to a subcarrier and this code would support 4 subcarriers. *Id.* at Q&A 176. The hearing testimony of Respondents' expert Dr. Heegard was consistent with this explanation. Heegard Tr. 1125. To put it into the terminology of the '958 patent, the number of chips in each codeword is $M \times N$, and there are at most $2M$ such codewords. The minimum value for N is 2, and in almost all the examples in the article N takes values from 4 to 32 bits. Thus, the number of chips in a codeword is typically $4M$ or $8M$. CX-1641C (Katti RWS) at Q&A 176.

In Prasad, when the selection of the code set is carried out in accordance with the grouping of the data (or "in response to the group of the data bits" as required by the claim language), the length (N) of each of the M code sets is a multiple integer of $2M$. *Id.* at Q&A 181. Further, the code set in Prasad cannot be "doubled" by inverting each code, as the use of such inversions to "double" a code set was disclaimed during the prosecution of the '574 application. *Id.*; JX-0004 ('958 file history) at 44, May 10, 2000 Office Action, at 4-8. Hence, in contrast to the asserted claims of the '958 patent requiring that $M > N$, in Prasad $M < N$ or, at most, $M = N$. CX-1641C (Katti RWS) at Q&A 181. Accordingly, Prasad fails to disclose the claim element "a modulator that chooses a code having N chips in response to the group of data bits, the code being a member of a code set that includes M codes, wherein $M > N$," as required by all asserted claims. *Id.* It is therefore determined that Prasad does not anticipate any asserted claim of the '958 patent.

b. Obviousness Analysis

Respondents assert that Prasad renders obvious claims 25, 26, 29, 32 and 35 of the '958 patent. Resps. Br. at 110-112. Inasmuch as Prasad fails to disclose $M > N$, Respondents have not adduced clear and convincing evidence that Prasad renders obvious any of these claims.

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Further, Prasad does not render obvious the ABAB' claim limitation of claims 29 and 35. *See* Resps. Br. at 111-12. While such sequences existed in the art, Respondents have pointed to nothing in the prior art in which such a sequence is used for modulation. Respondents' expert Dr. Heegard described the ABAB' limitation in the '958 patent as "silly" and "a travesty," and said that there would be no reason to use the ABAB' sequence. *See* Heegard Tr. 1144-1145. In light of Dr. Heegard's assertion that there would be no reason to use the ABAB' sequence, Respondents' argument that use of such a sequence was obvious from the prior art is not persuasive.

3. The Harris Proposal

The Harris Proposal (RX-0529 (Presentation – Harris High Rate Daa Modulation); RX-1351 (Harris Proposal)) was a prior art reference submitted in the '958 applicant's first Information Disclosure Statement. The Harris Proposal was presented to the IEEE 802.11 Working Group and made publicly available at least as early as November 10, 1997. RX-0001 (Andren WS) at Q&A 25-26. Inasmuch as it is determined that the '958 patent is entitled to a 1996 priority date, Respondents have not shown that the Harris Proposal is prior art to the asserted '958 claims.

a. Anticipation Analysis

The GR12 Filing indicates that this Initial Determination should include findings on whether the Harris Proposal anticipates claims 22, 23, 25, 26, 29, 32, and 35 of the '958 patent. *See* GR12 Filing at 12. Respondents, however, have not briefed the issue of anticipation by the Harris Proposal. *See* Resps. Br. at 96-121. Accordingly, the administrative law judge declines to issue any findings with respect to anticipation of the '958 patent by the Harris Proposal.

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b. Obviousness Analysis

The GR12 Filing also indicates that this Initial Determination should include findings on whether the Harris Proposal renders obvious claim 26 of the '958 patent, but Respondents did not brief this issue. *See* GR12 Filing at 12; Resps. Br. at 96-121. Accordingly, the administrative law judge declines to issue any findings with respect to whether the Harris Proposal renders obvious the '958 patent.

4. Combinations of Prior Art

a. The Harris Proposal and van Nee 1996

Respondents allege that the Harris Proposal, in combination with a 1996 article by named inventor Richard van Nee, renders obvious all asserted claims of the '958 patent. *See* Resps. Br. at 113-16. "OFDM Codes for Peak-to-Average Power Reduction and Error Correction" by Richard van Nee ("van Nee 1996") (RX-0614 (van Nee – OFDM Codes)) was published in *Global Telecommunications Conference*, 1996, and was publicly available no later than December 6, 1996. RX-1352 (Ellett Declaration) ¶ 19. Inasmuch as it is determined that the '958 patent is entitled to a July 30, 1996 priority date, Respondents have not shown that van Nee 1996 is prior art to the asserted '958 claims. Accordingly, it is determined that the Harris Proposal in combination with van Nee 1996 does not render obvious the asserted '958 claims.

b. Proakis in Combination with Weathers

John. G. Proakis, *Digital Communications* (3d ed.) ("Proakis") (RX-1349 (Proakis – *Digital Communications*)) is the 1995 edition of a textbook for students and practicing engineers involved in the design of digital communications. *See* RX-0006C (Heegard WS) at Q&A 438-439. Proakis is prior art to the asserted claims pursuant to 35 U.S.C. § 102(b).

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U.S. Patent No. 4,513,288 (“Weathers”) to Glenn D. Weathers and Edward M. Holliday was assigned to the United States government as represented by the Secretary of the Army. RX-0099 (Weathers ‘288). The title of the patent is “Group-Complementary Code Sets for Implementing Pulse-Compression Processing with Optimum Aperiodic Autocorrelation and Optimum Cross-Correlation Properties.” *Id.* The patent issued on April 23, 1985, and is prior art to the asserted ‘958 claims pursuant to 35 U.S.C. § 102(b).

The combination of these two references does not show by clear and convincing evidence that the asserted ‘958 claims are rendered obvious. Proakis discloses certain basic concepts applicable to digital signal modulation, and does not disclose autocorrelation sidelobes suitable for multipath. CX-1641C (Katti RWS) at Q&A 231. Weathers teaches a pulse compression radar system, and only discloses a code set with a single “group complementary code.” *Id.* at Q&A 241; RX-0099 (Weathers ‘288) at col. 3, lns. 13-17. In Weathers $M=1$, and therefore $M < N$ for a group complementary code of length $N > 1$. While Weathers does discuss low autocorrelation sidelobes, Weathers fails to address the specific multipath issues present in the WLAN system of the ‘958 Patent. CX-1641C (Katti RWS) at Q&A 243. Weathers is not applicable to the problem solved by the ‘958 patent, even if some of the same terminology is used. Inasmuch as Weathers fails to disclose $M > N$, and neither Proakis nor Weathers discloses low autocorrelation sidelobes suitable for multipath environments, the combination of these two references do not render obvious any asserted claim of the ‘958 patent.

c. Other Prior Art Combinations

The GR12 Filing indicates that this Initial Determination should include findings on whether additional prior art combinations render obvious the asserted claims of the ‘958 patent,

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but Respondents did not brief these combinations.⁴³ See GR12 Filing at 12-14; Resps. Br. at 96-121. Accordingly, the administrative law judge declines to issue any findings with respect to whether or not these prior art combinations render obvious the '958 asserted claims.

5. Secondary Considerations

Complainants argue that secondary considerations demonstrate that the asserted claims of the '958 patent are not obvious. See Compl. Br. at 417-20. Specifically, Complainants argue that evidence of commercial success, long felt but unmet need, failure of others, copying, and praise for the claimed invention weighs against a finding of obviousness. *Id.* The evidence cited by Complainants, however, consists primarily of expert testimony from Dr. Negus,⁴⁴ and fails to establish the requisite nexus between the alleged secondary considerations and the '958 patent. Moreover, inasmuch as Respondents have not shown by clear and convincing evidence that the asserted claims are anticipated or rendered obvious in light of the cited prior art references, the secondary considerations play only a minor role in the validity analysis of the '958 patent.⁴⁵

6. Indefiniteness

Respondents argue that each of the asserted independent '958 claims, *i.e.*, claims 22, 29, 32, and 35 are indefinite due to the limitation "wherein the code set is derived from a complementary code." See Resps. Br. at 97-101 (citing RX-0006C (Heegard WS) at Q&A

⁴³ These combinations include: (1) Prasad in combination with Proakis and the Harris Proposal, (2) Proakis in combination with Kemp, (3) Prasad in combination with the 802.11-1997 reference, (4) Proakis in combination with Kemp and the 801.11-1997 reference, and (5) Proakis in combination with Weathers and the 802.11-1997 reference. GR12 Filing at 12-14.

⁴⁴ [

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Tr. 237, 242.

⁴⁵ In any event, the discussion of the validity of the '958 patent is provided in the alternative, inasmuch as it has been determined that the asserted claims of the '958 patent are not infringed.

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709-713). Respondents also argue that claims 22 and 32 of the '958 patent are indefinite due to the limitation of a code derived from a complementary code with "autocorrelation sidelobes suitable for multipath environments." *See* Resps. Br. at 101-04 (citing RX-0006C (Heegard WS) at Q&A 714-717). Based on the record evidence, it is determined that Respondents have not shown by clear and convincing evidence that the identified claims are invalid for indefiniteness.

Turning first to the claim limitation "wherein the code set is derived from a complementary code," a person of ordinary skill in the art would understand the term to mean that a complementary code is used to determine the code set. CX-1641C (Katti RWS) at Q&A 350. Inasmuch as the '958 patent provides examples of complementary codes, the term is well-defined by the patent and would be understood by one of ordinary skill in the art. *Id.*

Moreover, the asserted claims do not require that the modulation system itself derives the code set. *Id.* at Q&A 351. Rather, the claims require that the code set itself "is derived" from a complementary code. *Id.* This is a property of the code set that has nothing to do with any action taken by the modulation system. *Id.* So long as the modulation system is configured to modulate signals using a code set derived from a complementary code, the claim element is satisfied. *Id.*

Also, an "end user" need not know how a code set was derived, and a person of ordinary skill in the art would know, *e.g.*, whether the code set was derived from a complementary code set, such as by using Equation 1 of the parent '182 patent. *Id.* Inasmuch as the '182 patent specification and the '958 patent specification each provide specific examples of how a code set may be derived from a complementary code, the asserted claims are not indefinite with respect to this claim limitation.

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As for the claim limitation “autocorrelation sidelobes suitable for multipath environments,” the ‘958 patent specification includes disclosure sufficient to support this claim term. A person of ordinary skill in the art would have understood what size autocorrelation sidelobes would have been suitable for multipath environment. CX-1641C (Katti RWS) at Q&A 356. At the very least, the ‘958 patent specification provides a specific example of suitable autocorrelation sidelobes, namely “half a code length.” JX-0003 (‘958 patent) at col. 4, lns. 1-6. This specific example demonstrates that the claim limitation at issue is not indefinite.

Further, the term “suitable for multipath environment” modifies “autocorrelation sidelobes,” and not the code set. CX-1641C (Katti RWS) at Q&A 357. Thus, the fact that there may be other factors that affect whether a particular code word or code set is “suitable for multipath environments” is irrelevant to the question of whether the autocorrelation sidelobes are suitable for multipath environments. *Id.*

7. Written Description

Respondents argue that, in the event that Complainants’ proposed construction of “code” were adopted such that the term were construed to encompass both real and complex codes, the asserted claims of the ‘958 patent would then be invalid for lack of written description. *See* Resps. Br. at 96-97. Respondent’s argument has merit.

The only codes described in the ‘958 patent are real codes, and the patent does not contain a description sufficient to support a broad claim over the entire “genus” of codes, both real and complex. As discussed above, not only is every code disclosed in the ‘958 specification a real code, but each described embodiment of a digital modulation system in fact requires that the codes selected are real. Accordingly, if the term “code” were construed to include the entire genus of codes, the asserted claims would be invalid for lack of written description.

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Nevertheless, inasmuch as Complainants' proposed construction of "code" was not adopted in this investigation, the question of whether the asserted '958 claims are invalid for lack of written description is moot.

VIII. The '867 Patent

A. The Asserted Claims and Accused Products

Asserted U.S. Patent No. 6,707,867 ("the '867 patent") is titled, "Wireless Local Area Network Apparatus." JX-0005 ('867 patent). The '867 patent issued on March 16, 2004, and the named inventors are Wilhelmus J. M. Diepstraten, Hendrik van Bokhorst, and Hans van Driest. *Id.* The '867 patent relates generally to "[a] wireless local area network apparatus includ[ing] a transmitter and a receiver in which operation of the receiver is accurately synchronized with periodic signal from the transmitter." *Id.* at Abstract.

LSI asserts independent claims 20, 26, 34, 47, and 49, and dependent claims 23, 24, 27-33, 35, 37-40, 50-56, and 58-61 against Funai and Realtek. The relevant claims are as follows:

20. A receiver, comprising:

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

23. The receiver of claim 20, wherein the transmission signal further includes a header field, which is transmitted before the timestamp field and the traffic pending field.

24. The receiver of claim 23, wherein the header field includes type data indicating a type of the transmission signal.

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26. A receiver, comprising:

a receiver counter that counts up to n counts,

a radio modem capable of 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 the receiver counter with a transmitter timer, wherein the timestamp represents a value m within a count sequence of the transmitter timer, and

circuitry for adjusting a value, based on the timestamp, at which a count sequence begins at the receiver timer, wherein the receiver counter commences a synchronizing count sequence beginning at the adjusted value.

27. The receiver of claim 26, further comprising:

circuitry for commencing the synchronizing count sequence after the transmission signal is completely received.

28. The receiver of claim 27, further comprising circuitry for commencing the synchronizing count sequence after a CRC data in the received transmission signal is checked.

29. The receiver of claim 26, further comprising an adder for adding a compensation factor to the value at which the count sequence begins.

30. The receiver of claim 29, wherein the compensation factor compensates for propagation delay at the receiver.

31. The receiver of claim 29, wherein the compensation factor allows for time taken to process the transmission signal at the receiver.

32. The receiver of claim 26, wherein the timestamp accounts for a delay between a start of a process to transmit the transmission signal and an actual time of transmitting the transmission signal.

33. The receiver of claim 26, wherein the timestamp accounts for delays due to a busy signal on a medium access protocol.

34. A receiver, comprising:

a receiver counter that counts up to n counts, and

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a radio modem capable of periodically receiving a transmission signal from a transmitter, the transmission signal including a traffic pending field and a timestamp field the traffic pending field including data indicating stations for which the transmitter has data buffered, the timestamp field including a timestamp having a value m for synchronizing the receiver counter with a transmitter timer, wherein the timestamp represents a value m within a count sequence of the transmitter timer at the time of transmission of the transmission signal.

35. The receiver of claim 34, wherein the transmission signal further includes a timer interval field, and the timer interval field includes timer interval data indicating an interval between periodic transmissions of transmission signals including traffic pending field.

37. The receiver of claim 35, wherein the timestamp accounts for a delay between a start of a process to transmit the transmission signal and an actual time of transmitting the transmission signal.

38. The receiver of claim 35, wherein the timestamp accounts for delays due to a busy signal on a medium access protocol.

39. The receiver of claim 34, wherein the timestamp accounts for a delay between a start of a process to transmit the transmission signal and an actual time of transmitting the transmission signal.

40. The receiver of claim 34, wherein the timestamp accounts for delays due to a busy signal on a medium access protocol.

47. A receiver comprising:

a receiver counter 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 field, the timestamp field including a timestamp having a value m for synchronizing the receiver counter with a transmitter timer, wherein the timestamp represents a value m within a count sequence of the transmitter timer, and wherein the timestamp accounts for a delay between a start of a process to transmit the transmission signal and an actual time of transmitting the transmission signal.

49. 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

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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.

50. The receiver of claim 49, wherein the timestamp accounts for delays in a modem of the transmitter.

51. The receiver of claim 49, wherein the timestamp accounts for delays due to a busy signal on a medium access protocol.

52. The receiver of claim 49, wherein the receiver timer commences a synchronizing count sequence beginning at a value based on the timestamp.

53. The receiver of claim 52, further comprising circuitry for adjusting the value at which the count sequence begins.

54. The receiver of claim 53, further comprising an adder for adding a compensation factor to the value at which the count sequence begins.

55. The receiver of claim 54, wherein the compensation factor compensates for propagation delay at the receiver.

56. The receiver of claim 54, wherein the compensation factor allows for time taken to process the transmission signal at the receiver.

58. The receiver of claim 49, further comprising circuitry for commencing the synchronizing count sequence after the transmission signal is completely received.

59. The receiver of claim 58, further comprising circuitry for commencing the synchronizing count sequence after a CRC data in the received transmission signal is checked.

60. The receiver of claim 49, wherein the transmission signal further includes a traffic pending field that indicates stations for which the transmitter has data buffered.

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61. The receiver of claim 60, wherein the transmission signal further includes a timer interval field, and the timer interval field includes timer interval data indicating an interval between periodic transmissions of transmission signals including traffic pending fields.

JX-0005 at col. 9, lns. 57-67; col. 10, lns. 9-14; col. 10, lns. 23-67; col. 11, lns. 1-8; col. 11, lns. 12-25; col. 12, lns. 18-29; col. 12, lns. 38-67; col. 13, lns. 1-3; col. 13, lns. 8-21.

Complainants accused the following products of infringing the ‘867 Patent: (1) Realtek’s products that are compliant or compatible with the applicable 802.11 standards described for timing synchronization; and (2) Funai’s products that (a) are compatible with the applicable 802.11 standards described for timing synchronization; (b) contain at least one of Realtek’s products; or (c) contain at least one of Ralink’s products that are compatible with the applicable 802.11 standards described for timing synchronization. Compls. Br. at 45-46.⁴⁶

Complainants provide the following table purporting to summarize Funai’s products accused of infringing the ‘958 Patent and the ‘867 Patent, along with the WiFi chip supplier for each product and documentation showing 802.11 compatibility:

[
]

⁴⁶ Complainants also accuse of infringement certain Funai products that contain chips from []. These products will be addressed separately in the section addressing Complainants’ infringement arguments.

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[
]

Compls. Br. at 46-47.

Complainants provide the following table purporting to summarize Realtek’s products accused of infringing the ‘958 Patent and the ‘867 Patent, along with the documentation showing 802.11 compatibility:

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[illegible]

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[illegible]

Compls. Br. at 47-49.

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Complainants provide the following table purporting to list the Ralink products at issue with respect to the '958 Patent and the '867 Patent, along with the documentation showing 802.11 compatibility:

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		I

Compls. Br. at 50.

B. Claim Construction

1. Level of Ordinary Skill

A person of ordinary skill in the art relevant to the '867 patent at the time of the invention would have at least a bachelor's degree in electrical engineering, computer science, or a related field, and at least one year of experience and knowledge in communication networks or a related field. RX-0006C (Heegard WS) at Q&A 718-21.⁴⁷

⁴⁷ Complainants propose that a person of ordinary skill in the art at the time of the invention of the '867 patent would be someone with a BSEE or equivalent and at least two years of experience in developing or implementing wireless communications protocols at the MAC layer. Compls. Br. at 42 (citing CX-1596C (Negus WS) at Q&A 133). The parties have not identified any way in which differences in their proposed definitions of the level of ordinary skill in the art affect issues in this investigation. *See* Resps. Br. at 137.

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2. “periodically receiving [a transmission signal from a transmitter]”

Claim Term/Phrase	Complainants’ Construction	Respondents’ Construction
“periodically receiving [a transmission signal from a transmitter]”	No construction necessary. Alternatively, “receiving transmission signals separated by time intervals”	“receiving at regular intervals”

The claim term “periodically receiving [a transmission signal from a transmitter]” appears in asserted claims 20, 26, 34, 47, and 49 of the ‘867 patent. Complainants argue that this term needs no construction, but argue that it should be construed to mean “receiving transmission signals separated by time intervals” in the event it is decided this term should be construed. Compls. Br. at 452-53. Respondents argue that this term should be construed to mean “receiving at regular intervals.” Resps. Br. at 152-52.

As proposed by Respondents, the claim term “periodically receiving [a transmission signal from a transmitter]” is construed to mean “receiving at regular intervals,” which is a construction that comports with the plain meaning of the term as understood by a person of ordinary skill in the art, and is consistent with the intrinsic evidence.

The plain meaning of “periodically” is “at regular intervals” or periods. RX-2811C (Vojcic WS) at Q&A 264; RX-0006C (Heegard WS) at Q&A 909-15. This plain meaning construction was adopted by the court in a previous litigation, and Complainants agreed with the construction at that time. *See* RX-1345 (Sony Opinion) at 17.

The language of the other ‘867 claims are also in accord with Respondents’ proposed construction. For instance, claims 2 and 21 recite “periodically waking the receiver from a sleep mode to receive transmissions.” The ‘867 specification describes “periodically” waking or energizing the transceivers from a sleep mode at fixed, recurring intervals. JX-0005 (‘867

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patent) at Fig. 7; col. 3, lns. 11-16 (“transceivers in the stations 12.1-12.6 are periodically energized at regular intervals such that the stations 12.1-12.6 wake up from a doze state”); col. 1, lns. 42-44 (“transmitter timer means for controlling periodic generation of transmission signals”); col. 2, ln. 66 – col. 3, ln. 1 (“the stations 12.1-12.6 are operated in a power-save-mode in which their transceivers are periodically de-energized”); col. 3, lns. 27-29 (“with the exception of the periodic waking to receive the TIM packets, a station 12.1-12.6 remains in a power saving doze state”).

Therefore, the claim term “periodically receiving [a transmission signal from a transmitter]” is construed to mean “receiving at regular intervals.”

3. **“a timestamp having a value m for synchronizing the receiver counter with a transmitter timer, wherein the timestamp represents a value m within a count sequence of the transmitter timer” / “a timestamp for synchronizing the receiver timer with a transmitter timer that counts up to n counts, the timestamp being a value m”**

Claim Term/Phrase	Complainants' Construction	Respondents' Construction
<p>“a timestamp having a value m for synchronizing the receiver counter with a transmitter timer, wherein the timestamp represents a value m within a count sequence of the transmitter timer”</p> <p>“a timestamp for synchronizing the receiver timer with a transmitter timer that counts up to n counts, the timestamp being a value m”</p>	<p>No construction necessary.</p> <p>Alternatively, “a timestamp representing a value of a counter in the transmitter”</p>	<p>“a timestamp representing a value m within the range 0 to n in the counter of the transmitter, where n represents the interval between transmission signals”</p>

The claim terms “a timestamp having a value m for synchronizing the receiver counter with a transmitter timer, wherein the timestamp represents a value m within a count sequence of the transmitter timer” and “a timestamp for synchronizing the receiver timer with a transmitter

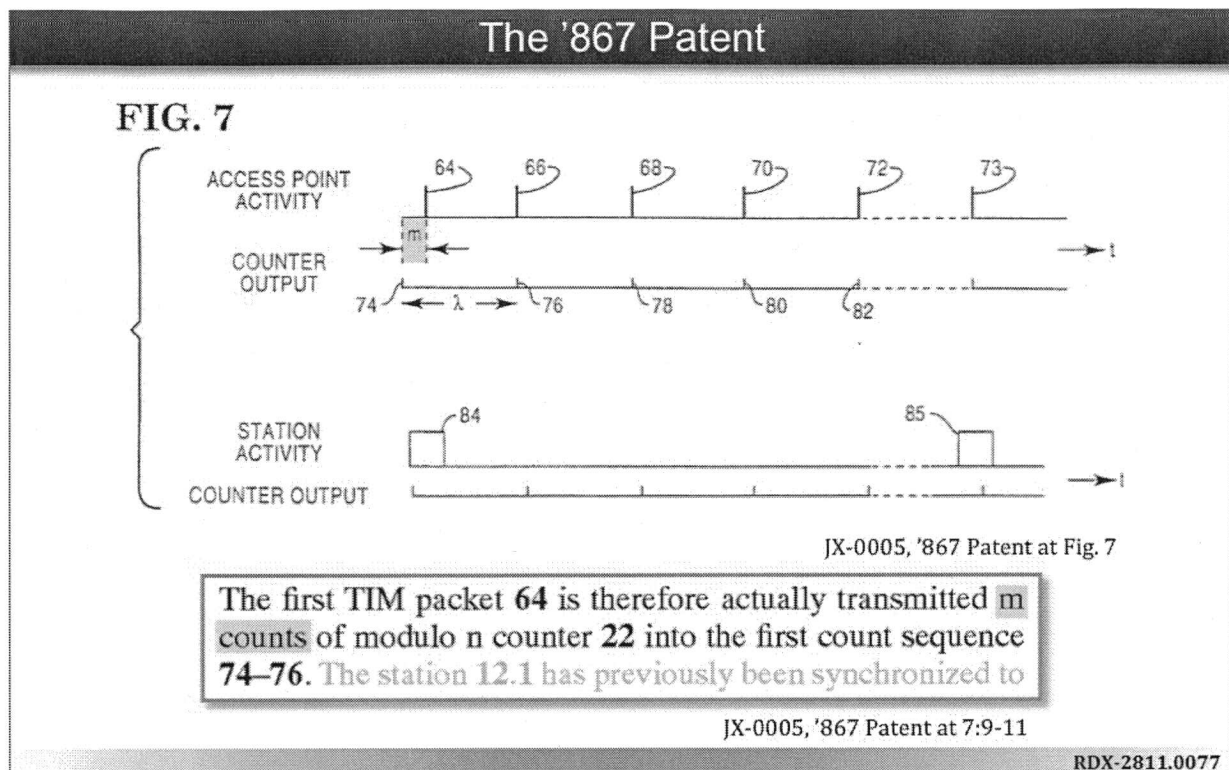
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timer that counts up to n counts, the timestamp being a value m” (the “timestamp phrases”) appear in asserted claims 20, 26, 34, 47, and 49 of the ‘867 patent. Complainants take the position that these terms need no construction, but argue that they should be construed to mean “a timestamp representing a value of a counter in the transmitter” in the event it is decided these terms should be construed. Compls. Br. at 453-56. Respondents argue that these terms should be construed to mean “a timestamp representing a value m within the range 0 to n in the counter of the transmitter, where n represents the interval between transmission signals.” Resps. Br. at 139-46.

As proposed by Respondents, the timestamp phrases are construed to mean “a timestamp representing a value m within the range 0 to n in the counter of the transmitter, where n represents the interval between transmission signals.”

The timestamp phrases expressly recite “value m,” which the specification and the prosecution history define as the delay between the time the next transmission of the TIM⁴⁸ packet is scheduled to occur and the time of its actual transmission. JX-0005 (‘867 patent) at Fig. 7; col. 7, lns. 9-11; RX-0006C (Heegard WS) at Q&A 916-28; RX-2813C (Heegard RWS) at Q&A 332-343; RX-2811C (Vojcic WS) at Q&A 221; *see* RDX-2811.0077.

⁴⁸ “TIM” is an acronym for “traffic indication message.” JX-0005 at col. 3, lns. 8-11.



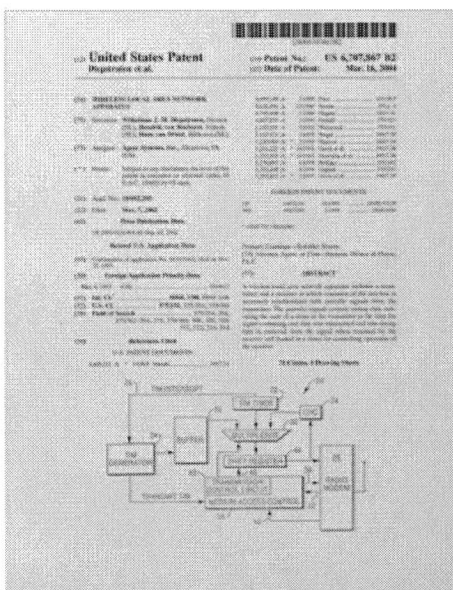
As illustrated above in RDX-2811.0077, the specification describes Figure 7 and explains that the first TIM packet 64 is delayed by “m counts,” and the timestamp will equal these “m counts” of delay. JX-0005 (‘867 patent) at col. 7, lns. 9-15. The entire specification uses “m” consistent with only one meaning, which is the amount of delay.

During prosecution of the ‘867 patent, the applicants stated that m is the length of the delay, explaining, “If there was a delay (e.g. m counts), the ‘time stamp’ informs the receiver of the length of the delay (i.e. m counts).” RX-1165 (file history of ‘661 application) at REA837ITC00000498-99, 526; JX-0006 (file history of ‘867 patent) at JX-0006.0232-33; RX-2811C (Vojcic WS) at Q&A 222; RDX-2811.0078-79; Katti Tr. 1893-1894 (“Q. So the applicant is saying, here, that this timestamp not only indicates whether there was a delay, but how long the delay was. That’s what they wrote here, right? A. It indicates how long was that delay.”).

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Each asserted claim also requires that the timestamp represent a value m within a “count sequence.” As illustrated below, the ‘867 specification defines “count sequence” as “a value between 0 and n ,” by referring to the receiver as being “already into its next count sequence, *i.e.*, at a value between 0 and n .” JX-0005 (‘867 patent) at col. 5, lns. 49-51; RDX-2811.00034.

The '867 Patent



start of the transmission of the header. As mentioned above, the modulo n counter 22 in the access point 14 of transmitter 20 is free running and so by the time the CSMA/CA protocol has been completed, and particularly if a medium busy signal 40 was received by the WMAC control 36, the counter 22 is already into its next count sequence, *i.e.* at a value between 0 and n , by the time that the clear-to-send signal 42 is received by the WMAC control 36. At a

JX-0005, '867 Patent at 5:45-52

modulo n counter 58. The use of the counter register 54 is particularly advantageous in that it allows TIM packets of different lengths to be received. This arises since the modulo n count sequence, that commences at the time stamp value, is buffered in the register 54 while the TIM packet 28 is processed completely. The counter register 54 maintains the cyclic modulo n count for as long as is necessary to process the TIM packet.

JX-0005, '867 Patent at 6:18-25

The first TIM packet 64 is therefore actually transmitted m counts of modulo n counter 22 into the first count sequence 74-76. The station 12.1 has previously been synchronized to

JX-0005, '867 Patent at 7:9-11

RDX-2811.0034

RDX-2811.00034.

During prosecution, the applicants explained that “timestamp” was “well defined in Applicants’ specification” as “represent[ing] a value m within a count sequence,” and that “[t]he count sequence ranges from 0 to n .” RX-1165 (file history of ‘661 application) at REA837ITC00000474, 498-99 & n .*, 501-03 & n ****; RX-2811C (Vojcic WS) at Q&A 222-24. The applicants also distinguished prior art whose timer was “not caused to start counting from a value which is intermediate any count sequence such as a value m , where the

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count sequence ranges from 0 to n, and $0 < m < n$.” RX-1165 (file history of ‘661 application) at 109; RX-2811C (Vojcic WS) at Q&A 224.

The specification defines “n” as the timer interval between successive TIM packets.⁴⁹ For example, the specification describes “A TIMER INTERVAL FIELD which indicates the value of n of the modulo n counter in the transmitter 20,” and states, “[t]he modulo n [transmitter counter] functions as a timer and when the count value reaches n, a TIM function generator 24 is triggered by way of an interrupt signal 25 indicating that the next TIM packet should be constructed by way of a radio modem 26.” JX-0005 (‘867 patent) at col. 4, lns. 57-61, col. 5, lns. 5-6. One of the named inventors, Mr. Diepstraten, [

] JX-0020C (Feb. 15, 2013 Diepstraten Dep.) at 45-46; RX-2683 (Exhibits to Diepstraten Dep.). Complainants’ expert Dr. Katti argues that this definition of n, which is the only definition of n in the intrinsic record, is merely a “preferred embodiment” and that n as used in the claims can represent “any whole number.” CX-1641C (Katti WS) at Q&A 433. The ‘867 patent, however, discloses and suggests no value for n that represents anything other than the interval between transmission signals.

Complainants’ proposed construction, “a timestamp representing a value of a counter in the transmitter,” treats the terms “value m,” “count sequence,” and “synchronizing” as nonexistent. Complainants’ proposed construction is also contrary to the intrinsic evidence, including the applicants’ statements to the PTO during prosecution that “timestamp” was “well

⁴⁹ A TIM packet, or Traffic Indication Message, is shown in Figure 3 of the ‘867 patent. JX-0005 (‘867 patent) at Fig. 3; col. 2, lns. 21-22. TIM packets are transmitted at regular intervals from an access point, or transmitter, to indicate which stations, or receiver, have information ready for transmission. *Id.* at col. 3, lns. 8-11.

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defined” in the specification as “a value m within a count sequence,” where “the count sequence ranges from 0 to n , where $0 < m < n$,” and the counters “remain in synchronization as they cyclically count up to value n ,” and that the purpose of the claimed “timestamp” is to “inform the receiver of the length of the delay (i.e. m counts).” RX-2811C (Vojcic WS) at Q&A 224, 229-31.

Complainants’ proposed construction also strips the claimed timestamp of its essential purpose of enabling accurate synchronization between the transmitter and a receiver. As named inventor Mr. Diepstraten testified, [

] JX-0020C (Diepstraten Dep.) at col. 15, lns. 5-23; RX-2683 (Exhibits to Diepstraten Dep.). For the receiver to achieve synchronization, it must know the amount by which an arriving transmission signal has been delayed in order to align its counter correctly. RX-2811C (Vojcic WS) at Q&A237-238. Complainants’ proposed construction reads this essential function of the timestamp, *i.e.*, the act of synchronization itself, out of the asserted claims.

Accordingly, the timestamp phrases are construed to mean “a timestamp representing a value m within the range 0 to n in the counter of the transmitter, where n represents the interval between transmission signals.

4. “accounts for delay” / “accounts for delays” / “accounts for a delay”

Claim Term/Phrase	Complainants’ Construction	Respondents’ Construction
“accounts for delay” “accounts for delays” “accounts for a delay”	No construction necessary. Alternatively, “accounts for the delay in transmission of a signal”	“indicates the amount of delay”

The claim terms “accounts for delay,” “accounts for delays,” and “accounts for a delay” appear in asserted claims 20, 32, 33, 37-40, 47, and 49-51 of the ‘867 patent. Complainants take the position that these terms need no construction, but argue that they should be construed to mean “accounts for the delay in transmission of a signal” in the event it is decided these terms should be construed. *See* Compls. Br. at 456-57; Joint List of Proposed Claim Constructions. Respondents argue that these terms should be construed to mean “indicates the amount of delay.” Resps. Br. at 149-50.

As proposed by Respondents, the claim terms “accounts for delay,” “accounts for delays,” and “accounts for a delay” are construed to mean “indicates the amount of delay.”

The specification describes a timestamp that represents a value *m* from 0 to *n*, *i.e.*, the interval between transmission signals, which is the length of any delay between the scheduled and the actual transmission of the TIM packet. JX-0005 (‘867 patent) at Fig. 7; col. 7, lns. 9-11; Thus, the timestamp indicates the amount of delay.

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5. “as to synchronize the receiver timer with the transmitter timer”

Claim Term/Phrase	Complainants’ Construction	Respondents’ Construction
“as to synchronize the receiver timer with the transmitter timer”	No construction necessary.	Indefinite.

The claim term “as to synchronize the receiver timer with the transmitter timer” appears in asserted claim 49 of the ‘867 patent. Respondents take the position that this term would be indefinite in the event Complainants’ proposed construction for the timestamp phrases were adopted. *See* Resps. Br. at 154-55. Inasmuch as Complainants’ proposed construction for the timestamp phrases was not adopted, Respondents’ argument with respect to the claim term “as to synchronize the receiver timer with the transmitter timer” is moot.

6. “the traffic pending field”

Claim Term/Phrase	Complainants’ Construction	Respondents’ Construction
“the traffic pending field”	No construction necessary.	Indefinite.

The claim term “the traffic pending field” appears in asserted claim 23 of the ‘867 patent. Respondents argue that this claim term is indefinite. Resps. Br. at 155. Whether or not this term is indefinite is discussed below in the section relating to the validity of the ‘867 patent.

7. “at the time of transmission of the transmission signal” / “an actual time of transmitting the transmission signal”

Claim Term/Phrase	Complainants’ Construction	Respondents’ Construction
“at the time of transmission of the transmission signal” “an actual time of transmitting the transmission signal”	No construction necessary. Alternatively, “when the transmission signal is transmitted”	“at the beginning of the transmission of the packet”

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The claim terms “at the time of transmission of the transmission signal” and “an actual time of transmitting the transmission signal” appear in asserted claims 32, 34, 37, 39, 47, and 49 of the ‘867 patent. Complainants take the position that these terms need no construction, but argue that they should be construed to mean “when the transmission signal is transmitted” in the event it is decided these terms should be construed. *See* Compls. Br. at 458; Joint List of Proposed Claim Constructions. Respondents argue that these terms should be construed to mean “at the beginning of the transmission of the packet.” Resps. Br. at 150-52.

The administrative law judge declines to adopt Respondents’ proposed construction. Respondents’ proposed construction is not supported by the intrinsic evidence, and the proposed construction does not add any clarity to the meaning of the claim terms. Respondents propose that these terms refer to the transmission of “the packet,” but do not specify what “the packet” is. *See* CX-1641C (Katti RWS) at Q&A 461-463. In fact, the claims themselves refer to a “signal,” but not to a “packet.”

Therefore, it is determined that the claim terms “at the time of transmission of the transmission signal” and “an actual time of transmitting the transmission signal” do not need construction, but should instead be given their plain and ordinary meaning.

8. “a receiver counter that counts up to n counts”

Claim Term/Phrase	Complainants’ Construction	Respondents’ Construction
“a receiver counter that counts up to n counts”	No construction necessary. Alternatively, “a counter in the receiver configured to count up to n counts, where n is any whole number”	“receiver counter that counts from 0 to n, where n represents the interval between transmission signals”

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The claim term “a receiver counter that counts up to n counts” appears in asserted claims 20, 26, 34, 47, and 49 of the ‘867 patent. Complainants take the position that this claim term does not need construction, but argue that it should be construed to mean “a counter in the receiver configured to count up to n counts, where n is any whole number” in the event it is decided the term should be construed. *See* Compls. Br. at 458; Joint List of Proposed Claim Constructions. Respondents argue that this term should be construed to mean “receiver counter that counts from 0 to n, where n represents the interval between transmission signals.” Resps. Br. at 146-48.

As proposed by Respondents, the claim term “a receiver counter that counts up to n counts” is construed to mean “receiver counter that counts from 0 to n, where n represents the interval between transmission signals.”

As explained above with respect to the “timestamp” phrases, the specification defines “n” as the timer interval between successive TIM packets. As illustrated below in RDX-2811.0088, during prosecution of the parent ‘661 patent application, the applicants explained the importance of the cyclical count from 0 to n, which they called the “count sequence,” of the receiver and transmitter counters. RX-1165 (file history of ‘661 application) at 80, 104-05 & n.*, 132; RX-2811C (Vojcic WS) at Q&A 243; *see* RDX-2811.0088. The ‘867 patent is therefore based on the timestamp being a value m within a cyclical count from 0 to n, where m is the length of the delay and n is the interval between transmission signals, and a receiver counter that cyclically counts from 0 to n, where n is the interval between transmission signals, is consistent with this understanding.

'661 File History

m. As a result, the two counters 22 and 58 remain in synchronization as they cyclically count up to value n. (See e.g. Applicants' specification at page 13, lines 6-16).

RX-1165 (U.S App. No. 08/155,661 File History) at 80

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).

RX-1165 (U.S App. No. 08/155,661 File History) at 105

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).

RX-1165 (U.S App. No. 08/155,661 File History) at 132

RDX-2811.0088

By allowing n to be “any whole number,” Complainants’ proposed construction ignores the definition in the specification and what they told the USPTO. Complainants’ proposed construction also renders the phrase “up to n counts” meaningless. Every counter must have some maximum value, and thus, Complainants’ proposed construction reduces the phrase “a receiver counter that counts up to n counts” to just “a receiver counter.”

Complainants’ expert Dr. Katti argues that, because the specification describes a “free running” counter which counts up to n, that “the specification places no limits on the value of n.” See CX-1641C (Katti RWS) at Q&A 437. This position contradicts what the applicants told the USPTO, which is that “free running” means “uncontrolled by a signal source,” and therefore has nothing to do with the value of n. RX-1165 (file history of ’661 application) at REA837ITC00000473. Indeed, Dr. Katti testified that the specification describes the “free running” counter as resetting to zero upon reaching the value n, which is the value of the interval

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between transmission signals. Katti Tr. 1897-1898; 1899 (describing JX-0005 ('867 patent) at col. 5, lns. 45-51). Thus, the only embodiment in the '867 patent uses a timestamp for synchronization in the context of timers or counters that roll over during a transmission signal interval. Negus Tr. 435.

Therefore, the claim term “a receiver counter that counts up to n counts” is construed to mean “receiver counter that counts from 0 to n, where n represents the interval between transmission signals.”

9. “timer interval field”

Claim Term/Phrase	Complainants' Construction	Respondents' Construction
“timer interval field”	No construction necessary. Alternatively, “a field which represents the time interval between transmissions”	“the value of n of the counter in the transmitter”

The claim term “timer interval field” appears in asserted claims 35 and 61 of the '867 patent. Complainants take the position that this claim term does not need construction, but argue that it should be construed to mean “a field which represents the time interval between transmissions” in the event it is decided the term should be construed. *See* Compls. Br. at 459; Joint List of Proposed Claim Constructions. Respondents argue that this term should be construed to mean “the value of n of the counter in the transmitter.” Resps. Br. at 153-54.

As proposed by the Respondents, the claim term “timer interval field” is construed to mean “the value of n of the counter in the transmitter.”

The '867 patent defines the “timer interval field” as a field which “indicates the value of n of the modulo n counter in the transmitter 20.” JX-0005 ('867 patent) at col. 5, lns. 2-4. This express definition is consistent with the adopted construction.

C. Infringement

1. The Accused Timing Synchronization Functionality of the 802.11 Standards

In the '867 patent, a timestamp is used for synchronization in the context of timers or counters that roll over or reset upon reaching the transmission signal interval value. Negus Tr. 435. This permits a receiver to know when to expect the next transmission signal in the next transmission signal interval and wake up at the expected time. The record evidence shows that the IEEE 802.11 standard describes a different paradigm for synchronization.

In 802.11, the Beacon interval (*i.e.*, the transmission signal interval) is 2^{16} , but the standard timestamp is given the value of a transmitter counter that counts up to 2^{64} , and therefore will not be within the Beacon interval. *See* CX-0116C (IEEE Std. 802.11-2007) at LSIAgere837-01170257 (Section 7.3.1.3), LSIAgere837-011700588 (Section 11.1.2); RX-2813C (Heegard RWS) at Q&A 351-57. Typically, [

] *See* Negus Tr. 437-438.

[

]

Rather, [] as discussed further below. The differences between the IEEE 802.11 standard and the '867 patent can be explained by the analogy offered by Dr. Heegard. RX-2813C (Heegard RWS) at QA 388; Hg. Tr. (Heegard) at 1156:20-1159:23. Rather than using a timestamp to inform a receiver of the next expected Beacon signal so that a receiver need only wake up the expected time of the next

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Beacon signal, the IEEE 802.11 standard provides for a different kind of synchronization by which a receiver can only estimate roughly when the next Beacon may arrive. Hg. Tr. (Heegard) at 1161-1164; RX-2813C (Heegard RWS) at QA 351-57, 365, 392.

Complainants concede there is no literal infringement under Respondents' proposed constructions for the following claim terms:

- “a timestamp having a value *m* for synchronizing the receiver counter with a transmitter timer, wherein the timestamp represents a value *m* within a count sequence of the transmitter timer” (CX-1596C (Negus WS) at QA 354 (claim 20), 381 (claim 26), 422 (claim 34), 450 (claim 47));
- “a timestamp for synchronizing the receiver timer with a transmitter timer that counts up to *n* counts, the timestamp being a value *m*” (*id.* at QA 455 (claim 49));
- “receiver [counter/timer] that counts up to *n* counts” (*id.* at QA 321 (claim 20), 379 (claim 26), (claim 34), 50 448 (claim 47), 453 (claim 49));
- “accounts for [delays/a delay]” (*id.* at 370 (claim 20), 419 (claim 33), 444 (claim 38), 446 (claim 40), 465 (claim 50), 466 (claim 51)); and
- “timer interval field” (*id.* at 439 (claim 35)).

⁵⁰ Complainants' expert, Dr. Negus, does not specifically address the “receiver counter counts up to *n* counts” limitation of claim 34. *See* CX-1596C (Negus WS) at QA 420-30.

2. Complainants' Reliance on HDL Code to Show Infringement

Complainants' expert Dr. Negus relies on analysis of HDL code for the accused products for his '867 infringement analysis, just as he did for his '958 infringement analysis. *See* CX-1596C (Negus WS) at Q&A 138.

[

]

For the Realtek products, Dr. Negus found that [] relevant to his infringement analysis of the '867 patent [

] CX-1596C (Negus WS) at Q&A 141. Dr. Negus summarized [

] and then analyzed the '867 patent issues separately for

[] *Id.* Dr. Negus determined that [

] in terms of issues related to the infringement analysis. *Id.* Realtek's

expert Dr. Vojcic testified to [] *See, e.g.,* Vojcic Tr. 1212.

3. Claim 20

The record evidence shows that the accused products do not satisfy all limitations of claim 20.

a. A receiver, comprising:

i. 802.11

Respondents' products are [

] *See, e.g.,* CX-0116C

(802.11 Standard, Jun. 2007) at §1.1; CX-1596C (Negus WS) at Q&A 301. An STA in an

⁵¹ [

]

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infrastructure BSS⁵² is a “receiver.” JX-0005 (‘867 patent) at Figs. 1, 5; col. 2, lns. 48-62; col. 5, lns. 64-67; CX-1596C (Negus WS) at Q&A 301.

ii. Ralink

[
CX-0562C, CX-0563C, CX-0564C
; CX-0565C ; CX-0566C ;
CX-0567C ; CX-0568C ; CX-0569C
; CX-0570C ; CX-1596C
CX-0565C ; CX-1596C
JX0014C
]

iii. Realtek

Datasheets for Realtek’s chips state that each such chip is [
] and in various exemplary documents [

⁵² “BSS” is an acronym for “basic service set.”

⁵³ “RF” is an acronym for “radio frequency.”

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] *See, e.g.*, CX-0571C [] at 8; CX-0572C [] at 11; CX-0573C [] at 8; CX-0575C [] at 8; CX-0576C [] at 9; CX-0577C [] at 9; CX-0578C [] at 10; CX-0579C [] at 116; CX-0580C [] at 57; CX-0581C [] at 39; CX-0582C [] at 37; CX-0583C [] at 38; CX-0584C [] at 9-10; CX-0585C [] at 10; CX-1596C (Negus WS) at Q&A 307. The documents also show exemplary usage of Realtek's chips [] in combination with other elements such as []

] *See, e.g.*, CX-0571C [] at 8; CX-0572C [] at 11; CX-0573C [] at 8; CX-0575C [] at 8; CX-0576C [] at 9; CX-0577C [] at 9; CX-0578C [] at 10; CX-0579C [] at 116; CX-0580C [] at 57; CX-0581C [] at 39; CX-0582C [] at 37; CX-0583C [] at 38; CX-0584C [] at 9-10; CX-0585C [] at 10; CX-1596C (Negus WS) at Q&A 307-308. As with Ralink's chips, Realtek's chips need not include RF circuitry to constitute a receiver. *Id.* at Q&A 309. Even if certain Realtek chips did not comprise [] any []

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] would still meet this claim element. *Id.* Finally, Realtek's witness [] testified that Realtek's Chips include [] *See, e.g.*, JX-0017 [] at 35-36, 45.

iv. Funai

For those of Funai's products that interoperate with 802.11 standards and contain at least one of Ralink's chips or Realtek's chips, the evidence shows a "receiver." Ralink's chips or Realtek's chips also inherently show a "receiver" within Funai's products. CX-1596C (Negus WS) at Q&A 311.

b. a receiver counter that counts up to n counts, and

Applying the claim construction adopted above, the accused products do not satisfy the claim limitation "a receiver counter that counts up to n counts." This limitation is construed to mean "a receiver counter that counts from 0 to n, where n represents the interval between transmission signals."

Complainants' expert Dr. Negus admits that the accused products [] under the adopted construction. *See* CX-1596C (Negus WS) at Q&A 321; RX-2811C (Vojcic WS) at Q&A 245; RX-2813C (Heegard RWS) at Q&A 366, Q&A 393-99. [] RX-2811C (Vojcic WS) at Q&A 245; RX-2813C (Heegard RWS) at Q&A 366, Q&A 393-99.

In addition, the accused [] in the accused Realtek products does not meet this limitation [] RX-2811C (Vojcic WS) at Q&A 246; CX-0298C (Realtek Source Code) at REA837ITC-SC-00000625-26.

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If, however, Complainants' proposed construction of "a receiver counter that counts up to n counts" were adopted such that the term meant "a counter in the receiver configured to count up to n counts, where n is any whole number," then the evidence shows that the accused products would satisfy this claim limitation. The following analysis sets forth this evidence showing satisfaction of this limitation under the alternate claim construction.

i. 802.11 – Analysis Under Alternate Construction

[Respondents' products
54] as shown in
CDX-0609 (Negus 010). *See, e.g.*, CX-0116C (802.11 Standard, Jun. 2007) at §11.1.2;
CX-1596C (Negus WS) at Q&A 312. []

ii. Ralink – Analysis Under Alternate Construction

[CX-1596C
CX-0561C ; CX-1596C
CX-0561 ; CX-1596C
JX-0014C
CX-0562C ; CX-0563C
; CX-0564C ; CX-0566C

⁵⁴ "TSF" is an acronym for "Timing Synchronization Function."