IN THE UNITED STATES DISTRICT COURT
FOR THE DISTRICT OF DELAWARE

TQ DELTA, LLC, Plaintiff; v. ADTRAN, INC., Defendant.	Civil Action No. 14-954-RGA

MEMORANDUM OPINION

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July 28, 2020

/s/ Richard G. Andrews
ANDREWS, U.S. DISTRICT JUDGE:

This is a patent case about digital communication technology. Currently before me is Defendant Adtran, Inc.'s Motion for Summary Judgment of Non-Infringement (D.I. 952) and Plaintiff TQ Delta, LLC's Motion for Summary Judgment of Infringement (D.I. 955). I have considered the briefing. (D.I. 953, 986, 997; D.I. 957, 985, 1004). Because genuine disputes of material fact exist, both motions are denied. The corresponding motions in No. 15-121 (which are D.I. 948 and 951) are thus also denied.

I. BACKGROUND

A. Asserted Patents

The asserted patents relate to Digital Subscriber Line (DSL) technology, which is a way to connect to the Internet using copper telephone lines. (D.I. 963-1, Ex. A, "Zimmerman Invalidity Report," ¶ 65). I bifurcated the case into separate trials for each patent family. (D.I. 369). The present motions are about the Family 4 patents: U.S. Patent Nos. 7,292,627 ('627 patent), 8,090,008 ('008 patent), and 8,073,041 ('041 patent). Plaintiff is asserting claim 26 of the '627 patent, claim 14 of the '008 patent, and claim 14 of the '041 patent.

The purpose of the Family 4 patents is to lower the peak-to-average power ratio (PAR) of transmitted signals. ('627 patent at 1:18-22). The PAR of a signal is the ratio of the maximum power that the signal reaches to the average power of the signal over a period of time. (*Id.* at 1:60-64). Reducing PAR is desirable because a high PAR can cause signal "clipping" (which degrades the signal), or it requires a system that consumes high amounts of power. (D.I. 959-2, Ex. B, "Madisetti Report," ¶ 60).

The patents address PAR in "multicarrier communications systems," such as DSL. ('627 patent at 3:24-37). These systems transmit signals simultaneously across multiple frequency channels, which are also called "carriers." (*Id.* at 1:26-32). The systems convey information by modulating the phases and amplitudes of the carrier signals. (Madisetti Report ¶ 46). Some phases and amplitudes represent "0," while others represent "1." (*Id.*). DSL uses a technique called "Discrete MultiTone" (DMT) to modulate the carrier signals. (Zimmerman Invalidity Report ¶ 66). With a technique known as Quadrature Amplitude Modulation (QAM), a single carrier signal can represent multiple bits at once (such as "000" or "001"). (Madisetti Report ¶ 47). Thus, a DMT symbol is made up of a set of QAM symbols. (*Id.* ¶ 49). A DSL system may transmit 4000 DMT symbols per second. (*Id.*). This process allows users to send and receive information over the Internet.

If the data is insufficiently random though, the amplitudes of multiple carriers can align, which results in a high peak power (and thus a high PAR). (Zimmerman Invalidity Report ¶ 76). The Family 4 patents address this problem by "substantially scramb[ling] the phase characteristics of the carrier signals." ('627 patent at 2:38-40). The scrambling technique disclosed in the patents involves: 1) associating a value with each carrier signal; 2) computing a phase shift for each carrier signal based on that value; and 3) combining the computed phase shift with the phase characteristic of that carrier signal. ('627 patent at Abstract).

Claim 14 of the '008 patent is representative. It recites:

> A multicarrier system including a first transceiver that uses a plurality of carrier signals for modulating a bit stream, wherein each carrier signal has a phase characteristic associated with the bit stream, the transceiver capable of:
>
> associating each carrier signal with a value determined independently of any bit value of the bit stream carried by that respective carrier signal, the value associated with each carrier signal determined using a pseudo random number generator, computing a phase shift for each carrier signal based on the value

> associated with that carrier signal; and combining the phase shift computed for each respective carrier signal with the phase characteristic of that carrier signal to substantially scramble the phase characteristics of the plurality of carrier signals, wherein multiple carrier signals corresponding to the scrambled carrier signals are used by the first transceiver to modulate the same bit value.

B. Accused Products

Plaintiff accuses fourteen of Defendant's products of infringing these patents. (Madisetti Report ¶ 125). These products all use the Broadcom BCM65300 chipset. (*Id.*). Plaintiff's infringement analysis focuses on the Total Access (TA) 5000 (PN 1187130F1), which, according to Plaintiff, is representative of all the accused products. (*Id.*). The TA5000 is a device that telecommunications companies place in central network hubs to provide Internet connectivity to their customers. (*Id.* ¶ 126). Plaintiff claims the TA5000 complies with an international technical standard, the "Very high-speed digital subscriber line transceivers 2" (VDSL2) standard. (*Id.* ¶ 125). Thus, under Plaintiff's theory, if complying with the mandatory provisions of the VDSL2 standard would infringe the Family 4 patents, then all fourteen accused products infringe.

The VDSL2 standard requires an initialization sequence in which the transceiver unit in a central office communicates with a transceiver unit in a customer's premises. (*Id.* ¶ 98). VDSL2 requires that the central office unit create a "special operations channel" ("SOC") to communicate with the customer unit. (*Id.* ¶ 101). Four types of messages are sent over the SOC channel: O-PRM, O-PMS, R-MSG 1, and R-MSG 2. (D.I. 959-12, Ex. K, "Zimmerman Report," ¶ 57). These messages are all sent using 4-QAM modulation, which means two bits are mapped to each carrier. (*Id.* ¶ 59). VDSL2 requires the application of a "quadrant scrambler" to those messages. (*Id.* ¶ 77).

II. LEGAL STANDARDS

A. Summary Judgment

"The court shall grant summary judgment if the movant shows that there is no genuine dispute as to any material fact and the movant is entitled to judgment as a matter of law." FED. R. CIV. P. 56(a). The moving party has the initial burden of proving the absence of a genuinely disputed material fact relative to the claims in question. *Celotex Corp. v. Catrett*, 477 U.S. 317, 330 (1986). Material facts are those "that could affect the outcome" of the proceeding, and "a dispute about a material fact is 'genuine' if the evidence is sufficient to permit a reasonable jury to return a verdict for the nonmoving party." *Lamont v. New Jersey*, 637 F.3d 177, 181 (3d Cir. 2011) (quoting *Anderson v. Liberty Lobby, Inc.*, 477 U.S. 242, 248 (1986)). The burden on the moving party may be discharged by pointing out to the district court that there is an absence of evidence supporting the non-moving party's case. *Celotex*, 477 U.S. at 323.

The burden then shifts to the non-movant to demonstrate the existence of a genuine issue for trial. *Matsushita Elec. Indus. Co. v. Zenith Radio Corp.*, 475 U.S. 574, 586–87 (1986); *Williams v. Borough of West Chester, Pa.*, 891 F.2d 458, 460–61 (3d Cir. 1989). A non-moving party asserting that a fact is genuinely disputed must support such an assertion by: "(A) citing to particular parts of materials in the record, including depositions, documents, electronically stored information, affidavits or declarations, stipulations . . . , admissions, interrogatory answers, or other materials; or (B) showing that the materials cited [by the opposing party] do not establish the absence . . . of a genuine dispute . . . ." FED. R. CIV. P. 56(c)(1).

When determining whether a genuine issue of material fact exists, the court must view the evidence in the light most favorable to the non-moving party and draw all reasonable inferences in that party's favor. *Scott v. Harris*, 550 U.S. 372, 380 (2007); *Wishkin v. Potter*, 476

F.3d 180, 184 (3d Cir. 2007). A dispute is "genuine" only if the evidence is such that a reasonable jury could return a verdict for the non-moving party. *Anderson*, 477 U.S. at 247–49. If the non-moving party fails to make a sufficient showing on an essential element of its case with respect to which it has the burden of proof, the moving party is entitled to judgment as a matter of law. *See Celotex Corp.*, 477 U.S. at 322.

B. Patent Infringement

A patent is infringed when a person "without authority makes, uses, offers to sell, or sells any patented invention, within the United States . . . during the term of the patent . . . ." 35 U.S.C. § 271(a). "Literal infringement of a claim exists when every limitation recited in the claim is found in the accused device." *Kahn v. Gen. Motors Corp.*, 135 F.3d 1472, 1477 (Fed. Cir. 1998). "If any claim limitation is absent from the accused device, there is no literal infringement as a matter of law." *Bayer AG v. Elan Pharm. Research Corp.*, 212 F.3d 1241, 1247 (Fed. Cir. 2000).

III. DISCUSSION

The asserted claims disclose, "each carrier signal [having/has] a phase characteristic associated with the [input] bit stream." Defendant argues that a person of ordinary skill in the art would understand that the "phase characteristic" in this limitation must be an "unshifted phase characteristic." Dr. George Zimmerman, Defendant's expert, notes that later language in each claim describes combining a phase shift with the phase characteristic. (Zimmerman Report ¶ 136). Dr. Zimmerman reasons that if a phase characteristic is ultimately shifted, it must have started as unshifted. (*Id.*). This does not follow. The phase characteristic could be shifted and then shifted again. There is nothing in the claims that would exclude such a technique.

The asserted claim of the '627 patent refers to an "input bit stream" in this limitation, while the asserted claims of the other patents mention only a "bit stream." According to Dr. Zimmerman, a person of ordinary skill in the art would understand an "input bit stream" to be a bit stream from a source that is external to the transceiver. (Zimmerman Report ¶ 131). The evidence he provides for this opinion is just one possible embodiment described in the specification. (*Id.*). "[W]e do not read limitations from the embodiments in the specification into the claims." *Hill-Rom Servs., Inc. v. Stryker Corp.*, 755 F.3d 1367, 1371 (Fed. Cir. 2014). I therefore decline to import that limitation into the asserted claim.

Under Plaintiff's theory, the "bit stream" (and the "input bit stream") described in the claims correspond to the O-PRM and O-PMS messages transmitted during the VDSL2 initialization sequence. (D.I. 957 at 10). The claims also recite a "phase characteristic associated with" that bit stream. Plaintiff argues this phase characteristic is the "two-bit constellation point associated with each two-bit portion of the O-PRM and O-PMS messages." (*Id.*). According to Dr. Vijay Madisetti, Plaintiff's expert:

> The VDSL2 standard describes the process of associating the bits from the input bit stream (O-PMS or O-PRM) to the phase and amplitude of a carrier signal. In 4-QAM modulation, the phase characteristic of a carrier signal can have one of four values, which value is determined based on the two bits from the input bit stream. For example, carrier 1 has a phase characteristic that is associated with bits 0 and 1 of a byte of the O-PRM SOC message. Pursuant to the 4-QAM modulation scheme defined in the VDSL2 standard, the phase characteristic of a carrier signal can be $\pi/4$ (also 45 degrees or X, Y constellation points +1, +1), $3\pi/4$ (also 135 degrees or X, Y constellation points -1, +1), $5\pi/4$ (also 225 degrees or X, Y constellation points -1, -1), or $7\pi/4$ (also 315 degrees or X, Y constellation points +1, -1) depending on the integer value of the two bits associated with that carrier.

(Madisetti Report ¶ 153) (cleaned up).

Dr. Madisetti thus concludes that, in the TA5000, each carrier signal has a "phase characteristic associated with" the bit stream. According to Dr. Madisetti, testing performed by Dr. Todor Cooklev and an analysis of the source code by Dr. Kevin Almeroth confirm the TA5000 meets this claim element. (*Id.* ¶¶ 156-8).

Defendant, however, argues that the accused products "scramble the data bits of the O-PMS message and then generate constellation points from those scrambled data bits." (D.I. 985 at 6). In other words, the products "use a bit scrambler applied *before* constellation encoding and do not further shift the constellation points after they are generated." (*Id.*) (emphasis in original). Thus, Defendant argues, there is no "phase characteristic associated with" the bit stream. Defendant's Dr. Zimmerman opines:

> [T]he source code shows that the Accused Products operate by directly transforming the mapped data bits to the transformed data bits using a series of bit-wise logical operations. Only after that transformation is complete does the source code calculate QAM symbols that have a phase characteristic for transmission of the carrier signal. That later-calculated phase characteristic necessarily cannot be the unshifted phase characteristic because the later-calculated phase characteristic is not further shifted or adjusted as required by the later limitations of claim 26 [of the '627 patent].
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> Nor may TQ Delta identify the mapped data bits as themselves being the unshifted phase characteristics. Claim 26 requires "each carrier signal having an unshifted phase characteristic associated with the input bit stream." Thus, the unshifted phase characteristic must be something associated with—in other words, something related to but different from—the input bit stream, not the input bit stream itself.

(Zimmerman Report ¶¶ 137-8) (cleaned up).

I conclude this is a genuine dispute of material fact. Neither party has successfully shown that no reasonable jury could return a verdict for the opposing side. Therefore, summary judgment for either party would be inappropriate.

This conflicting evidence on the "phase characteristic" limitation means there are also genuine disputes over whether the accused products "comput[e] a phase shift for each carrier signal based on the value associated with that carrier signal" and whether they "combin[e] the phase shift computed for each [respective] carrier signal with the phase characteristic of that carrier signal."

IV. CONCLUSION

Defendant's Motion for Summary Judgment of Non-Infringement (D.I. 952) and Plaintiff's Motion for Summary Judgment of Infringement (D.I. 955) are DENIED. I will enter an Order consistent with this Opinion.