United States Court of Appeals for the Federal Circuit

CORE WIRELESS LICENSING S.A.R.L.,
Plaintiff-Appellee

v.

APPLE INC.,
Defendant-Appellant

2017-2102

Appeal from the United States District Court for the Northern District of California in No. 5:15-cv-05008-NC, Magistrate Judge Nathanael M. Cousins.

Decided: August 16, 2018

MARC AARON FENSTER, Russ August & Kabat, Los Angeles, CA, argued for plaintiff-appellee. Also represented by ADAM S. HOFFMAN, REZA MIRZAIE, BENJAMIN T. WANG.

JOSEPH J. MUELLER, Wilmer Cutler Pickering Hale and Dorr LLP, Boston, MA, argued for defendant-appellant. Also represented by RICHARD WELLS O'NEILL; TOBIAS MOCK, Palo Alto, CA; MICHAEL WOLIN, Washington, DC.

Before REYNA, BRYSON, and HUGHES, *Circuit Judges.*

BRYSON, *Circuit Judge.*

This appeal arises from a patent infringement action brought in the United States District Court for the Northern District of California. The plaintiff, Core Wireless Licensing S.a.r.l., is the owner of U.S. Patent Nos. 6,477,151 ("the '151 patent") and 6,633,536 ("the '536 patent"). Core Wireless has appealed the district court's judgment with respect to one claim from each patent.

Both patents concern technology for wireless communications in a digital network. Claim 14 of the '151 patent is directed to a mobile station, such as a mobile telephone, that is configured to synchronize to a base station using the same timing information for both the uplink and downlink channels. Claim 19 of the '536 patent is directed to a receiver, such as a mobile telephone, that can detect predetermined control messages where they are not otherwise expected, such as on a user information channel.

Following trial, the jury found that the defendant, Apple Inc., infringed both asserted claims, and that neither claim was invalid. Following a concurrent bench trial, the district court rejected Apple's argument that the '151 patent was unenforceable due to implied waiver. We affirm in part, reverse in part, vacate in part, and remand.

I

A

The '151 patent describes an improvement in the way mobile devices communicate with base stations. A single base station may communicate with many mobile devices, and steps must be taken to ensure that the transmissions do not overlap and interfere. The patent describes a Time Division Multiple Access ("TDMA") scheme, in which a

particular mobile device is assigned specific time slots in which to send or receive data. '151 patent, col. 1, ll. 12–17; *id.*, col. 1, ll. 33–47; *id.*, col. 3, ll. 36–38.

The assigned time slots are quite short, so it is important that the transmissions be sent and received at precise times. Among other considerations, the device needs to account for propagation delay—that is, the time it takes for the transmission to travel between the mobile device and the base station. In order to account for the propagation delay, the mobile station will transmit the data in advance of the time slot allotted to it. The period of time that particular data must be sent in advance of the time it should be received is referred to as the timing advance value ("TAV"). Because the mobile device may be moving closer to or farther from the base station during a particular session, the TAV needs to be recalculated at regular intervals. *Id.*, col. 2, ll. 21–31.

The '151 patent refers to a version of the General Packet Radio Service ("GPRS") standard that was, at the time of the patent application, being considered by the European Telecommunications Standards Institute ("ETSI"). That standard provided that a mobile device could transmit a "timing access burst" to the base station, from which the base station could calculate and send back a TAV for each channel in operation. *Id.*, col. 2, ll. 39–52. In this scheme, the base station sets up a channel with the mobile device by generating a signal referred to as the timing advance index ("TAI"). The TAI identifies when the mobile station should transmit its timing access burst and when the mobile station should expect to receive a TAV in response. *Id.*, col. 3, ll. 36–55.

In that version of the GPRS standard, transmissions are organized into multi-frame structures. Each multi-frame structure contains eight multi-frames. Each multi-frame in turn includes 52 TDMA frames, which are fur-

ther subdivided into eight slots of equal duration. *Id.*, col. 1, ll. 38–47; *id.*, Fig. 1. Each multi-frame of 52 TDMA frames contains 48 transmission frames and four additional "idle" frames. Therefore, each multi-frame structure contains 32 "idle" frames. *Id.*, col. 2, line 53, to col. 3, line 11; *id.,* Fig. 5.

The TAIs and TAVs are transmitted in the idle frames. *Id.*, col. 3, ll. 36–55. The TAVs for a particular mobile device are updated only once for each multi-frame structure—that is, once every eight multi-frames. However, each TAV is transmitted four times in each multi-frame structure in order to provide the mobile device with multiple opportunities to receive and decode a particular TAV. If the mobile device receives the TAV in one of the earlier transmissions, it ignores the TAV transmissions in subsequent idle frames of that multi-frame structure. *Id.*, col. 3, ll. 22–35.

The '151 patent discloses a purported improvement to the GPRS standard: specifically, the invention is designed "to increase the number of mobile stations which may use the same time slot in an idle frame for transmitting and receiving timing advance information" by "allocating a single timing advance index to the uplink and downlink channels of a mobile station," so that both channels share the same TAV. *Id.*, col. 3, ll. 59–67; *see also id.*, col. 7, ll. 5–10 ("[T]he timing access burst and the TAV are common to all channels allocated to the [mobile station]. There is no need to repeat the transmission of timing advance information for all channels as the same timing advance value can be used for all uplink transmissions (associated with both uplink and downlink channels).").

Claim 14, the only claim of the '151 patent asserted at trial, reads as follows:

> 14. A mobile station for use in a radio telephone network, the radio telephone network comprising

> a base station subsystem and a plurality of mobile stations for communicating with the base station subsystem and in which radio signal transmission slots at a mobile station are synchronised to radio signal reception slots at the base station subsystem to account for a propagation delay between the mobile station and the base station subsystem, the reception slots corresponding to uplink and/or downlink user data packet switched transmission channels allocated dynamically by the base station subsystem, the mobile station being configured to:
>
> > receive a timing advance value once, from the base station subsystem to the mobile station, and to;
> >
> > advance transmission slots at the mobile station for both the uplink and downlink channels using the received timing[] advance value so that transmitted data is received at the base station subsystem in the allocated base station subsystem reception slots.

In the course of the claim construction proceeding, the parties disputed the meaning of the limitation to "receive a timing advance value once." Core Wireless's proposed construction of that limitation was to "receive a timing advance value that is shared by both uplink and downlink channels in the uplink direction." Apple's proposed construction of that limitation was to "receive one timing advance value for all uplink and downlink channels allocated to the mobile station per each multiframe structure." The magistrate judge who conducted claim construction stated that "the remainder of the claim already describes how the mobile station will use the TAV"—that is, to advance transmission for both the uplink and downlink channels. As such, he explained, "[i]n construing the

term at issue, the use of the received TAV is beside the point." The magistrate judge also stated that the word "once" is "not enough to convey" the fact that the TAV must be updated regularly, as described in the specification. Therefore, the magistrate judge construed the limitation to mean to "receive a timing advance value one time for a multiframe structure." *Core Wireless Licensing S.A.R.L. v. Apple Inc.*, No. 5:15-cv-05008-PSG, 2016 WL 3124614, at *8–9 (N.D. Cal. June 3, 2016) ("*Claim Construction Order*").

B

The '536 patent discloses a different improvement in the way mobile devices communicate with base stations. As described in the patent, the base station and the mobile device often need to transmit control messages in addition to speech or user data. One possible implementation, known in the prior art, is to dedicate a separate channel, or separate predetermined time slots on a single channel, for control messages. '536 patent, col. 1, ll. 12–18; *id.*, col. 2, ll. 33–49; *id.*, col. 4, ll. 17–30. However, dedicating a channel or transmission time to control information is inefficient when there is no control information to transmit. *Id.*, col. 6, ll. 5–27. One method to address this inefficiency, previously known in the art, is to use the speech channel to transmit control messages by briefly "stealing" a speech frame. *Id.*, col. 6, l. 64, to col. 7, l. 7.

This scheme, known as "frame stealing," uses preexisting mechanisms for transmission error correction. As described in the patent, existing mobile phones had protections in place to mitigate the effect of frames that were corrupted or not properly received by the mobile device. *Id.*, col. 3, ll. 45–51; col. 6, ll. 45–47. As a result, transmissions often included error prevention and detection mechanisms, such as convolutional coding and cyclic redundancy check bits, to assist the mobile receiver in

identifying transmission errors and, if the corruption was minimal, to fix the error. *Id.*, col. 2, ll. 15–19; *id.*, col. 3, ll. 30–40; col. 7, ll. 35–40. Those mechanisms permitted the receiving device to conclude that the frame was either in a "good" or a "bad" state. *Id.*, col. 2, ll. 19–32.

Most preexisting mobile devices had systems in place to minimize the impact of bad speech frames for the user. For example, if a receiver concluded that it had received a bad speech frame, it could replace that frame with all or part of the preceding good speech frame that it had received. Because frames are very short, the substitution would likely not be detected by the user. *Id.*, col. 6, ll. 49–54.

The '536 patent claims a technique, which could be implemented within preexisting mobile communications systems, for stealing a frame on the user information channel to transmit a control message when it is not expected. *Id.*, col. 6, ll. 31–37. To do so, a control message that is one of a number of predetermined bit patterns is sent over a stolen speech frame that is intentionally marked as a "bad" frame. *Id.*, col. 6, l. 64, to col. 7, l. 7; *id.*, col. 9, ll. 6–9. When the receiver detects a bad frame, it determines whether that frame contains user information with errors or a bit pattern corresponding to one of the known control messages. *Id.*, col. 9, ll. 6–9. If the frame includes a known control message, the receiver acts upon the message and repeats the preceding error-free speech frame in place of the bad frame.

Claim 19, the only claim of the '536 patent to be asserted at trial, recites the following:

> 19. A receiver for receiving information and messages in a digital telecommunications system, the receiver comprising:
>
> > receiving means for receiving a signal via a transmission channel in frames wherein

> each frame has one of two states, the states being a good state and a bad state;
>
> a user information decoder operationally coupled to the receiving means for generating decoded user information, and replacing means for replacing a bad frame at least partly with a preceding good frame; [and]
>
> a message decoder operationally coupled to the receiving means for decoding the messages, wherein for each different message, a corresponding unique bit pattern has been defined, wherein the receiver is adapted to detect a frame which contains a message and that the detecting is based only on identifying a bad frame which additionally contains a bit pattern which deviates from a bit pattern corresponding to a message at most by a predetermined threshold value.

As relevant to this appeal, the parties disputed the construction of two sets of claim terms. First, the parties disagreed about the proper construction of the terms "good state" and "bad state." Core Wireless proposed that "good state" should be construed to mean "a state of a frame from which the receiver can conclude that the frame should be treated as a normal good speech frame," and that "bad state" should be construed to mean "a state of a frame from which the receiver can conclude that the frame should not be treated as a normal good speech frame." Apple proposed that "good state" be defined to mean "a frame state indicating that the frame was transmitted error-free over an air interface," and that "bad state" be defined to mean "a frame state characterized by a flag indicating that the frame was not transmit-

ted error-free over an air interface." *Claim Construction Order*, 2016 WL 3124614, at *10.

The magistrate judge stated that "[n]either party's proposal is of much help." *Claim Construction Order*, 2016 WL 3124614, at *11. According to the magistrate judge, Core Wireless's proposal was "circular" and only defined the phrase in "terms of what 'the receiver can conclude.'" *Id.* In addition, the magistrate judge found, Core Wireless's proposal "makes no reference to the inventor's stated intent of relying on the preexisting concept of a 'bad frame.'" *Id.* As for Apple's construction, the magistrate judge found that it was "confusing and unnecessarily limiting." *Id.*

The magistrate judge chose a different approach. Noting that the "specification uses the terms 'good' and 'bad' to refer to those concepts in the context of the underlying wireless protocol," the magistrate judge reasoned that a "bad" frame "is one that does not contain error-free user information" and that "it is something about the frame itself" that indicates the frame's status as "good" or "bad." *Id.* As a result, the magistrate judge construed "good state" as a "state flagging that the frame contains error-free user information," and "bad state" as a "state flagging that the frame does not contain error-free user information." *Id.*

The second relevant disputed construction is that of the claim term "bit pattern." Core Wireless proposed that the term be given its plain and ordinary meaning. Apple proposed "a sequence of bits conveying a signaling message; not a code word that delineates the message." *Id.* The magistrate judge agreed with Apple's interpretation of the prosecution history of the '536 patent, in which the patentee distinguished a prior art reference by noting that "no separate code words are needed, and message detection is based only on individual messages." *Id.* at *12. The magistrate judge therefore construed "bit pat-

tern" to mean a "sequence of bits conveying a signaling message not delineated by a code word." *Id.*

II

Apple raises three arguments on appeal regarding the '151 patent: It challenges the jury's finding of infringement, the jury's finding of no invalidity, and the trial judge's finding of no unenforceability.

A

With regard to infringement, Apple argues that its mobile devices do not satisfy the claim limitation "configured to[] receive a timing advance value once," which was construed to require receiving a timing advance value one time for a multi-frame structure. Apple contends that its products are always configured to receive multiple TAVs per multi-frame structure because the devices support multiple modes of synchronization, including "initial" and "on-demand" modes, each of which permits multiple TAV updates per multi-frame structure.

Apple cites trial testimony that its devices are configured to receive multiple TAVs per multi-frame structure. That is because the base station may elect to use multiple modes in combination, such as by using the "initial" or "on-demand" modes in addition to the accused "continuous" mode. The "continuous" mode is the method described in the '151 patent of transmitting a TAV four times in a multi-frame structure in response to an access burst from a mobile device.

Apple argues that its devices do not infringe even when operating solely in the "continuous" mode because, even though operating in that mode, its devices are still configured to operate in multiple modes and to receive multiple TAVs. Apple also contends that Core Wireless presented no evidence that some base stations operate using only the "continuous" mode. And Apple argues that

the "continuous" mode still requires that the base station transmit four TAVs for each multi-frame structure.

Apple's arguments are all premised on the proposition that the claim is infringed only when a mobile device is configured to receive one *and only one* TAV transmission per multi-frame structure. That position, however, is contrary to the plain language of the '151 specification and the asserted claim. The '151 patent makes clear that the prior art required a mobile device to receive a TAI and TAV for each channel, thereby requiring separate TAIs and TAVs for the uplink and the downlink channels. The purpose of the invention, the specification explains, was to allocate a single TAI and TAV to both channels. '151 patent, col. 3, ll. 59–67. Thus, the invention permitted a mobile device to operate both uplink and downlink channels when the device received a TAV only once per multi-frame structure. *See id.*, col. 3, ll. 30–31; *id.*, col. 3, ll. 45–55. Claim 14 therefore covers a mobile station configured to receive a TAV once, and to use that single TAV for both the uplink and downlink channels.

The '151 specification makes clear that the disclosed invention is intended to operate within the existing GPRS proposal, in which a single TAV may be transmitted four separate times within a multi-frame structure. *Id.*, col. 3, ll. 22–35. In the embodiment described in the specification, each mobile station is allocated only a single TAI for all channels, and the TAI identifies "the four idle frame sequence in which the newly updated TAV" for the mobile device will be transmitted. *Id.*, col. 6, ll. 58–67. Apple's interpretation of the claim would exclude that embodiment.

Apple's argument that its accused devices are always configured to operate in a variety of modes and to receive more than one TAV per multi-frame structure misses the mark. "[I]nfringement is not avoided merely because a non-infringing mode of operation is possible." *z4 Techs.,*

Inc. v. Microsoft Corp., 507 F.3d 1340, 1350 (Fed. Cir. 2007); *see also VirnetX, Inc. v. Cisco Sys., Inc.*, 767 F.3d 1308, 1322 (Fed. Cir. 2014). To take a simple example, a patent that claims an automobile configured to operate in third gear would be infringed by an automobile that is configured to operate in first, second, and third gears. The automobile is at all times configured to operate in any one of its possible gears, including the infringing one, even if the automobile is never driven in the infringing gear. Similarly, claim 14 is satisfied as long as Apple's devices are configured to operate in a mode that receives a TAV only once per multi-frame structure and uses it for all channels.

Substantial evidence supports the jury's finding that Apple's devices are configured to receive a TAV once per multi-frame structure. Core Wireless's expert Dr. Richard Wesel testified that, based on Apple's source code, Apple's devices are programmed to use only a single TAI, to send only a single timing access burst, and to receive only one TAV per multi-frame structure. Dr. Wesel further testified that, although a base station may transmit an encoded TAV multiple times per multi-frame structure, Apple's devices decode only the first TAV they receive in a given multi-frame structure. He added that a base station may choose to operate in any one of the timing advance modes—continuous, initial, or on-demand—and that the iPhone is configured to be able to work with a base station regardless of which mode or modes it is employing, including a continuous-only mode. Apple's expert did not disagree, testifying that Apple's devices must "be ready for all three, so of course it has to be ready for just one."

Accordingly, we affirm the jury's finding of infringement of claim 14 of the '151 patent.

B

With regard to the issue of validity, Apple argues that the GPRS proposal considered by ETSI in 1997 renders claim 14 of the '151 patent invalid. At trial, Apple's expert testified that the 1997 GPRS paper disclosed everything required by claim 14, except for the limitation requiring that a mobile device be configured to receive only one TAV per multi-frame structure. To show invalidity regarding that limitation, Apple presented two theories.[1] First, Apple argued that the patent was anticipated by the "multi-slot" functionality described in the 1997 paper, which stated that a mobile device will perform the timing advance procedure on only one data channel, "even if involved in the multislot operation (either uplink or downlink transfers)." Second, Apple's expert testified that configuring a mobile device to receive a TAV once per multi-frame structure, rather than more than once, would have been obvious because it would require only a "minor variation" in the disclosed procedures, which would have had "a predictable outcome."

As to the first theory regarding "multi-slot" functionality, Core Wireless introduced evidence that the 1997

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[1] It appears that a claim scope dispute went unresolved during the course of trial, which resulted in the experts presenting competing theories of claim construction to the jury. Because of that dispute, Apple presented a theory of anticipation based on Core Wireless's application of the claim scope, and a theory of obviousness based on what it characterizes as the "proper application of the claim." This court has made clear that "[w]hen the parties present a fundamental dispute regarding the scope of a claim term, it is the court's duty to resolve it." *O2 Micro Int'l Ltd. v. Beyond Innovation Tech. Co.*, 521 F.3d 1351, 1362 (Fed. Cir. 2008). Neither party raised this issue on appeal, however, so we do not address it further.

paper discussed assigning a TAV for the uplink channel and assigning a TAV for the downlink channel, and explained that "different mechanisms are introduced for uplink and downlink packet transfer." In addition, Dr. Wesel testified that the 1997 paper "instructs the mobile [device] to use a different timing advance value for the uplink than it's using for the downlink," and deals with the two channels individually. Finally, although Apple's expert testified that multislot operations occur only when both the uplink and downlink channels are active, he agreed with Core Wireless on cross-examination that the proposed standard refers to "either uplink or downlink," not both, and does not use the term "bi-directional."

As to Apple's theory that configuring a mobile device to receive a TAV once per multi-frame structure would have been obvious, Apple's presentation was brief, consisting primarily of two questions and answers on direct examination. Asked if he had an opinion on whether the claim would have been obvious, Apple's expert testified in the affirmative, because "prior to the '151, there were procedures to send it four times, there were procedures to send it on demand, variably. So sending it once is a minor variation in all of those possibilities." Then, asked whether the results of that modification would have been expected or unexpected, Apple's expert testified that "[i]t's very expected to know what happens for sending it once versus twice. It's a predictable outcome."

Dr. Wesel presented a contrary view. He testified that "it's important to understand [regarding the 1997 GPRS proposal document] that the frame of mind of the engineers at the time was focussed on just setting up . . . a channel and transmit[ting] a packet." He added that "[t]hey were thinking of [the uplink and the downlink channels] separately" and, to the extent the 1997 document describes uplink and downlink communication happening simultaneously, "it instructs the mobile to use a different timing advance value for the uplink than it's

using for the downlink." Accordingly, Dr. Wesel concluded, the 1997 GPRS paper would not have rendered claim 14 obvious.

The issue of validity under both theories came down to a disagreement between the experts. Because the jury could reasonably credit the testimony of Core Wireless's expert over that of Apple's expert, the jury's finding of no invalidity as to claim 14 of the '151 patent must be affirmed.

C

Finally, Apple appeals the trial court's ruling that the '151 patent is not unenforceable. Apple asserted a theory of implied waiver, on which the trial court held a short supplemental bench trial. At that proceeding, Dr. Michael Walker testified on behalf of Apple and was cross-examined by Core Wireless.

Apple's theory of unenforceability is based on actions taken by Nokia, the original assignee of the '151 patent, during its participation with ETSI, the standards-setting organization referenced in the '151 patent.

In 1997 and 1998, ETSI was developing technical proposals to address the problem of propagation delay in GPRS networks. On November 4, 1997, Jarkko Oksala, the named inventor of the '151 patent and a Nokia employee, prepared an invention report for Nokia that described an invention that "enables the optimal usage of the network resources in the air interface of the GPRS system" where "[o]nly one Timing Advance Index (TAI) is allocated to the [mobile device] having bi-directional pa[c]ket data transfer active." The invention report stated that this functionality "is not yet stated in the GPRS specifications." In a section of the report addressing the "Value of the Invention," the question "Are competitors likely to want to use the invention?" was answered "Yes," with the explanation that "[i]t will be

added to [the GPRS] specification." The invention report also attached a draft ETSI Change Request form that proposed to modify the standard to use a single TAI value for both data transfer directions.

Nokia submitted that proposal to ETSI, and the proposal was considered by an ETSI working group, in which Nokia participated, at a meeting held between November 10 and 14, 1997. The working group initially recommended implementing the proposal as part of the GPRS standard. Contemporaneously, on November 11, 1997, Nokia filed a Finnish patent application based on Mr. Oksala's invention, to which the '151 patent claims priority.

At a January 1998 ETSI committee meeting, Nokia's proposal was rejected and replaced by a competing proposal submitted by Ericsson. Ericsson's proposal was similar to Nokia's, except that it merely permitted a mobile device to use a single TAV for bi-directional transfer, rather than requiring it. Four years later, in July 2002, Nokia disclosed the Finnish patent application, as well as the associated U.S. patent application, to ETSI.

Apple argues that Nokia had an obligation to disclose its Finnish patent application to ETSI when Nokia advanced its proposed revision of the GPRS standard and that, in breaching that obligation, Nokia waived its right to enforce the '151 patent. A participant in a standards-setting organization may waive its right to assert infringement claims against products that practice the standard. *Hynix Semiconductor Inc. v. Rambus Inc.*, 645 F.3d 1336, 1347–48 (Fed. Cir. 2011); *see also Qualcomm Inc. v. Broadcom Corp.*, 548 F.3d 1004, 1020–24 (Fed. Cir. 2008). Implied waiver occurs when the patentee's "conduct was so inconsistent with an intent to enforce its rights as to induce a reasonable belief that such right has been relinquished." *Hynix*, 645 F.3d at 1348 (quoting *Qualcomm*, 548 F.3d at 1020). The court in *Hynix* made clear that "[s]uch conduct can be shown where (1) the

patentee had a duty of disclosure to the standard setting organization, and (2) the patentee breached that duty." *Id.* (citing *Qualcomm*, 548 F.3d at 1011–12).

ETSI had an intellectual property rights policy in effect in 1997. Section 4.1 of the policy stated that each ETSI member "shall use its reasonable endeavours to timely inform ETSI of essential IPRs [intellectual property rights] it becomes aware of." The policy continued: "In particular, a member submitting a technical proposal for a standard shall, on a bona fide basis, draw the attention of ETSI to any of that member's IPR which might be essential if that proposal is adopted." The policy defined "essential" to mean "it is not possible on technical (but not commercial) grounds, taking into account normal technical practice and the state of the art generally available at the time of standardization, to make, sell, lease, otherwise dispose of, repair, use or operate equipment or methods which comply with a standard without infringing that IPR." The policy further specified that "IPRs" include "any intellectual property right conferred by statute law including applications therefor other than trademarks. For the avoidance of doubt rights relating to get-up, confidential information, trade secrets or the like are excluded from the definition of IPR."

The only witness to testify in the supplemental equitable defenses trial was Apple's witness Dr. Walker, who is a former chairman of the board of ETSI and was offered as an expert on the ETSI intellectual property rights policy. Dr. Walker testified that Nokia was subject to a disclosure obligation, even though its proposal was not accepted, "as long as there was a possibility of [the proposal] becoming essential." He testified that the policy's definition of IPR, in his understanding, applied to both patents and patent applications. He noted that the exception for confidential information referred to "things like get-up, design of equipment, appearance, [and] marketing attributes," but that the confidentiality proviso did not

exempt unpublished patent applications from the disclosure obligation. The importance of the IPR disclosure requirement, he explained, was to inform the decisionmaking of the members of the standards-setting organization, which could affect what technical solution they chose to adopt. Therefore, Dr. Walker testified, "the moment you submit a contribution which you believe might be essential to the standard, then you should disclose the IPR." Given his understanding of ETSI's policy, Dr. Walker concluded that Nokia should have disclosed its patent application when it submitted its proposal because "it has the potential to be essential," which was acknowledged by Nokia's employees in the invention report.

On cross-examination, Core Wireless first had Dr. Walker confirm that the word "timely" is not defined in the ETSI policy. Core Wireless further questioned Dr. Walker regarding the confidentiality of Finnish patent applications. Dr. Walker testified that the Finnish "patent authority would keep [such applications] confidential" for 18 months, but "the owner of the IPR wouldn't, not if it submitted it as a proposal." On redirect examination, Dr. Walker elaborated that an IPR does not have to actually be essential to fall under the disclosure obligation, "[s]o long as it might become essential, that's all that's required."

The district court issued a brief order containing its findings of fact and conclusions of law regarding Apple's equitable defenses. After reciting the facts and the relevant legal standard, the district court addressed implied waiver in a single paragraph. The court stated that Nokia did not have a duty to disclose the Finnish application for two reasons: "(1) Nokia's proposal was rejected; and (2) the patent claims were not finalized until 2002. Nokia disclosed the patent in 2002, shortly after it could point to the contours of its IPR with specificity because the claims were allowed." *Core Wireless Licensing*

S.A.R.L. v. Apple Inc., No. 5:15-cv-05008-NC, 2016 WL 8231156, at *2 (N.D. Cal. Dec. 22, 2016). In addition, the district court stated that "Apple presented no evidence that any ETSI member or other entity interpreted Nokia's failure to disclose the patent in 1998 as evidence that Nokia relinquished its patent rights." *Id.*

None of those stated reasons supports the district court's conclusion. The district court's finding that Nokia did not have a duty to disclose its patent application because its proposal was rejected is unsupported by the evidence. ETSI's intellectual property rights policy states that the disclosure requirement attaches to a member "submitting a technical proposal" if that party has intellectual property that "*might*" be essential "*if* that proposal is adopted." The district court's interpretation of the policy would undermine the very purpose of disclosure, which Dr. Walker testified was to permit the standards-setting decisionmakers to make an informed choice about whether to adopt a particular proposal. Dr. Walker's unrebutted testimony made it clear that an ETSI member's duty to disclose a patent application on particular technology attaches at the time of the proposal and is not contingent on ETSI ultimately deciding to include that technology in an ETSI standard.

As for the district court's second ground for decision, there was no testimony at trial that ETSI's intellectual property rights policy exempted patent applications that had not yet matured into issued patents. Rather, Dr. Walker's unrebutted trial testimony made clear that the ETSI policy included patent applications, which are, by their nature, not yet final.

As for the court's determination that there was no evidence that the ETSI members understood Nokia to have intended to waive its patent rights, there is no requirement under the implied waiver doctrine that a third party must interpret the patentee's conduct as constituting a

waiver of its rights to enforce the patent; such analysis is more relevant to equitable estoppel. *See Hynix*, 645 F.3d at 1348 (equitable estoppel requires a duty of disclosure, a breach of that duty, and misleading conduct that "led the alleged infringer to reasonably infer that the patentee does not intend to enforce its patent against the alleged infringer" (quoting *A.C. Aukerman Co. v. R.L. Chaides Constr. Co.*, 960 F.2d 1020, 1028 (Fed. Cir. 1992) (en banc), *abrogated on other grounds by SCA Hygiene Prods. Aktiebolag v. First Quality Baby Prods., LLC*, 137 S. Ct. 954 (2017)).

Core Wireless presents a number of additional arguments to bolster the district court's "no unenforceability" finding. The district court did not adopt any of those arguments, and we do not find any of them persuasive. First, Core Wireless argues that ETSI's intellectual property rights policy was limited to intellectual property that is or might be essential, and that Apple presented no evidence that the proposal ever was or might be standards-essential. However, that contention is undercut by, among other things, the testimony of Mr. Oksala, who explained the difference between his proposal and Ericsson's by pointing out that Ericsson's proposal is different only because it made his idea "optional." Moreover, there is no ground for dispute that Nokia's proposal, if adopted, would have made its patent standards-essential.

Second, Core Wireless argues that the ETSI intellectual property rights policy did not require the disclosure of patent applications. That argument, however, is clearly contrary to the evidence, as the policy by its terms encompassed applications, and Dr. Walker's unrebutted testimony confirmed that interpretation of the policy.

Third, Core Wireless argues that the Finnish patent application was confidential under Finnish law and therefore fell within an exception to ETSI's intellectual property rights policy. That argument, too, is contrary to

the record. Dr. Walker explained that, although under Finnish law the Finnish patent authority treats a patent application as confidential, ETSI's policy applied to unpublished patent applications without regard to whether they were confidential. Core Wireless points to nothing in Finnish law that would entitle it to ignore the requirements of the ETSI policy simply because Finnish patent authorities were required to treat patent applications as confidential. Core Wireless's proposed reading of ETSI's policy is unsupported by any evidence at trial.

Finally, Core Wireless argues that the disclosure in 2002 was timely. Dr. Walker testified, however, that a disclosure under the ETSI policy was required to be made no later than the date the standard was adopted, which in this case was June 1998. Again, Core Wireless's reading of the policy, which would define a timely disclosure as one occurring as late as four years after the adoption of the standard, is unsupported in the record. As Dr. Walker's testimony made clear, Core Wireless had a duty to disclose its IPR no later than June 1998; its later disclosure was clearly untimely and not sufficient to cure the earlier breach of its duty.

Nonetheless, we remand rather than reverse. It is possible to interpret the district court's ruling as being based on the conclusion that, because Nokia's proposal was not adopted, no inequitable consequence flowed from Nokia's failure to disclose its patent application. Equitable defenses seek to prevent a party from unfairly benefiting from its wrongful actions, and in some circumstances courts have held that an equitable defense will not be recognized if the offending party did not gain a benefit from its wrongdoing. *See Therasense, Inc. v. Becton, Dickinson & Co.*, 649 F.3d 1276, 1292 (Fed. Cir. 2011) (en banc). Implied waiver is an equitable doctrine, and an equitable doctrine "hinges on basic fairness." *Id.*; *see also Gasser Chair Co. v. Infanti Chair Mfg. Corp.*, 60 F.3d 770, 776 (Fed. Cir. 1995) (discussing prejudice and egregious

conduct as factors in showing the equitable defenses of laches and equitable estoppel). As the Supreme Court has acknowledged, "the remedy imposed by a court of equity should be commensurate with the violation." *Columbus Bd. of Educ. v. Penick,* 443 U.S. 449, 465 (1979).

Because implied waiver, like the doctrine of inequitable conduct discussed in *Therasense*, may render an entire patent unenforceable, the doctrine "should only be applied in instances where the patentee's misconduct resulted in [an] unfair benefit." 649 F.3d at 1292; *see also id.* ("[E]nforcement of an otherwise valid patent does not injure the public merely because of misconduct, lurking somewhere in [the past], that was immaterial to the patent's [enforcement]."). *Therasense*, however, recognized an exception to the materiality requirement for "cases of affirmative egregious misconduct." *Id.* In the analogous case of implied waiver, which like inequitable conduct involves the breach of a disclosure duty, the same equitable considerations require either a showing of prejudice or egregious misconduct sufficient to justify the sanction of unenforceability of the patent at issue.

Here, it may be that, despite breaching its duty to disclose its application, Nokia (and Core Wireless, its successor-in-interest) did not obtain any unjust advantage, because Nokia's proposal was not adopted. On the other hand, given the similarities between Nokia's and Ericsson's proposals, and given that Nokia participated in at least some of the discussions in the ETSI working groups, it is also possible that the standard that was adopted, which made Nokia's proposal "optional," has still provided Nokia (and Core Wireless) with an undeserved competitive advantage.

The district court did not make findings regarding whether Nokia or Core Wireless inequitably benefited from Nokia's failure to disclose, or whether Nokia's con-

duct was sufficiently egregious to justify finding implied waiver without regard to any benefit that Nokia or Core Wireless may have obtained as a result of that misconduct. Those issues must be addressed in the first instance by the district court on remand, as the task of applying an equitable defense is committed to the district court's discretion. *See Meredith v. Winter Haven*, 320 U.S. 228, 235 (1943) ("An appeal to the equity jurisdiction conferred on federal district courts is an appeal to the sound discretion which guides the determinations of courts of equity."); *Qualcomm*, 548 F.3d at 1019; *A.C. Aukerman*, 960 F.2d at 1028. We therefore vacate the district court's finding of no unenforceability and remand for further proceedings consistent with this opinion.

III

Apple raises two challenges to the jury's finding that Apple infringed claim 19 of the '536 patent. Because we find that Core Wireless's theory of infringement is inadequate to support a judgment of infringement of that claim, we reverse.[2]

A

Claim 19 of the '536 patent recites a receiver that has "receiving means for receiving a signal via a transmission channel in frames wherein each frame has one of two states, the states being a good state and a bad state." As construed, "good state" and "bad state" refer to a state flagging that the frame contains, or does not contain, error-free user information.

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[2] Because we reverse the judgment of infringement, we need not address Apple's additional argument that the district court erred in precluding certain testimony from Apple's witnesses.

To prove infringement of the '536 patent, Core Wireless accused Apple's implementation of the Robust Adaptive Multi-Rate Traffic Synchronized Control Channel ("RATSCCH") protocol, which is part of the Global System for Mobile Communications ("GSM") standard. The GSM standard describes eight receive types ("RX_TYPE"), which allow a mobile device's "RX DTX handler to determine in a simple way how the received frame is to be handled." These eight types are described in the standard as follows:

Table 4: RX_TYPE identifiers

RX_TYPE Legend	Description
SPEECH_GOOD	Speech frame with CRC OK, Channel Decoder soft values also OK
SPEECH_DEGRADED	Speech frame with CRC OK, but 1B bits and class2 bits may be corrupted
SPEECH_BAD	(likely) speech frame, bad CRC (or very bad Channel Decoder measures)
SID_FIRST	first SID marks the beginning of a comfort noise period
SID_UPDATE	SID update frame (with correct CRC)
SID_BAD	Corrupt SID update frame (bad CRC; applicable only for SID_UPDATE frames)
ONSET	ONSET frames precede the first speech frame of a speech burst
NO_DATA	Nothing useable (for the speech decoder) was received. This applies for the cases of no received frames (DTX) or received FACCH or RATSCCH or SID_FILLER signalling frames.

Core Wireless's expert Dr. Wesel testified that the RX DTX handler in Apple's devices treats those eight RX_TYPE identifiers in one of two ways. Four of the RX_TYPE identifiers—"SPEECH_GOOD," "SID_FIRST," "SID_UPDATE," and "ONSET"—are all "flagged" by Apple's device as having error-free user information, and are "going to be used as if they contain error-free" user data. It is these frames that produce the sound for the user of the mobile device. The other four identifiers—"SPEECH_DEGRADED," "SPEECH_BAD," "SID_BAD," and "NO_DATA"—are substituted and muted by Apple's devices because "the iPhone treats it as a frame that does not contain error-free user information." Because Apple does not want its devices "to take any chances," all frames flagged with any of those four RX_TYPE identifiers are

treated as if they do not contain error-free user information. From this evidence, Core Wireless concludes that Apple's devices receive frames that have "one of two states, the states being a good state and a bad state."

Apple's non-infringement position is based on the "SPEECH_DEGRADED" RX_TYPE identifier. As explained in the GSM standard, that identifier means that the speech frame "may be corrupted." Apple contends that this identifier represents a third state—neither "good" nor "bad"—and that the Apple devices cannot infringe. During Apple's cross-examination of Dr. Wesel, he admitted that the SPEECH_DEGRADED identifier does not indicate that the frame is definitely corrupted or definitely not corrupted. Dr. Wesel was asked, "this is a third type of state, it's neither good nor bad. It may be bad; it may not be bad. And the standard tells us exactly that; right?" He responded: "Well, yes. But we're not accusing this table. We're accusing the Apple devices, and in the Apple devices, speech degraded is flagged as a bad state. The phone does not treat it as error-free user information. It's going to substitute it and mute it."

Core Wireless's theory of infringement—that Apple's devices *treat* a SPEECH_DEGRADED identifier as a bad state—is legally insufficient to satisfy claim 19. The magistrate judge who conducted the claim construction rejected Core Wireless's proposed construction of "good state" and "bad state" as referring to states of a frame "from which the receiver can conclude that the frame should be treated." *Claim Construction Order*, 2016 WL 3124614, at *10. Rather, the magistrate judge held that the patent relies on preexisting systems to define "good" and "bad" states. *Id.* at *11; *see* '536 patent, col. 2, ll. 19–24; *id.*, col. 6, ll. 31–37; *id.*, col. 7, ll. 41–57. A "good" and "bad" state is not defined by how the mobile device treats the frame; instead, those states "may be distinguished

from one another by means of an implicit or explicit information element in the frame." *Id.*, col. 2, ll. 21–23.

All of the testimony that Core Wireless cites on appeal addresses how the iPhone *treats* a frame labeled SPEECH_DEGRADED, and not what the label itself indicates. From the very beginning of Dr. Wesel's presentation, he emphasized that "we're going to look at the RX_TYPEs and look at how the iPhones *treat* them, and we're going to discover that four of the RX_TYPEs *are treated* as frames that contain error-free user information . . . and four of those RX_TYPEs are going to be identifying frames that *are not used as if* they had error-free user information."

Later, identifying good frames, Dr. Wesel explained that "those frames are—they contain error-free user information, *at least, they have been flagged that way by the phone*, because they're going to be *used as if* they contain error-free." As to the SPEECH_DEGRADED identifier, he stated that "even though in the RX_TYPE slide that we looked at earlier, it says the speech may contain errors, the iPhone *treats it* as a frame that does not contain error-free user information, it's not going to take any chances."

Responding directly to Apple's non-infringement theory, Dr. Wesel testified that SPEECH_DEGRADED is not "in between" a good and bad state "because the iPhone has flagged it as not containing error-free user information," and therefore it is treated the same way as SPEECH_BAD and other "bad" RX_TYPE identifiers. Summarizing his infringement position, Dr. Wesel testified that he concluded that each of the eight RX_TYPE identifiers is either good or bad "both based on what the RX_TYPE tells us about the frame, *and on how the iPhone uses that*." None of Dr. Wesel's confidential testimony regarding Apple's source code rectifies that flaw, because

it addresses only how Apple's devices treat each RX_TYPE identifier, and not what the label itself indicates.

Finally, on redirect examination, Dr. Wesel summarized his opinion that "the phone is going to treat the frame as if it does not contain error-free user information," and explained that for SPEECH_DEGRADED frames, the phone "has to decide, is it going to treat it as an error-free user information frame or not? And the phone—these phones, using this standard, have decided to be cautious . . . [and say] [w]e're going to flag this frame as a frame that does not contain error-free user information."

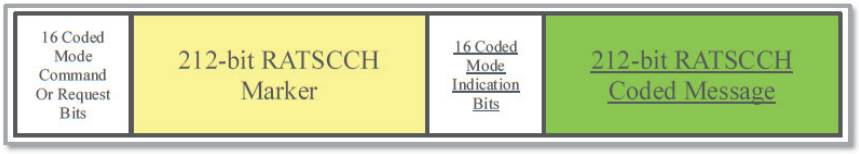
This testimony does not satisfy the claim as construed, which requires "receiving means" for receiving a signal in frames wherein each frame has one of two states, either a "state flagging that the frame contains error-free user information" or a "state flagging that the frame does not contain error-free user information." The standard, as Dr. Wesel admitted, recognizes at least three states, which cannot be squared with the patent's requirement that each frame have one of only two states. The fact that Apple's devices subsequently take one of two actions with these frames is insufficient to infringe. The judgment of infringement therefore must be reversed.

B

In challenging the judgment of infringement of claim 19 of the '536 patent, Apple also argues that no reasonable jury could have found that Apple's products met the limitation that recites a "bit pattern."

The accused bit pattern is a RATSCCH frame in the GSM standard. As described in the standard, a RATSCCH frame has a defined structure consisting of 456 bits. The RATSCCH message, which is the control mes-

sage, consists of 35 bits that are encoded for transmission into a 212-bit message. A RATSCCH message is always preceded by a pre-defined 212-bit identification marker. Finally, there is a 16-bit data field before the identification marker, and a 16-bit data field in between the identification marker and the encoded message. The RATSCCH message can be visualized as follows:



Apple argues that the RATSCCH message does not satisfy the "bit pattern" limitation. The magistrate judge who issued the claim construction noted that the prosecution history of the '536 patent explained that "no separate code words are needed, and message detection is based only on individual messages." He therefore construed "bit pattern" to mean a "sequence of bits conveying a signaling message not delineated by a code word." *Claim Construction Order*, 2016 WL 3124614, at *12. Apple argues that the RATSCCH identification marker is a "code word" that "delineates" the RATSCCH message. In support of that theory, Apple's expert testified that the RATSCCH marker is "a code word that tells us exactly where the position is," and because "[i]t's a fixed length message . . . the specification tells us where the message starts after the marker is found so we know exactly where it begins and exactly where it ends as soon as we find that RATSCCH marker."

At trial, Core Wireless's expert Dr. Wesel sought to draw a distinction between "identifying the frame as a particular kind of frame" and "delineating the message." Specifically, Dr. Wesel explained that the RATSCCH marker "identifies the frame as a RATSCCH frame" but does not delineate the message because the marker does

not signal where the RATSCCH message starts, where it ends, or how long it might be. Core Wireless further argues that the identification marker cannot "delineate" the message because the receiver must decode the encoded 212-bit message to conclude whether a message was included in the frame. In its brief, Core Wireless argues, without citation, that "the RATSCCH marker is simply the first breadcrumb in a trail that sometimes leads to a message and sometimes leads to corrupted data."

The parties do not disagree about the GSM standard or how the accused devices operate. Rather, the parties' dispute focuses primarily on the scope of the claim and the meaning of the term "delineate." The '536 patent does not use that term, but the magistrate judge adopted it from the prosecution history. During prosecution, the patentee addressed a prior art reference in which "the beginning and end of a message are explicitly indicated by separate code words." Amendment filed in Patent Application No. 09/254,890 (June 28, 2002) (Amendment); *see Claim Construction Order,* 2016 WL 3124614, at *12 & n.98. That operation, the patentee argued, is "fundamentally different from the claimed invention" because "no separate code words are needed, and message detection is *based only on individual messages*, not on separate code words that delineate the message." Amendment at 8; *see Claim Construction Order*, 2016 WL 3124614, at *12 & n.99 (emphasis added).

The use of the RATSCCH identification marker, which is not part of the accused message, is fatal to Core Wireless's theory of infringement. Every encoded 212-bit RATSCCH message is preceded by 16 coded mode indication bits and a 212-bit RATSCCH identification marker. Dr. Wesel's analysis of Apple's source code confirmed that the accused devices use the RATSCCH identification marker to determine that the frame is a bad frame and to look for an encoded RATSCCH message. Core Wireless's concession that the RATSCCH identification marker is a

"breadcrumb" to aid in identifying the RATSCCH message is at odds with the claimed invention, which requires detecting a message "based only on [the] individual messages."

Core Wireless's position that the RATSCCH identification marker does not "delineate" the RATSCCH message because it does not indicate where the message begins or ends is unpersuasive. As the experts for both parties agreed, RATSCCH frames are of a fixed length, and the RATSCCH message appears at a predetermined position relative to the RATSCCH marker that precedes it. A mobile device knows that a RATSCCH message will follow after a RATSCCH marker. Based on the standard, the device knows precisely how long the RATSCCH message is and when it will start and stop relative to the RATSCCH marker. For this additional reason, the judgment of infringement of claim 19 of the '536 patent cannot be upheld.

Each party shall bear its own costs for this appeal.

AFFIRMED IN PART, REVERSED IN PART, VACATED IN PART, AND REMANDED