United States Court of Appeals for the Federal Circuit

ZYXEL COMMUNICATIONS CORP.,
Appellant

v.

UNM RAINFOREST INNOVATIONS,
Cross-Appellant

2022-2220, 2022-2250

Appeals from the United States Patent and Trademark Office, Patent Trial and Appeal Board in Nos. IPR2021-00375, IPR2021-00734.

Decided: July 22, 2024

JONATHAN IAIN MAX DETRIXHE, Reed Smith LLP, San Francisco, CA, argued for appellant. Also represented by PETER J. CHASSMAN, MICHAEL JOHN FORBES, Houston, TX.

JAY P. KESAN, DiMuroGinsberg, P.C., Tysons Corner, VA, argued for cross-appellant. Also represented by CECIL E. KEY; HENNING SCHMIDT, Stradling Yocca Carlson & Rauth LLP, Austin, TX; MICHAEL W. SHORE, The Shore Firm, Dallas, TX.

Before DYK, PROST, and STARK, *Circuit Judges*.

DYK, *Circuit Judge*.

In this inter partes review proceeding, the Patent Trial and Appeal Board (the "Board") found claims 1–4, 6, and 7 of U.S. Patent No. 8,265,096 (the "'096 patent") unpatentable as obvious but declined to find claim 8 of the '096 patent unpatentable as obvious. The Board also granted patentee UNM Rainforest Innovations's ("UNMRI") motion to amend, canceling claims 1–4, 6, and 7 and substituting in claims 44–47, 49, and 50.

Petitioner ZyXEL Communications Corp. ("ZyXEL") appeals the Board's determination that claim 8 was not obvious and the Board's decision granting UNMRI's motion to amend. UNMRI cross-appeals the Board's determination that claims 1–4, 6, and 7 are unpatentable as obvious.

We affirm the Board's determination that claims 1–4, 6, and 7 are unpatentable as obvious, but reverse the Board's determination that claim 8 is not obvious. We affirm the Board's decision to grant UNMRI's motion to amend. However, we remand to the Board to determine if the substitute claims are unpatentable as obvious under collateral estoppel based on our holding that claims 1–4 and 6–8 are unpatentable as obvious. We also remand to the Board for it to consider whether to exercise its discretion to evaluate if the substitute claims are unpatentable as obvious on a new ground. Thus, as to the main appeal, we affirm-in-part, reverse-in-part, and remand-in-part, and we affirm as to the cross-appeal.

BACKGROUND

I

UNMRI owns the '096 patent, entitled "Method for Constructing Frame Structures." J.A. 1733. The patent relates to methods for constructing frame structures (i.e., the organization of information transmitted across time and frequency) in orthogonal frequency-division multiple

access (OFDMA) systems. OFDMA "is a multiple access scheme for transmitting data in different subcarriers in a channel, wherein the data may come from different users and may be transmitted in disjoint subsets of sub-channels in a transmission bandwidth." J.A. 1740, col. 1, ll. 21–24. "The orthogonality property among the subcarriers may allow simultaneous transmission of data from different users without interference from one [an]other." *Id.*, col. 1, ll. 24–27.

The patent describes a method for constructing a frame structure with two sections, each of which is configured for a different communication system, where the second communication system is used to support high mobility users (i.e., faster moving users). The advantage of using this type of frame structure is that it can support both an older OFDMA system for slower moving users and a newer OFDMA system for faster moving users, (i.e., it uses newer OFDMA systems while also being compatible with older systems).

The '096 patent provides an example where the frame structure employs the older IEEE standard 802.16(e) system[1] as the first communication system and the newer IEEE standard 802.16(m) system as the second communication system. *See, e.g.*, J.A. 1740, col. 1, ll. 27–35; J.A. 1741, col. 4, ll. 25–27. The IEEE standard 802.16(m)

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[1] The IEEE standard 802.16 protocols are a set of wireless broadband standards developed by the Institute of Electrical and Electronics Engineers. The 802.16(e) protocol "aims to enhance the specifications to the 802.16 standard to support both fixed and mobile subscriber stations to accommodate, for example, subscriber stations moving at vehicular speeds." J.A. 2383, ¶ 1. The 802.16(m) protocol is newer and provides enhanced spectrum efficiency and higher speed tolerance, among other things.

system better supports higher mobility users. The '096 patent also discloses that the placement of pilot symbols (i.e., non-data symbols sent at known intervals to help correct for changing channel conditions) can be transmitted more frequently and/or placed at higher density in the second communication system than the first system in order to increase the accuracy of channel estimation (a method to use known transmitted signals to calculate the effect of the wireless channel conditions on the signal). Symbol period refers to the amount of time between the transmission of successive pilot symbols. Symbol density refers to the number of pilot symbols transmitted during a particular time period across all sub-carriers.

Independent claims 1 and 8 of the '096 patent are at issue in this appeal:

> 1. A method of constructing a frame structure for data transmission, the method comprising:
>
> generating a first section comprising data configured in a first format compatible with a first communication system using symbols;
>
> generating a second section following the first section, the second section comprising data configured in a second format compatible with a second communication system using symbols, wherein the first communication system's symbols and the second communication system's symbols co-exist in one transmission scheme and wherein:
>
> the second format is compatible with the second communication system configured to support higher mobility than the first communication system, wherein each symbol in the second

communication system has a shorter symbol period than that in the first communication system;

generating at least one non-data section containing information describing an aspect of data in at least one of the first section and the second section; and

combining the first section, the second section and the at least one non-data section to form the frame structure.

8. A method of constructing a frame structure for data transmission, the method comprising:

generating a first section comprising data configured in a first format compatible with a first communication system using symbols;

generating a second section following the first section, the second section comprising data configured in a second format compatible with a second communication system using symbols, wherein the first communication system's symbols and the second communication system's symbols co-exist in one transmission scheme and wherein the second communication system has pilot symbols that are denser than those in the first communication system;

generating at least one non-data section containing information describing an aspect of data in at least one of the first section and the second section; and

combining the first section, the second section and the at least one non-data section to form the frame structure.

J.A. 1743, col. 8, ll. 32–54 (emphasis added); J.A. 1744, col. 9, ll. 6–25 (emphasis added).

II

Qualcomm Inc. ("Qualcomm") filed a petition for inter partes review as to claims 1–4 and 6–8 of the '096 patent contending that they are unpatentable as obvious. The Board instituted review for all the challenged claims (IPR2021-00375). ZyXEL also filed a petition for inter partes review (IPR2021-00734) raising the same arguments as to the same claims. The Board granted ZyXEL's motion for joinder, joining it as a petitioner in the IPR2021-00375.

Qualcomm appears to have settled with UNMRI. ZyXel is the only petitioner who has appealed the Board's final written decision or defended the Board's decisions that are adverse to UNMRI. Because Qualcomm and ZyXEL raised the same arguments in their petitions, we will refer to ZyXEL as "petitioner."

Before the Board, ZyXEL argued that claims 1–4, 6, and 7 were unpatentable as obvious over a combination of U.S. Publication No. 2009/0067377 ("Talukdar") and U.S. Publication No. 2007/0155387 ("Li"). The Board found claims 1–4, 6, and 7 to be unpatentable as obvious over Talukdar and Li. The Board determined that a person of ordinary skill in the art ("POSA") would apply the teachings of Li to Talukdar in order to achieve the same benefits described in Li.

ZyXEL also argued that claim 8 was unpatentable as obvious over a combination of Talukdar and U.S. Publication No. 2007/0104174 ("Nystrom"). The Board declined to find claim 8 unpatentable as obvious over Talukdar and Nystrom, finding that ZyXEL had not shown that a POSA would have been motivated to combine the two prior art references.

On cross-appeal, UNMRI contends that during the proceedings the Board improperly admitted and relied upon the testimony of ZyXEL's expert, Dr. Roy, to support its findings of unpatentability of claims 1–4, 6, and 7. On December 6, 2021, UNMRI took the deposition of Dr. Roy. On December 16, 2021, UNMRI filed a motion to exclude Dr. Roy's expert report arguing that Dr. Roy adopted the expert report of another, Dr. Akl, as his own and gave false testimony as to his role as expert. UNMRI argued that this violated Federal Rules of Evidence 702(d), which requires an "expert's opinion reflect[] a reliable application of the principles and methods to the facts of the case," and Federal Rules of Evidence 703, which states an "expert may base an opinion on facts or data in the case that the expert has been made aware of or personally observed," because Dr. Roy's report was the work of another, and he failed to perform the analysis himself. FED. R. EVID. 702, 703. The Board denied the motion as untimely, but also found that it would have denied the motion had it considered the merits. J.A. 12–13.

III

During the course of the proceedings, UNMRI filed a contingent motion to amend. *See* 35 U.S.C. § 316(d)(1). In that motion, UNMRI requested that, if claims 1–4, 6, and 7 were found to be unpatentable, those claims be canceled and that claims 44–47, 49, and 50 be substituted in their stead. As part of its motion, UNMRI requested preliminary guidance from the Board regarding UNMRI's motion to amend, pursuant to the Board's "MTA Pilot Program." *See generally* Notice Regarding a New Pilot Program Concerning Motion to Amend Practice and Procedures in Trial Proceedings under the America Invents Act Before the Patent Trial and Appeal Board ("MTA Pilot Program Notice"), 84 Fed. Reg. 9497 (Mar. 15, 2019).

The MTA Pilot Program "provide[s] an improved amendment practice in AIA trials in a manner that is fair and balanced for all parties and stakeholders." *Id.* at 9499 (internal quotations and citation omitted). Under the program, patent owners may request preliminary guidance from the Board as to whether the motion meets statutory and regulatory requirements. *Id.* at 9497. This mechanism provides useful information to the parties and allows issues with the motion to be addressed.

Independent claim 44 is representative of the proposed substitute claims (with underscoring to distinguish differences from claim 1):

> 44. A method of constructing a frame structure for data transmission, the method comprising:
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> generating a first section comprising data configured in a first format compatible with a first communication system using symbols;
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> generating a second section following the first section, the second section comprising data configured in a second format compatible with a second communication system using symbols, wherein the first communication system's symbols and the second communication system's symbols co-exist in one transmission scheme and wherein:
>
> the second format is compatible with the second communication system configured to support higher mobility than the first communication system,
>
> wherein each symbol in the second communication system has a shorter symbol period than that in

> the first communication system; and
>
> wherein the second communication system has pilot symbols that are denser than those in the first communication system;
>
> generating at least one non-data section containing information describing an aspect of data in at least one of the first section and the second section; and combining the first section, the second section and the at least one [non-data] section to form the frame structure.

J.A. 67.

In its opposition to UNMRI's motion to amend, ZyXEL argued, *inter alia*, that UNMRI's motion was deficient because it failed to show written description support for all of the claim limitations in the proposed substitute claims as required by the regulations. *See* 37 C.F.R. § 42.121(a)–(b). ZyXEL contended that UNMRI's motion only showed support for the newly added limitations, instead of showing support for the proposed substitute claim as a whole.

In its preliminary guidance, which is not binding on the Board, MTA Pilot Program Notice, 84 Fed. Reg. at 9500, the Board "agree[d] with [ZyXEL]'s contentions that 'Patent Owner only purport[ed] to show support for the additional features added by the amendments,' and that 'Patent Owner has not even attempted to show support in the original disclosure for any other limitations of the proposed substitute claims.'" J.A. 940 (citations omitted). The Board also noted that "it appear[ed] more likely than not that there is adequate written description support for the proposed substitute claims . . . in the Specification, as filed, of U.S. Patent Application 12/168,855" (the "'855 Application"), which issued as the '096 patent. J.A. 940–41.

In response to the Board's preliminary guidance, UNMRI filed a revised motion to amend. In its revised motion, UNMRI proposed the same substitute claims, but supplemented the written description support for the pre-existing claim limitations by citing to the '855 Application. ZyXEL opposed.

The Board rejected UNMRI's revised motion (and ZyXEL's opposition to it) because it did not include any new substitute claims that were not already present in the original motion to amend as required by the regulations. *See* MTA Pilot Program Notice, 84 Fed. Reg. at 9499 ("A revised [motion to amend] includes one or more new proposed substitute claims in place of previously presented substitute claims to address issues identified in the preliminary guidance and/or the petitioner's opposition.").

However, the Board permitted UNMRI to file a reply in support of its original motion to amend, which the Board required to be "substantively identical" to UNMRI's rejected revised motion to amend. *Qualcomm Inc. v. UNM Rainforest Innov.*, Case IPR2021-00375, Paper No. 63 at 5 (PTAB May 19, 2022). The Board waived the usual page limit requirement for replies and permitted UNMRI's reply to be 25 pages. Likewise, the Board waived the page limit requirement for ZyXEL's sur-reply and authorized it to file a 25-page sur-reply. In its reply, UNMRI included written description support for the remaining claim limitations by citing to the '855 Application.[2] ZyXEL filed a sur-reply

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[2] ZyXEL argues that the Board erred in granting the motion to amend because UNMRI did not show written description support to U.S. Provisional App. No. 60/929,798 (the "'798 Application"). UNMRI had originally sought a priority date for its application going back to the '798 Application. By the time of the motion to amend, it had

arguing the procedural point but not disputing that there was sufficient written description support in the '855 Application for all the limitations in the substitute claims. ZyXEL also reiterated its argument that the proposed substitute claims were unpatentable as obvious over the combination of Talukdar and Li.

The Board granted UNMRI's motion to amend, substituting claims 44–47, 49, and 50, and determined those claims to be nonobvious over Talukdar and Li (rejecting ZyXEL's argument as to obviousness). Specifically, the Board found the limitation "wherein the second communication system has pilot symbols that are denser than those in the first communication system" (similar to claim 8), which was not present in the original claims, was neither disclosed nor taught by the combination of Talukdar and Li.

ZyXEL appeals the Board's decision to grant UNMRI's motion to amend and the Board's decision finding claim 8 nonobvious over Talukdar and Li. UNMRI cross-appeals the Board's finding that claims 1–4, 6, and 7 are unpatentable as obvious over Talukdar and Li.

We have jurisdiction under 28 U.S.C. § 1295(a)(4)(A).

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abandoned that contention. There was no need under these circumstances to provide written description support to the '798 Application. *See* 37 C.F.R. § 42.121(b) ("A motion to amend claims must . . . set forth: . . . (2) The support in an earlier-filed disclosure for each claim for which benefit of the filing date of the earlier filed disclosure is sought.").

DISCUSSION

I. Obviousness of Claims 1–4, 6, and 7

A. Dr. Roy's Testimony

UNMRI contends that the Board's finding that claims 1–4, 6, and 7 are unpatentable as obvious should be set aside because the Board erroneously refused to exclude, and relied on, Dr. Roy's expert testimony (his expert report) on obviousness. In moving to exclude Dr. Roy's expert report, UNMRI argued that Dr. Roy's report was actually an expert report prepared by another expert, Dr. Akl, in an earlier proceeding and that Dr. Roy "simply signed his name to" it. Cross-Appellant Opening Br. 59. UNMRI argued that Dr. Roy did not disclose that Dr. Akl's report was the basis for his report until he was asked about it during his deposition. UNMRI also contended that Dr. Roy misrepresented under oath the contributions he made to the report. Specifically, UNMRI cited to Dr. Roy's deposition testimony where he stated that he contributed (i.e., provided corrections and edits) to various sections of the expert report. UNMRI argued that the differences between Dr. Akl's report and Dr. Roy's report were de minimis, and thus Dr. Roy misrepresented his contributions to the report.

The Board first denied UNMRI's motion as untimely. Under 37 C.F.R. § 42.64(b)(1), the Board's regulations provide:

> Any objection to evidence submitted during a preliminary proceeding must be filed within ten business days of the institution of the trial. Once a trial has been instituted, any objection must be filed within five business days of service of evidence to which the objection is directed.

Dr. Roy's expert report was submitted with the petition, and trial was instituted (began) on July 19, 2021. The

Board concluded that the objection to Dr. Roy's expert report, filed on December 16, 2021, was untimely because it was not filed within 10 business days of the institution of trial.

UNMRI contended that it only became aware of Dr. Roy's alleged misrepresentation on December 6, 2021, the date of his deposition, and therefore could not object earlier. The Board, however, found that even if the first sentence of the rule was inapplicable, under the second sentence of the regulation, the filing was still untimely because UNMRI was objecting to evidence presented during trial and UNMRI filed its objection eight business days after the deposition date, while the regulation requires any objection to be filed within five business days of service of the evidence.

"Decisions related to compliance with the Board's procedures are reviewed for an abuse of discretion." *Intelligent Bio-Sys., Inc. v. Illumina Cambridge Ltd.*, 821 F.3d 1359, 1367 (Fed. Cir. 2016) (citing *Bilstad v. Wakalopulos*, 386 F.3d 1116, 1121 (Fed. Cir. 2004)). We see no abuse in discretion by the Board's interpretation of its own rules to require a filing within five business days of service of evidence to which the objection is directed.

The Board also concluded that it would have denied the motion on the merits even if it had been timely because it viewed UNMRI's challenges to Dr. Roy's testimony as going to the weight that should be given to his testimony, not its admissibility. We conclude that the Board did not err in concluding that the objection did not merit exclusion of the report even if the objection had been timely. We see no abuse of discretion by the Board in determining that the issues with Dr. Roy's report go to the credibility and weight attributed to the report and not to its admissibility. Unlike

the cases UNMRI relies on,[3] there was evidence here that Dr. Roy analyzed the prior art references, the patent, and Dr. Akl's expert report, and reached the same conclusions as Dr. Akl. While Dr. Roy may have overstated his contributions in revising Dr. Akl's report, he admitted that Dr. Akl's report served as the basis for his report and stated that his own report reflected his own opinion, and the Board was free to accept the report and to consider any erroneous testimony by Dr. Roy in deciding to attribute weight to his testimony.

B. Substantial Evidence for the Board's Findings

"In reviewing the Board's determination on the question of obviousness, we review the Board's legal conclusions de novo and its factual findings for substantial evidence." *Becton, Dickinson & Co. v. Baxter Corp. Englewood*, 998

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[3] In all of the cases on which UNMRI relies, an expert's testimony was excluded because the expert did not actually perform the analysis or falsified the content of the analysis. *See, e.g.*, *Rembrandt Vision Techs., L.P. v. Johnson & Johnson Vision Care, Inc.*, 818 F.3d 1320, 1325 (Fed. Cir. 2016) (ordering a new trial when expert falsely testified about his involvement and experience, withheld documents, and withheld contradictory test results); *Puppolo v. Welch*, 771 F. App'x 64, 65 (2d Cir. 2019) (finding no abuse of discretion by the district court excluding expert's testimony when the expert acknowledged "he performed none of the legal research"); *United States v. Tomasian*, 784 F.2d 782, 786 (7th Cir. 1986) (excluding expert opinion where the expert "had no opinion of his own" and "could only relay another's opinion"); *Crowley v. Chait*, 322 F. Supp. 2d 530, 554 (D.N.J. 2004) (precluding expert from testifying when it constituted "simply summariz[ing] the facts and the depositions of others," but declining to exclude expert testimony in its entirety).

F.3d 1337, 1339 (Fed. Cir. 2021) (internal quotation marks, citation, and alterations omitted). "What a reference teaches and the differences between the claimed invention and the prior art are questions of fact which we review for substantial evidence." *In re Cuozzo Speed Techs., LLC*, 793 F.3d 1268, 1280 (Fed. Cir. 2015).

UNMRI contends that a POSA would not know how to combine Talukdar and Li in order to render obvious the limitation "wherein each symbol in the second communication system has a shorter symbol period than that in the first communication system." J.A. 1743, col. 8, ll. 47–49. We conclude that the Board's decision is supported by substantial evidence.

Talukdar discloses a frame structure that includes first and second sections, each corresponding to a first and second communication system. *See, e.g.*, J.A. 38–40; 2131–32, ¶¶ 27–30. Talukdar discloses using the IEEE standard 802.16(e) system as an older legacy system and the IEEE standard 802.16(m) as a newer system, which are the same systems used in the '096 patent. Li in the context of a legacy system teaches "using shorter symbol periods for faster moving remote units." Cross-Appellant Opening Br. 53; *see also* J.A. 2386, ¶ 37. UNMRI does not dispute any of these facts.

The Board determined that it would have been obvious to apply Li's teachings to the second communication system in Talukdar (i.e., the newer system) because "it would improve Talukdar's method in the same way as Li by reducing inter-subcarrier interference experienced by the faster moving mobile remote users." J.A. 48. The Board's conclusion is supported by substantial evidence. Li teaches that using shorter pilot symbol periods for faster mobile users has the benefit of reducing inter-subcarrier interference that faster mobile users may experience. Faster mobile users would be using the second communication system in

Talukdar (the 802.16(m) system), the same system in the '096 patent. Dr. Roy's expert report supports the argument that it would be obvious to a POSA to apply Li's teachings to the second system in Talukdar.[4] This is substantial evidence that supports the Board's obviousness determination.

Therefore, we affirm the Board's decision finding claims 1–4, 6 and 7 unpatentable as obvious over Talukdar and Li.

II. Obviousness of Claim 8

ZyXEL argues that the Board erred in finding that claim 8 was not obvious because there was no motivation to combine Talukdar and Nystrom. As the Board noted, claim 8 is nearly identical to claim 1, except that claim 8 recites "wherein the second communication system has pilot symbols that are denser than those in the first communication system," in place of claim 1's recitation of "wherein each symbol in the second communication system has a shorter symbol period than that in the first communication system." J.A. 55. The difference between these two limitations is subtle, as noted earlier. Symbol period refers to the amount of time between the transmission of pilot symbols, whereas symbol density refers to the number of pilot symbols transmitted during a particular time period.

Before the Board, ZyXEL argued a POSA would have been motivated to combine Talukdar and Nystrom to achieve the pilot density limitation. ZyXEL contended a

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[4] On appeal, UNMRI argues that there is no evidentiary support for a motivation to combine. We disagree as the Board pointed to Li, Talukdar, and Dr. Roy's testimony for support that Li would improve Talukdar's method in the same way as in Li. Thus, there is substantial evidence for the Board's finding of a motivation to combine.

POSA would be motivated to apply the teachings in Nystrom about using denser pilot symbols to improve Talukdar because Nystrom teaches that denser pilot symbols (1) counteract the effects of Doppler shift and fading experienced by faster-moving remote units and (2) enhance a faster-moving unit's ability to perform channel estimation.

It is undisputed that the limitation pertaining to symbol density is present in Nystrom. The Board found that "Nystrom discloses that it is beneficial to assign resources for mobile stations with certain fast varying channel or Doppler conditions in the dense parts of the pilot pattern and users with more slowly varying conditions in the less dense parts." J.A. 54–55. The Board, however, found that Nystrom did not teach that higher density pilot symbols are used to counteract high doppler conditions or improve channel estimation. We disagree. The Board's determination is not supported by substantial evidence, and the record supports only a conclusion of obviousness.[5]

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[5] UNMRI argues that the Board found ZyXEL's arguments about claim 8 to be forfeited and ZyXEL has not challenged the Board's finding of waiver. Cross-Appellant Opening Br. 17, 21. It is true that the Board found ZyXEL had forfeited certain arguments by only raising them in its reply brief. J.A. 60, 63–64. However, the Board did not find ZyXEL to have waived all arguments regarding claim 8. J.A. 55–58 (citing petition and discussing non-forfeited arguments). It is these original arguments that ZyXEL raises on appeal. UNMRI indeed concedes that these arguments were not forfeited as the heading for its discussion of these issues is titled "ZyXEL's Original Motivation To Combine Arguments Are Unsupported." Cross-Appellant Opening Br. 22. These issues were not forfeited and are properly before us here on appeal.

Nystrom extensively teaches that denser pilot symbols should be used in situations when users encounter large Doppler shifts, such as moving at high velocity. Nystrom recognizes that "different users travel at different speeds and thus experience different Doppler shifts." J.A. 2401, ¶ 4. Recognizing users may face different conditions, Nystrom discloses that different pilot symbol patterns (i.e., different densities) can be used to accommodate these different conditions. For example, in Figure 5A, reproduced below, Nystrom discloses four different combinations of pilot symbol densities varied in frequency and time:

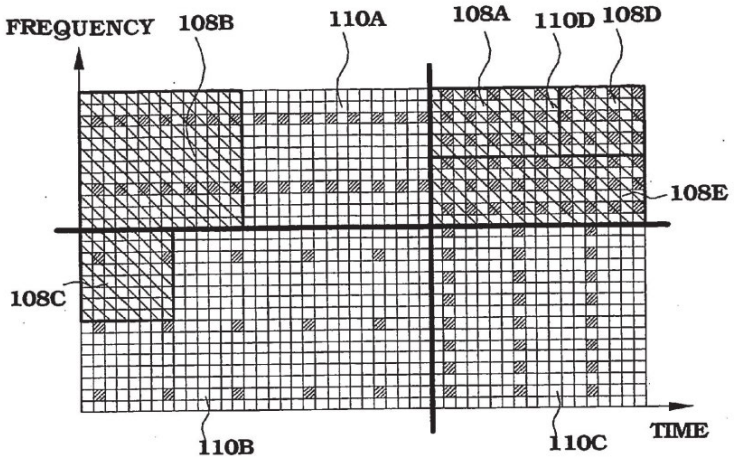

Fig. 5A

J.A. 2394. In describing Fig. 5A, Nystrom explains how these different pilot symbol densities should be used for different conditions, including higher density pilot symbols for higher Doppler conditions and lower pilot symbol densities for lower Doppler conditions. *See, e.g.*, J.A. 2404, ¶ 42. Nystrom further teaches "[i]t is beneficial, e.g. to assign resources for mobiles with certain fast varying channel or Doppler conditions in the dense parts of the pilot pattern and uses with more slowly varying conditions in the less dense parts." J.A. 2404, ¶ 43. Thus, Nystrom

plainly teaches that it is beneficial to use higher pilot symbol densities for higher Doppler conditions.

While Nystrom may not explicitly state that denser pilot symbols counteract the effect of high Doppler shifts or improve channel estimation, this is not necessary to show obviousness. A prior art reference does not need to explicitly articulate or express why its teachings are beneficial so long as its teachings are beneficial and a POSA would recognize that their application was beneficial. *Intel Corp. v. PACT XPP Schweiz AG*, 61 F.4th 1373, 1380–81 (Fed. Cir. 2023) ("There is a motivation to combine when a known technique 'has been used to improve one device, and a person of ordinary skill in the art would recognize that it would improve similar devices in the same way,' using the 'prior art elements according to their established functions.'" (first quoting *KSR Int'l Co. v. Teleflex Inc.*, 550 U.S. 398, 417 (2007); and then quoting *Intel Corp. v. Qualcomm Inc.*, 21 F.4th 784, 800 (Fed. Cir. 2021)). Here, Nystrom discloses that it is beneficial to use denser pilot symbol patterns for higher Doppler conditions, conditions common to high mobility users. Indeed, UNMRI seems to concede this point as, on appeal, it characterized Nystrom as "disclos[ing] the use of denser pilots for high mobility users: Users with 'radio conditions demanding a high density of pilots'—such as fast-moving users—could be allocated resource space with increased pilot density in the time dimension, frequency dimension, or both." Cross-Appellant Opening Br. 16 (quoting J.A. 2404, ¶ 43). Furthermore, Dr. Roy testified that a POSA would have been motivated to combine Nystrom and Talukdar and cited to these portions of Nystrom for support. *See* J.A. 1854–56.

There is no contrary evidence. While UNMRI's expert, Dr. Vojcic, opined that a POSA would not be motivated to

combine Talukdar and Nystrom,[6] his opinion offers no support for the Board's reasoning and is not relevant to whether Nystrom discloses that high pilot symbol densities are beneficial for high Doppler shifts. Indeed, Dr. Vojcic acknowledged that Nystrom discloses using a higher density of pilot symbols in the time dimension for users moving at higher speeds, and that such users may encounter higher Doppler shifts. Dr. Vojcic stated "[a] POS[A] would also understand that small/larger Doppler spread (or equivalently velocity) corresponds to low/high time selectivity, requiring low/high pilot density over time." J.A. 3028. Dr. Vojcic does not state or opine that a POSA would not recognize the benefits of using higher pilot symbol densities for faster mobile users who experience high Doppler conditions.

The Board's conclusion as to claim 8 lacks substantial evidence. We determine that claim 8 is unpatentable as obvious and reverse the Board's contrary decision.

III. Substitute Claims

A. Motion to Amend

ZyXEL argues that the Board erred in granting UNMRI's motion to amend because UNMRI did not satisfy the requirement that the motion itself contain written description support for all of the claim limitations of the

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[6] On appeal, UNMRI suggests that the Board adopted Dr. Vojcic's testimony that "a significant non-obvious redesign of the *Talukdar* system would be required to incorporate *Nystrom's* disclosure" and that the two would otherwise be incompatible with each other. Cross-Appellant Opening Br. 29. The Board did not find that applying Nystrom's teachings to Talukdar would require such a redesign and made no reference to these portions of Dr. Vojcic's report.

substitute claims. *See* 37 C.F.R. § 42.121(b) ("A motion to amend claims must include a claim listing . . . and set forth: (1) The support in the original disclosure of the patent for each claim that is added or amended; and (2) The support in an earlier-filed disclosure for each claim for which benefit of the filing date of the earlier filed disclosure is sought."); *Lectrosonics, Inc. v. Zaxcom, Inc.*, IPR2018-01129, Paper 15 at 8 (PTAB Feb. 25, 2019) ("In addition, the motion must set forth written description support for each proposed substitute claim as a whole, and not just the features added by the amendment."). Even though it is undisputed on appeal that UNMRI provided the missing written description in its reply brief, ZyXEL argues that this could not cure the procedural defect. ZyXEL points out that the regulations require "[a]ll arguments and evidence in support of the motion to amend shall be in the motion itself" and cites to a number of Board decisions that held supplementing a motion to amend through a reply brief was improper.[7] *Lectrosonics*, IPR2018-01129, Paper 15 at 8; 37 C.F.R. § 42.121(b). There is nothing in the MTA Pilot Program Notice eliminating this requirement. To the contrary, the MTA Pilot Program Notice references *Lectrosonics* as governing law. MTA Pilot Program Notice, 84 Fed. Reg. at 9500.

But these arguments as to the requirements of the reply fail to take into account the MTA Pilot Program's purpose. The MTA Pilot Program introduced the option for patent owners to receive preliminary guidance from the Board with respect to motions to amend. MTA Pilot Program Notice, 84 Fed. Reg. at 9497 (noting the option to receive preliminary guidance was "not previously available"). To be sure, the MTA Pilot Program did not eliminate

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[7] *See also Lippert Components, Inc. v. Days Corp.*, IPR2018-00777, Paper 28 (PTAB Sept. 24, 2019).

requirements as to the contents of the original motion or the limitations on reply briefs. *See* MTA Pilot Program Notice, 84 Fed. Reg. at 9500 (citing *Lectrosonics*, IPR2018-01129, Paper 15). But the core purpose of the MTA Pilot Program is to allow for the correction of errors in the original motion. The MTA Pilot Program Notice describes the purpose of preliminary guidance as "provid[ing] an initial discussion about whether there is a reasonable likelihood that the [motion to amend] meets statutory and regulatory requirements for a [motion to amend.]" *Id.* at 9497. The MTA Pilot Program Notice further explains "the guidance may be helpful to patent owner as it determines whether and/or how to revise its [motion to amend] or . . . how to respond to information discussed in the preliminary guidance." *Id.* at 9500. Thus, a key purpose of issuing preliminary guidance, and the MTA Pilot Program in general, is to provide feedback as to whether the motion to amend satisfies the statutory and regulatory requirements so the parties may respond and address any such errors. The MTA Pilot Program also permits a patent owner to "respond to the Board's preliminary guidance (if requested) and to the petitioner's opposition," as well as "file new evidence, including declarations, with its reply." *Id.* at 9501. It thus appears that the MTA Pilot Program is designed to allow reply briefs to address and correct errors. We do not think the Board erred in permitting UNMRI to use its reply brief to supplement the written description support that should have been, but was not, included in its original motion to amend.

Even if allowing the reply brief to supply the missing information had been inconsistent with the regulations, we conclude that any error was harmless error. "We review Board decisions pursuant to the standards of the Administrative Procedure Act ('APA'), 5 U.S.C. § 550 et seq." *Corephotonics, Ltd. v. Apple Inc.*, 84 F.4th 990, 1001 (Fed. Cir. 2023). "The judicial review provision of the APA includes

a harmless error rule." *In re Chapman*, 595 F.3d 1330, 1338 (Fed. Cir. 2010) (citing 5 U.S.C. § 706); *see* 5 U.S.C. § 706 ("[D]ue account shall be taken of the rule of prejudicial error."); *see also Shinseki v. Sanders*, 556 U.S. 396, 406 (2009) ("[W]e have previously described § 706 as an 'administrative law . . . harmless error rule.'" (citations omitted)); *In re Watts*, 354 F.3d 1362, 1369 (Fed. Cir. 2004) ("We have previously made clear that the harmless error rule applies to appeals from the Board just as it does in cases originating from district courts.").

Any error that was committed by the Board was harmless error because ZyXEL was not prejudiced by the Board's decision to allow the reply brief to supplement the initial motion. ZyXEL was on notice of the written description arguments and had ample opportunity to respond in its sur-reply.[8] The Board waived the page limits on the sur-reply and allowed ZyXEL to respond with a 25-page brief in order to ensure it had a proper opportunity to respond. *Qualcomm Inc. v. UNM Rainforest Innov.*, Case IPR2021-00375, Paper No. 63 at 5–6 (PTAB May 19, 2022).

ZyXEL asserts, however, that it had no opportunity to present any expert declarations to refute UNMRI's new arguments about written description that were raised in the reply brief because under the Board's rules such evidence cannot be raised in a sur-reply. Oral Arg. 13:24–13:32; *see* MTA Pilot Program Notice, 84 Fed. Reg. at 9500 ("[N]ew evidence (including declarations) may be submitted with every paper in the [motion to amend] process, except a sur-reply."). There are two answers to this. First, ZyXEL never made any request to the Board to waive its rules and

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[8] In addition to UNMRI's reply brief, the Board also identified where written description support could be located in its preliminary guidance, which ZyXEL received. J.A. 940–41.

permit it to file an expert declaration. Oral Arg. 12:46–13:20; *see, e.g.*, *Axonics, Inc. v. Medtronic, Inc.*, 75 F.4th 1374, 1384 (Fed. Cir. 2023) (noting that the Board may allow new evidence and expert declarations to be submitted with sur-replies if requested by the parties to avoid prejudice); *Belden Inc. v. Berk-Tek LLC*, 805 F.3d 1064, 1081 (Fed. Cir. 2015) ("Thus, if the petitioner submits a new expert declaration with its Reply, the patent owner can respond in multiple ways. . . . [I]t can request the Board waive or suspend a regulation that the patent owner believes impairs its opportunity to respond to the declaration."); *Parkervision, Inc. v. Vidal*, 88 F.4th 969, 981 (Fed. Cir. 2023) (concluding that because patent owner "failed to partake in available procedural mechanisms" such as "request[ing] that its [s]ur-reply be permitted to include arguments and evidence that would otherwise be impermissible in a sur-reply," it could not "fault the Board" for excluding new arguments in the sur-reply). Second, ZyXEL does not to point to any relevant evidence that it would have presented if the opportunity had been available. ZyXEL did not raise any substantive argument regarding the '855 Application in its opposition to UNMRI's revised motion to amend or in its sur-reply. Under these circumstances, ZyXEL has failed to establish prejudice. We affirm the Board's decision to grant the motion to amend.

B. Further Proceedings

In its opening brief on appeal, ZyXEL only raised two arguments regarding the Board's decision to grant UNMRI's motion to amend. ZyXEL first identified the alleged procedural deficiencies discussed in the previous section and second argued the amended claims were obvious over the Talukdar and Li combination. We think the Board's decision finding the amended claims not to be obvious over the Talukdar and Li combination was supported

by substantial evidence.[9] However, at oral argument, ZyXEL argued that if claim 8 were held to be unpatentable (as we now hold), we should remand to the Board to consider whether the substitute claims are unpatentable. The substitute claims are entirely a combination of the limitations of claims 1–4 and 6–8, all of which we have now held unpatentable as obvious. It follows from the invalidation of claim 8 and the other claims, says ZyXEL, that the substitute claims are unpatentable as a matter of collateral estoppel.[10]

"[A]n IPR decision does not have collateral estoppel effect until that decision is affirmed . . . ." *United Therapeutics Corp. v. Liquidia Techs., Inc.*, 74 F.4th 1360, 1372 (Fed. Cir. 2023), *cert. denied*, 144 S. Ct. 873 (2024) (citing *XY,*

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[9] ZyXEL contended that Li discloses the limitation "wherein the second communication system has pilot symbols that are denser than those in the first communication system." J.A. 67 (emphasis omitted). The Board determined that while Li discloses using shorter symbol periods, it does not disclose denser pilot symbols as required by the amended claims. The testimony of ZyXEL's own expert (Dr. Roy) supports the Board's conclusion.

[10] *See, e.g.*, *Finjan LLC v. SonicWall, Inc.*, 84 F.4th 963, 969 (Fed. Cir. 2023) ("For patent claims, collateral estoppel applies where the 'issues of patentability' are identical, i.e., where 'the differences between the unadjudicated patent claims and adjudicated patent claims do not materially alter the question of invalidity.'" (citation omitted)); *Nestle USA, Inc. v. Steuben Foods, Inc.*, 884 F.3d 1350, 1352 (Fed. Cir. 2018) ("Importantly, our precedent makes clear that collateral estoppel is not limited 'to patent claims that are identical. Rather, it is the identity of the *issues* that were litigated that determines whether collateral estoppel should apply.'" (citation omitted) (emphasis in original)).

LLC v. Trans Ova Genetics, L.C., 890 F.3d 1282, 1294 (Fed. Cir. 2018)). We have held that even where the initial decision would be the basis for collateral estoppel, "failure to raise collateral estoppel before the appeal process in the preclusive case has concluded should not necessarily be a work of forfeiture," and that "courts of appeals have discretion to entertain a party's res judicata (including issue preclusion) argument when it is raised for the first time on appeal." *Uniloc USA, Inc. v. Motorola Mobility LLC*, 52 F.4th 1340, 1348–49 (Fed. Cir. 2022)*; see also Stanton v. D.C. Ct. of Appeals*, 127 F.3d 72, 77 (D.C. Cir. 1997) ("As res judicata belongs to courts as well as to litigants, even a *party*'s forfeiture of the right to assert it . . . does not destroy a *court*'s ability to consider the issue sua sponte." (emphasis in original)).

Because the potential for collateral estoppel did not become available until our reversal of the Board's finding as to claim 8, we conclude that ZyXEL did not forfeit the argument by failing to raise it earlier. We remand to the Board to determine if, in light of our conclusion that claim 8 is unpatentable as obvious (together with the unpatentability of claims 1–4 and 6–7), collateral estoppel should apply, and the substitute claims should be deemed unpatentable.

On the remand, the Board may also wish to consider if the substitute claims are unpatentable as obvious on a new ground: the combination of Talukdar, Li, and Nystrom. We note that before the Board ZyXEL did not argue that the substitute claims were obvious in light of Talukdar, Li, and Nystrom. However, "the Board may sua sponte identify a patentability issue for a proposed substitute claim based on the prior art of record." *Nike, Inc. v. Adidas AG*, 955 F.3d 45, 51 (Fed. Cir. 2020); *see also Hunting Titan, Inc. v. DynaEnergetics Eur. GmbH*, 28 F.4th 1371, 1382 (Fed. Cir. 2022) (acknowledging the Board may sua sponte advance a ground of unpatentability of a substitute claim "where the

record readily and persuasively establishes that substitute claims are unpatentable for the same reasons that corresponding original claims are unpatentable"); *see Q.I. Press Controls, B.V. v. Lee*, 752 F.3d 1371, 1383 (Fed. Cir. 2014) (noting that in the context of a reexamination "the Board [of Patent Appeals and Interferences] has the discretion to issue a new ground of rejection if it has knowledge of one"). We therefore remand to the Board to consider whether it should entertain an argument that the substitute claims are unpatentable as obvious over the combination of Talukdar, Li, and Nystrom.

We also note that "[i]f the Board sua sponte identifies a patentability issue for a proposed substitute claim . . . it must provide notice of the issue and an opportunity for the parties to respond before issuing a final decision under 35 U.S.C. § 318(a)." *Nike*, 955 F.3d at 51.

CONCLUSION

We affirm the Board's determination that claims 1–4, 6, and 7 are unpatentable as obvious, and the Board's decision to grant UNMRI's motion to amend. We reverse the Board's determination as to claim 8 and conclude that claim 8 is unpatentable as obvious. We remand to the Board to determine, based on our determination that claims 1–4 and 6–8 are unpatentable as obvious, if collateral estoppel applies to substitute claims 44–47, 49, and 50, and to allow the Board to consider whether to exercise its discretion to evaluate if these claims are invalid based on a combination of Talukdar, Li, and Nystrom.

AFFIRMED-IN-PART, REVERSED-IN-PART, REMANDED-IN-PART AS TO THE MAIN APPEAL. AFFIRMED AS TO THE CROSS-APPEAL.

COSTS

No costs.