NOTE: This disposition is nonprecedential.

United States Court of Appeals for the Federal Circuit

DALI WIRELESS INC.,
Appellant

v.

COMMSCOPE TECHNOLOGIES LLC,
Appellee

KATHERINE K. VIDAL, UNDER SECRETARY OF COMMERCE FOR INTELLECTUAL PROPERTY AND DIRECTOR OF THE UNITED STATES PATENT AND TRADEMARK OFFICE,
Intervenor

2020-1045

Appeal from the United States Patent and Trademark Office, Patent Trial and Appeal Board in No. IPR2018-00571.

Decided: September 6, 2023

STEFAN SZPAJDA, Folio Law Group PLLC, Seattle, WA, argued for appellant. Also represented by ALEXANDRA O. FELLOWES, CRISTOFER LEFFLER, DAVID DOUGLAS

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SARAH E. CRAVEN, Office of the Solicitor, United States Patent and Trademark Office, Alexandria, VA, for intervenor. Also represented by THOMAS W. KRAUSE, FARHEENA YASMEEN RASHEED.

Before HUGHES, LINN, and STARK, *Circuit Judges*.

LINN, *Circuit Judge*.

Dali Wireless Inc. ("Dali") appeals from a Final Written Decision of the Patent Trial and Appeal Board ("Board") holding that claims 6–8, 11–13, and 18–21 of Dali's U.S. Patent Number 9,531,473 ("'473 patent") are anticipated and obvious over prior art reference *Wu*,[1] and claims 9, 10, 14–17 of the same patent are obvious over a combination of *Wu* and *Sabat*.[2] *See CommScope Techs. LLC v. Dali Wireless Inc.*, IPR No. 2018-00571 (P.T.A.B. Aug. 12, 2019) ("*Board Opinion*"). We have jurisdiction pursuant to 28 U.S.C. § 1295(a)(4)(A) and 35 U.S.C. §§ 141(c) and 319.

Because substantial evidence supports the Board's determinations of anticipation and obviousness of claims 6–8, 11–13, and 18–21 over *Wu*, and because substantial evidence supports the Board's determination of obviousness of claims 9, 10, 14–17 over the combination of *Wu* and *Sabat*, we affirm.

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1 U.S. Pat. Pub. 2010/0128676.

2 U.S. Pat. Pub. 2009/0180426.

DISCUSSION

I

The '473 patent discloses a distributed antenna system that "enables a high degree of flexibility to manage, control, enhance, [and] facilitate the usage and performance of a distributed wireless network." '473 patent, Abstract. In such systems, downlink data is sent from a base station to any number of digital access units and, in turn, to various remote units located about an area of desired coverage. The remote units convey select information to user devices, such as cell phones. Software embedded in the digital access units and remote units determines "the appropriate amount of radio resources . . . to meet desired capacity and throughput objectives." *Id.* at 11:44–50.

A single limitation of independent claim 11 is at the center of the debate over the unpatentability of claims 6–8, 11–13, and 18–21. That limitation is referred to as the "capable of sending" limitation: "wherein the host unit is *capable of sending* a digital representation of *any* downlink signal it receives to *any* of the plurality of remote units." (Emphases added).[3] Dali also argues error in the Board's treatment of the "packetizing" limitations of dependent claims 9, 10, 14–17.[4]

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[3] Dali also cited at oral argument the so-called "configurable to transmit" limitation at the end of claim 11 but conceded that it did not challenge that limitation in its brief as part of this appeal. Oral Arg. at 2:46–55, 3:15–30, No. 20-1045, available at https://oralarguments.cafc.uscourts.gov/default.aspx?fl=20-1045_07102023.mp3.

[4] Claims 15 and 17 depend from claims 14 and 16, respectively. The parties do not raise any issues on appeal concerning claims 15 or 17 that differ from their contentions regarding claims 14 and 16.

II

Beginning with the "capable of sending" limitation, we note that Dali first asked the Board to construe that limitation as requiring a "host unit . . . capable of sending a digital representation of a specific downlink signal it receives to a specific *one* of the plurality of remote units." *Board Opinion* at 12 (emphasis added). Dali explained that its construction required the host unit to be capable of sending a specific signal to "only one remote unit without sending it to any other remote units." *Id.* at 13. The Board rejected this construction because the specification describes upconverters at the remote units that can selectively broadcast from among the resources the remote unit receives and thus control the uplink resources themselves. *Id.* at 13–14. The Board concluded that it need not explicitly construe the claim in the manner requested by Dali. *Id.* at 14.

The Board then held claims 6–8, 11–13, and 18–21 anticipated and obvious over *Wu*. *Wu* describes a "carrier channel distribution system" to route channels to remote transceiver units ("RTUs"). *Wu* at ¶ 11. *Wu*'s base transceiver station ("BTS") has a matrix switch, 250, and host units, 230 and "can include multi-band transceiver 260." *Id.* at ¶¶ 15, 34. The transceiver sends analog channels to a matrix switch, which "routes analog channels 270 to an appropriate host unit 230 according to a [routing] policy 255 for distribution to remote regions or RTUs." *Id.* at ¶¶ 38, 40. The Board held that *Wu* disclosed all the limitations of claim 11: the signal source read on the transceiver, the claimed host unit read on the combination of Wu's matrix switch and host unit 230, and the claimed remote units read on the RTUs. *Board Opinion* at 17–22. As particularly relevant here, the Board held that *Wu* disclosed the "capable of sending" limitation because "Wu's matrix switch allows individual carrier channels to be routed, via host units, to specific connected remote units." *Id.* at 23.

The Board next addressed claims 9, 10, and 14–17 and construed the term "packetizing" as framing data and adding information that describes the source or destination of the data. *Id.* at 9–12. The Board then held claims 9, 10, 14–17 obvious over a combination of *Wu* and *Sabat*. *Sabat* discloses a communication system with distributed remote units using a DDR hub between a host digital base station and the digital remote units and *vice versa*. *Sabat* at ¶¶ 15, 16, 34–37, FIGs 3, 6. *Sabat* teaches that the hub may use the CPRI standard for communications and incorporates the specifications of that standard by reference into the patent. *Id.* at ¶¶ 14, 31, 32. As discussed further, *infra*, the CPRI specification discloses but does not require using "addresses" such as ethernet addresses and an "address table" that "maps a CPRI port to an address." J.A. 1161.

The Board held that *Sabat* taught using CPRI for communications between a host unit and base station. The Board also held that CPRI disclosed using addressing information, which "would have taught or suggested to one of ordinary skill in the art that the host unit would frame data being transmitted to the base station and address that data . . . so that packets arrive at their intended destination." *Board Opinion* at 34.

III

The parties treat claim 11 as representative of claims 6–8, 11–13, and 18–21 and argue claims 9, 10, 14–17 together. *Board Opinion* at 24, 31, 35; Appellant's Opening Br. at 13. Dali raises several arguments on the merits of the Board's unpatentability determinations.

Dali first contends that because *Wu* is not capable of sending only certain selected communications to particular remote radio units, the Board could not have properly found the claims anticipated or obvious over *Wu* without effectively construing the "capable of sending" limitation to encompass a host that broadcasts *all* communications it receives to *all* the remote units attached thereto. Dali argues

that this essentially replaces "any" as claimed in the "capable of sending" limitation with "all." Second, Dali contends that substantial evidence does not support the Board's consideration of the separately disclosed host unit 230 and matrix switch of *Wu* together in what it terms a modified diagram in order to meet the claimed "host unit" limitation. Third, Dali argues that substantial evidence does not support the Board's obviousness determinations predicated on *Wu* and *Sabat* as meeting the "packetizing" limitation of claims 9, 10, and 14–17. We address each argument in turn.

A

Dali first argues that the Board acted arbitrarily in making a de facto construction of the "capable of sending" limitation by replacing "any downlink signal . . . to any remote unit" with "*all* downlink signals to *all* remote units" in finding independent claim 11 anticipated and obvious over *Wu*. *See Board Opinion* at 23–24. Dali contends that the Board could not have properly found the claims anticipated or obvious over *Wu,* because *Wu* is not capable of sending only certain selected communications to specific remote radio units as recited in the claims. CommScope responds that the Board did not make a new construction at all, but merely rejected Dali's argument that claim 11 required selected signals to be sent to only a single remote unit. In CommScope's view, the Board properly treated the *combination* of Wu's host unit 230 and matrix switch as disclosing and teaching the "capable of sending" limitation as recited.

We agree with CommScope. The passage of the Board's decision Dali cites reads:

> While "sending a digital representation of any downlink signal . . . to any of the plurality of remote units" may, in the case in which multiple remote units are connected to one of Wu's host units, mean that all such remote

> units receive the downlink signal, as discussed *supra* at Section II.C.2, this is consistent with the "capable of sending" limitation.

Id. at 23. This was not a construction replacing "any" with "all" in the claim limitation. It was simply a recognition that *Wu's* host unit 230, *acting alone*, sends all the channels it receives to all of its connected remote units. The Board relied not on that portion of *Wu,* alone, but considered the *combination* of Wu's host unit 230 *and* matrix switch 250 to allow individual carrier channels to be routed to specific connected remote units. *See Board Opinion* at 23 ("Instead, we are persuaded by Petitioner's showing that Wu's matrix switch allows individual carrier channels to be routed, via host units, to specific connected remote units."). Because *Wu*'s *matrix switch* selectively sends signals to particular *Wu* host units 230, the Board found it inapposite that *Wu*'s host unit 230 alone sends *all* the signals it receives to *all* of its connected remote units. For this reason, we reject Dali's argument that the Board, in finding the claims unpatentable, did so only by improperly construing the "capable of sending" limitation.

B

Dali argues that substantial evidence does not support the Board's consideration of the separately disclosed host unit 230 and matrix switch of *Wu* together in what it terms a modified diagram in order to meet the claimed "host unit" limitation. First, Dali contends that the matrix switch in *Wu* is shown *inside* the signal source BTS 240, while certain embodiments of the claimed invention disclose the signal source as "physically and functionally *separate* from the host unit." Appellant's Opening Br. at 44 (emphasis in original). Dali also argues that grouping *Wu*'s host unit 230 and matrix switch together to satisfy the host unit limitation creates a logical conflict with the "signal source" claim limitation. Finally, Dali argues that the Board failed

to discern a reason to modify *Wu* to group the host unit and matrix together.

CommScope responds that *Wu* describes how the matrix switch and host unit 230 function together and argues that the Board's determination of anticipation and obviousness does not require altering *Wu*'s disclosed components to satisfy the claim. CommScope also argues that the claims do not require that the host unit is separate from the signal source (only that it be coupled to the signal source), and even if it does require separation, that *Wu* teaches that the transceiver may be remote from the base station. Finally, CommScope argues that the Board's holding is internally consistent in reading the disclosed structure of *Wu* on each limitation of the claims.

We agree with CommScope. Nothing about the structure of the claim precludes reading the combination of *Wu*'s matrix switch and *Wu*'s host unit 230 together as meeting the claimed host unit. Moreover, there is no modification of *Wu* needed to group the matrix switch and *Wu*'s host unit together for purposes of the unpatentability analysis. The Board did not "import the functionality of the separate matrix switch into the host unit," as Dali contends. Appellant's Opening Br. at 44. *Wu*'s host unit 230 and matrix switch already function together as part of the base station, 240, to route channels to remote units. *Wu* at FIG. 2; *id.* at ¶ 15 (describing Figure 2 as showing a schematic of a "base transceiver station (BTS) having a matrix switch and host units"); *id.* at ¶ 38 (describing a preferred embodiment, matrix switch "routes analog channels 270 to an appropriate host unit 230 according to a policy 255 for distribution to remote regions or RTUs. Host units 230 further distribute the channels to RTUs over links 215."); *id.* at ¶ 39 (describing an example of the routing). *See also Board Opinion* at 22 ("[W]e agree that the matrix switch and host units function together to disclose the claimed host unit."). It is inapposite that *Wu* itself labels host unit 230 as a "host." As the Board correctly recognized, "identity of terminology is

not required for anticipation." *Board Opinion* at 21 (citing *In re Bond*, 910 F.2d 831, 832 (Fed. Cir. 1990)). We discern no error in the Board's treatment of *Wu*'s host unit 230 and matrix switch together as meeting the "capable of sending" limitation.

Furthermore, as the Board correctly noted, Dali "does not argue a difference—structural, functional, or otherwise—between the identified elements from *Wu* and the claimed host unit," and does not present any other reason why the combination of *Wu*'s matrix switch and host unit 230 does not anticipate or render obvious representative claim 11. *Board Opinion* at 21. Dali does not dispute that *Wu*'s matrix switch can allocate certain carrier channels to a certain host unit, Appellant's Opening Br. at 16 (conceding that *Wu*'s matrix switch performs this function), or that *Wu*'s host units can send the channels to the remote units according to the routing policy in the matrix switch. *Wu*'s disclosures support the Board's findings. *Wu* repeatedly teaches selectively routing certain channels to certain remote units. *Wu* at ¶ 11 ("The [matrix] switch preferably routes the individual channels, individually or combined, to RTUs according to a routing policy. The routing policy can be reconfigured as desired."); *id.* at ¶ 38 (noting that the matrix switch can split "individual channels 1–12 . . . into individual channels or groups of channels" via an "appropriate host unit 230"); *id.* at ¶ 40 (noting that the routing policy in the matrix switch determines "how analog channels 270 should be routed to host units 230 for further distribution to RTUs"); *id.* at ¶ 47 (noting that the policy inside the matrix switch can route a single carrier channel to a first RTU and a second carrier channel to a different RTU or group the channels together for routing to another RTU); *id.* (noting that the routing policy may "route, distribute, or allocate channels 270 collectively, as groups, individually, or in other desirable configurations"). *See also Board Opinion* at 19 (citing the above paragraphs and finding that *Wu* teaches "routing each channel individually to

one or more RTUs"); *id.* at 23 ("[W]e are persuaded by Petitioner's showing that *Wu*'s matrix switch allows *individual* carrier channels to be routed, via host units, to *specific* connected remote units.").[5] Substantial evidence thus supports the Board's findings on anticipation and obviousness of claims 6–8, 11–13, and 18–21 of the '473 patent over *Wu*.

C

Dali next argues that substantial evidence does not support the Board's determination that the combination of *Wu* and *Sabat* discloses the "packetizing" limitation of claims 9, 10, and 14–17, and thus that the Board erred in holding those claims obvious.

The Board construed "packetizing" to require the inclusion of addressing information—either the source or destination information. *Board Opinion* at 12. Applying this construction, the Board held that *Wu* alone and *Wu* in combination with *Sabat* rendered these claims obvious. With respect to the *Wu*/*Sabat* combination, the Board held that an ordinary artisan would have modified *Wu* "to use a digital CPRI link as taught by *Sabat*, between the matrix switch of *Wu* and the multiband transceiver 260," to "enable the use of a simple digital matrix switch and capitalize on the known advantages of digital communications." *Id.* at 31–32 (citing CommScope's expert Dr. Acampora's declaration). The Board also held that CPRI disclosed using addressing information, which "would have taught or suggested to one of ordinary skill in the art that the host unit would frame data being transmitted to the base station and

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[5] The parties largely argue anticipation and obviousness together. Because the resolution of both anticipation and obviousness over *Wu* is determined by the factual determination of the scope and content of *Wu's* disclosure, an issue common to unpatentability under both doctrines, we resolve the two together herein.

address that data . . . so that packets arrive at their intended destination." *Board Opinion* at 34. We affirm the Board's holding of obviousness over the combination of *Wu* and *Sabat* and need not address obviousness over *Wu* alone or Dali's arguments regarding *Wu* alone for these claims.

Dali argues that CPRI and *Sabat* do not disclose "packetizing." First, Dali argues that the CPRI specification does not teach using a CPRI link in the uplink signal to the base station from a host unit. CommScope responds that *Sabat*'s Figures 3 and 6 and the descriptions thereof disclose CPRI links between the DDR Hub and the base station, and CPRI links are bidirectional by definition.

Substantial evidence supports the Board's finding that *Sabat* and the CPRI Specification disclose a digital uplink between the base station and host unit. Figures 3 and 6 in *Sabat* both show bidirectional arrows between the DDR Hub, 310 and 510, and the base station, 302 and 502, and Figure 3 labels that link a "Donor *Digital* Stream." *Sabat* describes that link in Figure 3 as a "direct digital connection *to and from* the donor base station" using CPRI as the "specific digital base station interface." *Sabat* at ¶ 31 (emphasis added); *id.* at FIG. 3. *See also id.* at FIG. 6 (similar); *Board Opinion* at 30–31. Moreover, the CPRI standard defines CPRI links as bidirectional. J.A. 1084 (CPRI Specification defining "Link" as a "bidirectional interface in between two directly connected ports").

Next, Dali argues that the CPRI Specifications and *Sabat* do not teach *addressing* in the uplink because the disclosure of addressing in the CPRI Specification sections 6.3.2 and 6.3.3 relied on by the Board are limited to describing communications to the remote units, not to the base station from the host (i.e., the matrix switch in *Wu* or the DDR Hub in *Sabat*). CommScope responds that the Board reasonably credited Dr. Acampora's declaration that the CPRI Specification suggests using addressing in the uplink when an REC is placed in complex network configurations,

like that shown in Figure 5D—where one "RE" (radio equipment component) is connected to multiple "RECs" (radio equipment control component). *See Board Opinion* at 34 (crediting Dr. Acampora's declaration at J.A. 2475–77 and J.A. 2480–81).

The Board's determination that the CPRI Specification and *Sabat* disclose addressing in the uplink is supported by substantial evidence from the CPRI Specification, *Sabat*, and Dr. Acampora's declaration. The CPRI Specification at Sections 6.3.2 and 6.3.3, titled, respectively, "Reception *and Transmission* of SAP_{CM} by the RE" and "Reception *and Transmission* of SAP_{IQ} by the RE," J.A. 1161 (emphases added), describe the use of an "address table" that "defines how SAP_{IQ} logical connections shall be switched from one port to another," and discloses that the addressing may be managed by the REC "that has full knowledge of the topology and *all addresses* to all REs." (Emphasis added). It provides two examples of addressing: "HDLC or Ethernet address can be used to define a table that maps a CPRI port to an address." *Id.* Dali does not dispute that an Ethernet address is an "address" for purposes of packetizing. The CPRI Specification then recognizes that RECs may be used as networking elements in configurations such as those shown in Figures 5D and 5E,

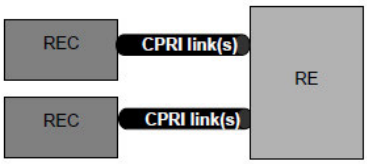

Figure 5D: Multiple point-to-point links between several RECs and one RE

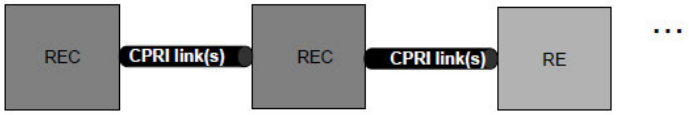

Figure 5E: Chain topology of multiple RECs

shown above, where one RE is connected to multiple RECs. J.A. 1089. In these configurations, the CPRI Specification explains that "Reception *and Transmission*" would use the addressing described in Sections 6.3.2 and 6.3.3. J.A. 1162 (emphasis added) ("Reception and Transmission of SAP_{CM} follow chapter 6.3.2" and "Reception and Transmission of SAP_{IQ} follow chapter 6.3.3"); J.A. 2477 (Dr. Acampora declaration explaining the same). Dr. Acampora explained that because Figure 5E "requires different logical connections of digital IQ data from a single RE to be sent upstream to two different REC components," Section 6.3.8 teaches that addressing may be used to route the signals to the appropriate location. J.A. 2480–81.

Sabat's Figure 6, shown below, teaches using the CPRI links for communications to and from the base station, as discussed above. In this embodiment, *Sabat* shows connecting remote units to multiple base stations, just as in the CPRI Specification Figure 5D.

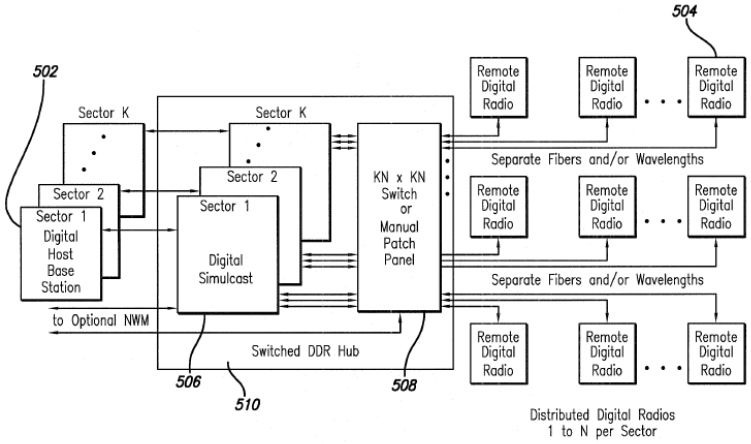

FIG. 6

From the above, Dr. Acampora declared that it would have been obvious to "communicate upstream signals from the host unit to the base station using the known CPRI communication protocol, a protocol specifically designed for communication with base station components, and a

protocol which is specifically taught by *Sabat* to be useful for this purpose," including the use of addressing in the complex network configurations shown in the CPRI Specification and *Sabat*. J.A. 865, J.A. 2476, J.A. 2480–81. From this declaration and the references themselves, the Board held "that the host unit would frame data being transmitted to the base station and address that data . . . so that packets arrive at their intended destination." *Board Opinion* at 34. This was supported by substantial evidence.

In its Reply Brief, Dali adds a new argument why the CPRI Specification and *Sabat* do not teach addressing in the uplink. Dali reasons that the CPRI Specification routes channels to their destinations based on their relative position in the bit stream, rather than based on the information contained within the packet, as in the '473 patent. *See* Appellant's Reply Br. at 12–15. Dali failed to present this argument in its opening brief, and it is thus forfeited. Moreover, even if we were to consider the issue, Dali is incorrect because the Board's construction of "packetizing" did not require that the system "address" in any particular way, and nothing in the Board's construction excludes the kind of sequential/temporal addressing used by the CPRI standard.

Relatedly, Dali argues that there would be no need for packetizing in the uplink direction if the signals from the remote units to the hub are already packetized at the remote units, as *Sabat*, *Wu*, and the CPRI Specification teach. CommScope responds that *Sabat* teaches that the uplink, what it calls the "reverse" link, combines the signals from the remote units to create "a single combined reverse-link signal" to the base station in accordance with CPRI and that this link would require its own packetizing. *See Sabat* at ¶ 36. Substantial evidence supports the Board's finding. Nothing about the hub receiving individualized packetized information from the remote units in *Sabat* undermines the disclosure and the advantage of

combining those signals and packetizing the *combined* signals for transmission to the base station. *See Wu* at ¶ 38 (disclosing that the matrix switch "can combine the channels *back into their proper form* for transmission within bands 263 for transmission via multi-band transceiver" (emphasis added)); *Sabat* at ¶ 36 (disclosing that the DDR hub provides a "single combined reverse-link signal" to the base station).[6]

Dali also cursorily argues that none of *Wu*, *Sabat*, or the CPRI Specification articulated "any reason" for *Wu*'s matrix switch to digitally packetize uplink signals. Appellant's Opening Br. at 39. CommScope responds that it presented evidence that the CPRI standard was a well-known protocol for communications between base station components that allowed digital transport of information over a network and provided evidence of the known advantages of digital communications, including lower noise when communicating between distant components, and allowing communications with digital-only base stations.

The Board's finding that an ordinary artisan would combine *Wu*'s matrix switch with CPRI uplinks is supported by substantial evidence. As the Board noted, the combination was motivated by the advantages of digital communication between the host and the base station, "such as noise immunity and longer-distance transport," allowing "the use of a simple digital matrix switch," and allowing communication with entirely digital base stations such as in *Sabat*. *Board Opinion* at 31–32; J.A. 863 (Dr. Acampora declaration listing advantages of digital signals, including less noise than analog allowing longer distance transport of information, less expensive processing, more

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[6] As an alternative ground for affirmance, CommScope argues that the Board erred in construing "packetizing" to require addressing information. We need not and do not reach this issue.

reliability, easier manipulation, and allowing the omission of RF equipment from the transceiver); J.A. 865 (Dr. Acampora declaration explaining that using CPRI between the matrix switch and the transceiver in *Wu* would allow compatibility with all-digital base stations, such as disclosed in *Sabat*). As CommScope correctly notes, *Wu* discloses the use of a transceiver situated remotely from the matrix switch, *Wu* at ¶ 34, a particularly advantageous situation for digital communication, as explained by Dr. Acampora. J.A. 863. Dr. Acampora also noted that *Wu* already teaches using the CPRI link between the remote units and the host unit 230, and that it would have been obvious to use the same protocol upstream. J.A. 862. We see no error.

IV

Dali finally argues that the Board's decision should be vacated because it was issued in violation of the Appointments Clause because Commissioner Hirshfeld was not a principal officer and had not been validly appointed as the Acting Director of the Patent Office, citing *United States v. Arthrex*, 141 S. Ct. 1970 (2021).

This Court has previously rejected Dali's position in *Arthrex, Inc. v. Smith & Nephew, Inc.*, 35 F.4th 1328, 1332–40 (Fed. Cir. 2022). This panel is bound by that decision, and we therefore reject Dali's Appointments Clause challenge here.

CONCLUSION

For the reasons stated above, we affirm. We have carefully considered but do not find merit to Dali's remaining arguments.

AFFIRMED