

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

MERCEDES-BENZ USA, LLC,
Petitioner,

v.

CARUCEL INVESTMENTS, L.P.,
Patent Owner.

IPR2019-01442
Patent 7,848,701 B2

Before THOMAS L. GIANNETTI, DANIEL J. GALLIGAN, and
PAUL J. KORNICZKY, *Administrative Patent Judges*.

GIANNETTI, *Administrative Patent Judge*.

JUDGMENT
Final Written Decision
Determining All Challenged Claims Unpatentable
35 U.S.C. § 318(a)

I. INTRODUCTION

A. Background

Mercedes-Benz USA, LLC (“Petitioner” or “Mercedes-Benz”) filed a Petition requesting *inter partes* review of claims 10, 15–18, 31, and 33–35 (the “challenged claims”) of U.S. Patent No. 7,848,701 B2 (Ex. 1001, the “’701 patent”). Paper 2 (“Pet.”). Carucel Investments, L.P. (“Patent Owner”) filed a Preliminary Response. Paper 6 (“Prelim. Resp.”).

Pursuant to 35 U.S.C. § 314, we instituted this *inter partes* review as to all of the claims challenged and all grounds raised in the Petition. Paper 8 (“Institution Dec.”).

Following institution, Patent Owner filed a Response. Paper 12 (“PO Resp.”). Subsequently, Petitioner filed a Reply to Patent Owner’s Response (Paper 21, “Pet. Reply”), and Patent Owner filed a Sur-reply (Paper 27, “PO Sur-reply”).

On December 2, 2020, we held a consolidated oral hearing with several related cases involving Patent Owner. A transcript of the hearing is included in the record. Paper 30 (“Hearing Tr.”).

We have jurisdiction under 35 U.S.C. § 6. This decision is a Final Written Decision, issued pursuant to 35 U.S.C. § 318(a). For the reasons we discuss below, we determine that Petitioner has proven by a preponderance of the evidence that claims (the “challenged claims”) of the ’701 patent are unpatentable.

B. Related Proceedings

The parties identify the following pending district court proceedings involving the ’701 patent: *Carucel Investments, LP v. Fiat Chrysler Automobiles US LLC, et al.*, 3:18-cv-03331 (N.D. Tex.); *Carucel Investments, LP v. General Motors Company*, 3:18-cv-03332 (N.D. Tex.);

Carucel Investments, LP v. Volkswagen Group of America, Inc., 3:18-cv-03333 (N.D. Tex.); *Carucel Investments, LP v. Mercedes-Benz USA, et al.*, 3:18-cv-03334 (N.D. Tex.). Paper 4; Pet. 74.

In addition to this Petition, the '701 patent was also challenged by a different party (Volkswagen Group of America, Inc.) in IPR2019-01102. Pet. 60; Paper 4.

Patents related to the '701 patent are challenged in IPR2019-01101, IPR2019-01103, IPR2019-01104, IPR2019-01079, IPR2019-01298, IPR2019-01404, IPR2019-01105, IPR2019-01440, and IPR2019-01441. Pet. 60–61; Paper 4.

C. Real Parties-in-Interest

Petitioner identifies “Daimler AG, Daimler North America Corporation, Mercedes-Benz USA, LLC and Mercedes-Benz U.S. International, Inc.” as the real parties-in-interest. Pet. 60. Patent Owner identifies Carucel Investments, L.P., as the real party-in-interest. Paper 4, 1.

D. The '701 Patent

The '701 patent is titled “Mobile Communication System with Moving Base Station.” Ex. 1001, (54). According to the patent, “[a] problem with existing mobile telephone systems is the considerable time required in handoffs. This becomes a particular problem in urban areas which are highly congested.” *Id.* at 1:54–56. The '701 patent addresses this problem by providing “a moving base station which is interposed between a moving mobile telephone unit and a fixed base station.” *Id.* at 2:65–3:1. The “movable base station moves with the traffic at a rate of speed which is comparable to the speed of the traffic and communicates with a moving mobile telephone unit via standard mobile radio transmission.” *Id.* at 3:2–5. The movable base station “communicates by radio signals with a plurality of

fixed antennas spaced along the path of travel of the mobile base station.”
Id. at 3:5–8.

This is illustrated by Figure 1 of the '701 patent, reproduced below.

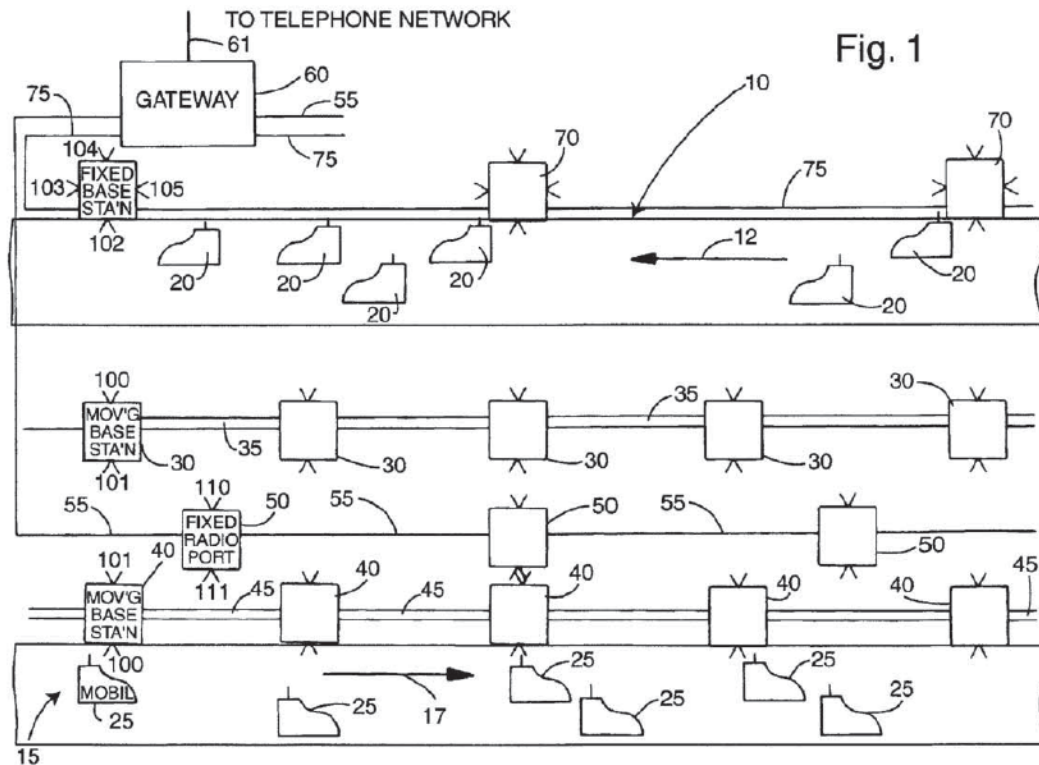


Fig. 1 is a block diagram representation of a roadway structure with fixed base stations, moving base stations, and fixed radio ports. *Id.* at 3:43–45.

In Figure 1, a divided highway has mobile units 20 traveling on first roadway 10, in one direction, and mobile units 25 traveling along second roadway 15, in the opposite direction. *Id.* at 3:65–4:1. Moving base stations 30 are disposed along one side of roadway 10. *Id.* at 4:1–3. The base stations are spaced apart by a selected distance equivalent to the diameter of the cell served by the moving base station. *Id.* at 4:3–5.

Moving base stations 30 may be moved by means of rail 35 or other suitable conveying device, which may include an automotive vehicle traveling on the roadway, in the same direction as the traffic flow on

roadway 10, as indicated by arrow 12. *Id.* at 4:5–9. Similarly, moving base stations 40 are disposed along adjacent roadway 15, moving in the direction of the traffic as indicated by arrow 17. *Id.* at 4:9–12. Moving base stations 40 are moved along rail 45. *Id.* at 4:12.

In operation, base stations 30 move in the direction of the flow of the traffic at a rate of, for example, sixty miles per hour, which may be faster than some traffic and slower than other traffic. *Id.* at 4:41–44. The moving base stations handle telecommunications with mobile units 25, which travel at a rate of not more than thirty miles per hour faster or slower than the moving base stations. *Id.* at 4:37–40. Fixed base stations 70 accommodate communications with mobile units traveling at speeds of less than thirty miles per hour, including pedestrian traffic and stationary units. *Id.* at 4:46–49.

According to the '701 patent, the advantage of this system is reducing the number of handoffs:

The system in accordance with the invention differs from the prior art primarily in that the base stations 30, 40 are moving with the traffic and communicate with the gateway office 60 via fixed radio ports 50. Furthermore, the various call-handling functions, including handoff, are performed by the moving base station.

Advantageously, because of movement of the base station in the same direction as the traveling mobile unit, the number of handoffs is greatly reduced.

Id. at 5:8–16 (emphasis added).

Each of the moving base stations is provided with multiple antennas. *Id.* at 5:17–18. Antennas 100 on moving base stations 30, 40 are used to communicate with mobile units 20, 25, whereas antennas 101 on moving

base stations 30, 40 are used to communicate with fixed radio ports 50. *Id.* at 5:22–26.

E. Illustrative Claims

The '701 patent has forty-two claims. Nine claims (10, 15–18, 31, and 33–35) are challenged in the Petition. *See supra*. Of the challenged claims, two (claims 10 and 31) are independent. Claim 10 recites¹:

10. A movable base station configured to move relative to Earth, the movable base station comprising:

[10a] a plurality of spatially separated antennas;

[10b] a receiver configured to receive mobile device signals from a fixed port through the plurality of spatially separated antennas;

[10c] a controller configured to align and combine the received fixed port signals; and

[10d] a transmitter configured to transmit radio frequency signals to a mobile device corresponding to the received fixed port signals.

Ex. 1001, 11:54–64.

Claim 31 recites:

31. A movable base station configured to move relative to Earth, the movable base station comprising:

[31a] a plurality of spatially separated antennas;

[31b] a receiver configured to receive fixed port signals from a fixed port through the plurality of spatially separated antennas; and

[31c] a transmitter configured to transmit radio frequency signals to a mobile device corresponding to the received fixed port signals, the radio frequency signals transmitted within time slots of time-division multiplex channels.

¹ Reference numbers assigned by Petitioner have been added in brackets to claims 10 and 31.

Id. at 13:13–22.

E. References and Other Evidence

The Petition relies on the following references:

1. U.S. Patent No. 5,276,686, issued January 4, 1994 (Ex. 1003, “Ito”);
2. U.S. Patent No. 5,101,501, issued March 31, 1992 (Ex. 1004, “Gilhousen501”);
3. U.S. Patent No. 5,519,761, filed July 8, 1994 (Ex. 1005, “Gilhousen761”);
4. U.S. Patent No. 5,652,765, filed May 22, 1995 (Ex. 1031, “Adachi”).
5. William C. Jakes, “A Comparison of Specific Space Diversity Techniques for Reduction of Fast Fading in UHF Mobile Radio Systems,” *IEEE Transactions on Vehicular Technology*, Vol. VT-20, No. 4, Nov. 1971 (Ex. 1032, “Jakes”).

Pet. 10–20.

In addition, Petitioner submitted a Declaration of Jeffrey Fischer (Ex. 1008, “Fischer Decl.”) with the Petition and a further Declaration of Mr. Fischer (Ex. 1106, “Fischer Reply Decl.”)² with its Reply. Patent Owner submitted the Declaration of Mark R. Lanning (Ex. 2100, “Lanning

² Petitioner submitted a corrected version of this declaration with the same exhibit number as the original version. Our citations refer to the corrected version.

Decl.”) with its Patent Owner Response. Both parties have submitted deposition transcripts for these declarants.³

F. Asserted Grounds of Unpatentability

Petitioner asserts the challenged claims are unpatentable on the following grounds.

Claims Challenged	Statutory Basis 35 U.S.C.⁴	References
10, 17	§ 103	Gilhousen761, Gilhousen501, Adachi
10, 16–18, 31, 34, 35	§ 103	Ito, Gilhousen501, Adachi
10, 15–18, 31, 33–35	§ 103	Ito, Jakes

Pet. 10.

II. PRELIMINARY MATTERS

A. Level of Ordinary Skill

Petitioner contends: “One of ordinary skill in the art would have at least a Bachelor’s degree in Electrical Engineering, Computer Science, or an equivalent area of study, and at least three years of graduate study or professional experience with wireless and/or cellular communications or similar experience.” Pet. 7 (citing Fischer Decl. ¶¶ 33).

Patent Owner contends that a person of ordinary skill in the art “at or near the filing date of the earliest priority application of the ’701 Patent would have had (i) a Bachelor of Science degree in electrical engineering or

³ Ex. 1101 (“Lanning I Dep.”); Ex. 1102 (“Lanning II Dep.”); Ex. 2108-1 (“Fischer I Dep.”); Ex. 2108-2 (“Fischer II Dep.”).

⁴ The Leahy-Smith America Invents Act (“AIA”), Pub. L. No. 112-29, 125 Stat. 284, 287–88 (2011), amended 35 U.S.C. § 103. Because the ’701 patent was filed before March 16, 2013 (the effective date of the relevant amendments), the pre-AIA version of § 103 applies.

computer engineering or related field of study; (ii) at least two years of experience with wireless communications systems; and (iii) would also be familiar with cellular communication technology.” PO Resp. 8. Further, Patent Owner contends “[a] lack of experience can be compensated with additional education and a lack of education can be compensated with additional work experience.” *Id.* at 9 (citing Lanning Decl. ¶ 59).

The formulations differ slightly, in that Patent Owner’s formulation specifically calls for familiarity with cellular communication technology, whereas Petitioner’s formulation is more general, requiring a comparable level of experience (three years versus two years) with mobile wireless communications.

We regard these formulations as not materially different, because familiarity with mobile wireless communications would normally include knowledge of cellular communication technology. Furthermore, we do not regard the one-year difference in experience levels as significant. Both formulations, also, are consistent with the prior art before us and with the level of skill reflected in the ’701 patent. *See Okajima v. Bourdeau*, 261 F.3d 1350, 1355 (Fed. Cir. 2001) (prior art itself may reflect an appropriate level of skill). As the formulations are not materially different, we adopt Patent Owner’s more specific description, with the exception of the open-ended language “at least.” However, we would reach the same result on the ultimate question of patentability of the challenged ’701 patent claims under either formulation.

B. Claim Construction

We interpret claim terms using “the same claim construction standard that would be used to construe the claim in a civil action under 35 U.S.C. 282(b).” 37 C.F.R. § 42.100(b) (2019). In this context, claim terms “are

generally given their ordinary and customary meaning” as understood by a person of ordinary skill in the art in question at the time of the invention. *Phillips v. AWH Corp.*, 415 F.3d 1303, 1312–13 (Fed. Cir. 2005) (citations omitted) (en banc). “In determining the meaning of the disputed claim limitation, we look principally to the intrinsic evidence of record, examining the claim language itself, the written description, and the prosecution history, if in evidence.” *DePuy Spine, Inc. v. Medtronic Sofamor Danek, Inc.*, 469 F.3d 1005, 1014 (Fed. Cir. 2006) (citing *Phillips*, 415 F.3d at 1312–17). Extrinsic evidence is “less significant than the intrinsic record in determining ‘the legally operative meaning of claim language.’” *Phillips*, 415 F.3d at 1317 (quoting *C.R. Bard, Inc. v. U.S. Surgical Corp.*, 388 F.3d 858, 862 (Fed. Cir. 2004)).

Petitioner cites a *Markman* order “regarding the ’701 patent and its family” issued by the district court in *Carucel Investments, L.P. v. Novatel Wireless, Inc.*, No. 3-16-cv-00118, Dkt. 131 (S.D. Cal. Sep. 19, 2016) (“*Novatel* Litigation”). Pet. 8; *see* Ex 2105. Petitioner refers us to the district court’s construction for these terms: “fixed port,” “base station,” “configured to,” and “transmit radio signals to a mobile device corresponding to the received fixed port signals.” *Id.* at 8.

Petitioner contends: “Based on the district court’s constructions of ‘fixed port’ and ‘base station,’ a [person of ordinary skill] would understand that disclosure of a cellular base station satisfies both claim terms.” Pet. 8.

As to the term “configured to,” Petitioner states: “Petitioner proposes that this term be applied in this Petition consistent with [Patent Owner]’s Complaints—that the claimed movable base station is ‘configured to move relative to Earth’ when a vehicle includes a movable base station.” Pet. 9.

Petitioner contends: “All other terms are sufficiently clear, should be given their plain and ordinary meaning as understood by a person of ordinary skill in the art . . . at the time of the alleged invention, and do not require construction.” *Id.*

Patent Owner provides proposed constructions for the terms “fixed port,” “configured to,” “transmit radio frequency signals to a mobile device corresponding to the received fixed port signals,” “mobile device,” “automotive vehicle,” and “cellular base station.” PO Resp. 10–18.

Petitioner responds “that each of the Grounds [asserted by Petitioner] renders the challenged claims obvious even under [Patent Owner’s] proposed construction of ‘fixed port,’ ‘configured to,’ ‘transmit radio frequency signals...,’ ‘automotive vehicle,’ and ‘cellular base station,’ and that therefore no construction for these terms is required.” Pet. Reply 7.

*1. “fixed port”*⁵

Patent Owner proposes that we adopt the district court’s construction of these “fixed port” in the *Novatel* litigation, which is: “a stationary device at which signals can enter or exit a communication network.” PO Resp. 10;⁶ Ex. 2105, 12.

Petitioner responds that no construction is required. Pet. Reply 7. We do not see the need to construe this term for the purpose of resolving a controversy, and therefore, we do not adopt Patent Owner’s proposed

⁵ The parties agree that there is no difference between the terms “fixed port” and “fixed radio port.” Hearing Tr. 27:9–23; 88:12–13.

⁶ Patent Owner misquotes the district court’s claim construction as saying “enter and exit” rather than “enter or exit,” as stated in the district court’s order. Ex. 2105, 12. We treat Patent Owner’s misquotation as a typographical error.

construction. *Vivid Techs., Inc. v. Am. Sci. & Eng'g, Inc.*, 200 F.3d 795, 803 (Fed. Cir. 1999).

2. “*configured to*”

The district court construed this term as “constructed to move with the traffic at a rate of speed which is comparable to the speed of the traffic.”

Pet. 9. Petitioner proposes that this term be construed “consistent with [Patent Owner’s] Complaints” in district court, as requiring “that the claimed movable base station is ‘configured to move relative to Earth’ when a vehicle includes a movable base station.” *Id.* Patent Owner contends that the proper construction is the construction adopted by the district court. PO Resp. 10–13.

In our analysis below, we apply the construction adopted by the district court.

3. “*transmit radio frequency signals to a mobile device corresponding to the received fixed port signals*”

Patent Owner urges us to adopt the district court’s construction which is “transmit radio frequency signals to a mobile device, where the radio frequency signals correspond to the received fixed port signals.” PO Resp. 13.

We do not see the need to construe this term for the purpose of resolving a controversy, and therefore, we do not adopt Patent Owner’s proposed construction.

4. “*mobile device/mobile unit*”⁷

Patent Owner contends that mobile units are “also known as cell phones or mobile phones.” PO Resp. 7. Patent Owner asks us construe

⁷ The parties agree that the term “mobile unit” in the ’701 patent has the same meaning as “mobile device.” Hearing Tr. 22:18–23, 88:14–16.

“mobile device” as “a device that must register with and be able to directly communicate with the cellular network.” *Id.* at 13. Patent Owner contends that this is “the plain and ordinary meaning of the term.” *Id.* Patent Owner explains: “A mobile device is more than just a cordless phone handset.” *Id.*

Patent Owner asserts that a “mobile unit” also includes the “capability to be switched back-and-forth between either a direct connection with the fixed base station or a connection with a moving base station.” *Id.* at 14.

Patent Owner’s proposed construction relies mainly on the ’701 patent specification: “The ’701 Patent specification teaches that a mobile device must be capable of directly communicating with either a fixed cellular base station or a moving base station.” PO Resp. 13 (citing Ex. 1001, 4:46–49). Furthermore, according to Patent Owner, “the mobile unit’s capability to be switched back-and-forth between either a direct connection with the fixed base station or a connection with a moving base station is discussed repeatedly and throughout the specification.” *Id.* at 14. Also, “[t]he ’701 Patent specification teaches that a mobile device must be capable of registering with a cellular network so it is able to receive calls coming from the cellular network.” *Id.* at 14–15. Patent Owner cites also the discussion in the ’701 patent that describes registration by the mobile unit:

When a mobile unit set is first powered up or first enters a service area, the mobile unit must register in the manner described earlier, by transmitting its unique address in the new service area. The address will be received by the closest moving base station 30 and transmitted via a fixed radio port and the gateway switch 60 to the telephone network.

Ex. 1001, 9:49–54 (partially quoted at PO Resp. 15). Patent Owner relies on testimony from its expert, Mr. Lanning. *See* PO Resp. 13–15 (citing Lanning Decl. ¶¶ 58, 65–70. 78).

Petitioner opposes Patent Owner’s proposed construction of mobile device. Pet. Reply 1–7. Petitioner contends that Patent Owner’s proposed definition “does not reflect the term’s ordinary meaning.” *Id.* at 2. Petitioner asserts that Patent Owner’s proposed construction is “flatly inconsistent” with a construction Patent Owner proposed in the *Novatel* Litigation. *Id.* Petitioner describes this previous “inconsistent” construction advanced by Patent Owner in district court as a “non-cellular construction”: “[Patent Owner] should not be permitted to propose a broad construction to capture infringing devices in litigation, then make an about-face in an IPR to avoid the prior art.” *Id.* Petitioner asserts also that the construction proposed here by Patent Owner should be rejected because it “contradicts the claims, the specification and the prosecution history.” *Id.* at 3. Petitioner contends that “[n]one of the claims require the ‘mobile device’ to register, and none require it to communicate directly with a cellular network.” *Id.*

Finally, Petitioner concludes its discussion of “mobile device” with the proposal “that this term is sufficiently clear on its face that construction is not necessary.” *Id.* at 6.

Having reviewed and considered the record presented, including Petitioner’s and Patent Owner’s submissions, we are not persuaded to adopt Patent Owner’s construction of “mobile device.” Our reasoning follows.

As instructed by *Phillips*, we first look to the words of the claims. *Phillips*, 415 F.3d at 1312. We find that the language of the challenged claims does not support Patent Owner’s construction. As Petitioner points

out, the challenged claims themselves do not require the mobile device to register or communicate directly with a cellular network. Pet. Reply 3. In fact, the claims are not directed to the mobile device. The '701 patent claims the mobile base station, not the mobile units. Hearing Tr. 52:21–53:5.

Patent Owner's Response confirms that Patent Owner regards the mobile base station, and not the mobile device, as the invention: "Most importantly to the issues presented here, Mr. Gavrilovich invented a 'mobile base station' that significantly improved wireless communications by acting as an intermediary between cell towers and mobile devices." PO Resp. 2. And this identification by Patent Owner of the mobile base station as the invention is consistent with the Summary of the Invention in the '701 patent itself, which states: "These and other problems of the prior art are overcome in accordance with this invention by means of a moving base station which is interposed between a moving mobile telephone unit and a fixed base station." Ex. 1001, 2:65–3:1.

As Petitioner shows, in the challenged claims of the '701 patent, it is the mobile base station, not the mobile device or mobile unit, that communicates directly with the fixed ports or base stations associated with the network. Pet. Reply 3. This important aspect of the '701 patent claims was explored with Patent Owner's counsel at the oral argument:

[PATENT OWNER'S COUNSEL]: The purpose of the invention is to allow all five different mobile devices to be connected through a moving base station so that there's only one hand-off. If you did that at the mobile phone level, that wouldn't be accomplishing the same purpose. . . .

[THE BOARD]: -- the mobile device doesn't have to be a cellular device in order to do that as long as the base station can

communicate with the cellular network; isn't that correct? I mean it's actually -- the base station in your claims, *it's the base station that's communicating with the cellular network not the mobile device.*

[PATENT OWNER'S COUNSEL:]: *Right.*

Hearing Tr. 53:20–54:6 (emphasis added).

As Patent Owner acknowledges, the mobile base station in the '701 patent acts as “an intermediary” between the mobile devices and the network. PO Resp. 3. The challenged claims describe the communications passing between the moving base station (the recited “apparatus” in the claim) and the fixed ports of the network and between the moving base station and the mobile devices. Pet. Reply 3–4.

Thus, for example, independent claim 10 recites that the claimed “movable base station” has “a receiver configured to receive fixed port signals *from a fixed port*” and “a transmitter configured to transmit radio frequency signals *to a mobile device.*” Ex. 1001, 11:57–59, 11:62–64 (emphasis added). Claim 31 has similar descriptions of the receiver and transmitter. *Id.* at 13:16–21.

Furthermore, the challenged claims do not require the signals transmitted between the mobile device and the moving base station to be cellular signals, or identify the recited mobile device as a device that communicates with a cellular network. Nor do they require registration of the mobile device with the cellular network. Pet. Reply 3. Based on the foregoing, we find that the challenged claims of the '701 patent do not require a mobile device that must register with or is capable of communicating directly with a cellular network.

Moreover, we find that the '701 patent specification does not support Patent Owner's construction of “mobile device.” *Cf.* PO Resp. 14–16; PO

Sur-reply 6–10. As stated in *Phillips*, “the specification is always highly relevant to the claim construction analysis. Usually, it is dispositive; it is the single best guide to the meaning of a disputed term.” *Phillips*, 415 F.3d at 1315 (internal quotes and citation omitted).

First, we do not see in the specification of the ’701 patent a clear indication supporting Patent Owner’s contention that conventional non-cellular cordless phones should be excluded. *Cf.* PO Resp. 13 (“A mobile device is more than just a cordless phone handset.”). In the Background section, the ’701 patent describes the goal of the patent as encompassing “all applications” including cordless phones: “What is desirable is an infrastructure which allows use of such terminals *in all applications*, whether in the home or office as a *cordless phone . . .*” Ex. 1001, 2:45–47 (emphasis added); Fischer Reply Decl. ¶ 7.

While the ’701 patent does refer to the fixed base stations as “cell site[s]” (Ex. 1001, 4:61–62), it also describes the radio interfaces between the mobile devices and the base stations in more general terms. Pet. Reply 4; Ex. 1001, 6:34–37. Thus, the ’701 patent describes the radio interface between the mobile units and both the moving and fixed base stations as “a standard radio interface, well known in the art.” Ex. 1001, 6:37–39. This generic description in the ’701 patent of these radio interfaces as a “standard radio interface” is broader than a “cellular interface,” and is consistent with the patent’s stated goal of providing “an infrastructure which allows use of . . . a cordless phone.” Pet. Reply 4 (citing Ex. 1001, 2:45–49); Fischer Reply Decl. ¶¶ 7–8. Elsewhere, the ’701 patent states this interface “*may* be the standard [cellular] air interface standard,” confirming that a cellular interface

is not a requirement for the mobile units. Ex. 1001, 6:59–61 (emphasis added).⁸

We find further support for our conclusion that Patent Owner’s construction is too limiting in the ’701 patent’s description of an embodiment where the mobile unit is prevented from communicating directly with the fixed ports. Ex. 1001, 3:20–35. In this embodiment, the power levels for the signals between the moving base station and the mobile unit are chosen to *avoid* direct communication between the mobile device and the fixed radio ports. *Id.* at 3:26–31. This embodiment is consistent with the claim language, which we find describes the mobile base station, not the mobile units, communicating with the cellular network. *See* discussion *supra*.

Phillips instructs us that the prosecution history may also be relevant in construing the claims. 415 F.3d at 1317; *see* Pet. Reply 5 (discussing prosecution history). The ’701 patent is a continuation of U.S. Patent No. 7,221,904, and shares a common specification and similar claims with the ’904 patent. Ex. 1001, 1:6–7. During prosecution of the ’904 patent, in an appeal brief to the Board, the applicant did not limit mobile units to cellular devices, but instead told the Board that radios and telephones were included: “The present invention is directed to methods and devices for providing communication services to moving mobile units *such as telephones, radio modems, or other types of radios.*” Ex. 1107, 289 (emphasis added). We agree with Petitioner and find that this prosecution history describing the mobile units as “telephones” and “radios” contradicts Patent Owner’s

⁸ Patent Owner relies on this statement to prove that this interface *must* be cellular. *See infra*.

construction limiting such devices to “a device that must register with and be able to directly communicate with the cellular network.” Pet. Reply 5.

Petitioner also cites an October 4, 2004, Office Action in which the Examiner found that the claim term “mobile unit” read on a reference (Yokoi) disclosing a cordless phone. *Id.* (citing Ex. 1107, 328). Petitioner notes that Patent Owner’s response did not challenge this finding by the Examiner. *Id.* (citing Ex. 1107, 338 *et seq.*).

Patent Owner responds that its proposed construction is “[c]orrect,” and that Petitioner “attempts to . . . broadly construe the term ‘mobile device’ in a vacuum.” PO Sur-reply 6–7. Patent Owner contends Petitioner’s analysis “is flawed for several reasons.” *Id.* at 6. Patent Owner further argues that “the ’701 Patent relates to and describes as a whole improving the wireless connections of mobile devices within cellular telephone systems via a moving base station” *Id.* at 7 (footnote omitted).

We are not persuaded by these arguments limiting “mobile unit” to cellular devices as they are contrary to the claim language, the specification, and the other intrinsic evidence discussed above. In the claims, it is the mobile base station that communicates with the cellular network, not the mobile units. *See discussion supra.* As explained there, the challenged claims focus on the mobile base station; they do not describe the mobile units as cellular devices, which according to the prosecution history, can be radios and telephones. *See discussion above.* While the ’701 patent may discuss cellular networks, we find the disclosure and the claims do not limit the claimed “mobile device” to a cellular phone, for the reasons given above.

Patent Owner asserts that “[t]he purpose of the invention is only

achieved within a cellular infrastructure.” PO Sur-reply 6. Patent Owner argues that “the ‘701 Patent explicitly and exclusively relates to improving the wireless connections of mobile devices within cellular telephone systems,” and cites numerous references in the patent to cellular communications. *Id.* at 8–10 (emphasis and internal quotation marks omitted). Only one of the citations provided by Patent Owner refers to the communications interface between the mobile unit and the moving base station. *Id.* at 9 (citing Ex. 1001, 7:4–6).⁹ That one reference refers to a CDMA (“Code Division Multiple Access”)-based cellular standard (IS-95), which it indicates “may” be the interface between the mobile unit and the moveable base. Ex. 1001, 6:60. As discussed *supra*, this description in the specification, making use of a cellular standard optional, does not support Patent Owner’s argument that the patent “explicitly and exclusively relates to improving the wireless connections of mobile devices within cellular telephone systems.”

The other quotations from the specification cited by Patent Owner are merely general references to cellular systems and do not support Patent Owner’s argument. The ’701 patent specification, in fact, supports Petitioner’s argument that communications between the mobile unit and the mobile base station are not required to follow cellular protocols. Thus, as discussed *supra*, the ’701 patent states the interface between the mobile units and the mobile base station “is a standard radio interface.” Ex. 1001, 6:37–39. And, as just discussed, the patent explains that this interface “may” follow the cellular protocol IS-95, indicating that it is not required it to do so. *Id.* at 6:59–60; *cf.* PO Sur-reply 9.

⁹ This citation is incorrect. The quote appears at Ex. 1001, 6:59–61.

Moreover, this argument focusing on the “cellular infrastructure” does not address the fact that the challenged claims are directed to the mobile base station. *See* discussion *supra*. The fact that in some alternative embodiments, the mobile unit may be able to communicate with the cellular network, does not erase the fact that the challenged claims and the stated objectives of the ’701 patent, i.e., to provide a mobile base station as an intermediary between the mobile units and the cellular network, do not require direct communication.

Patent Owner relies on “Federal Circuit precedent [that] forbids an overly broad interpretation of the claims.” PO Sur-reply 6–7 (citing *Pacing Techs., LLC v. Garmin Int’l, Inc.*, 778 F.3d 1021, 1025 (Fed. Cir. 2015)). In *Pacing Technologies*, the Federal Circuit found evidence of “a clear and unmistakable statement of disavowal or disclaimer” in the stated objects of the invention, including a statement that the objects would be accomplished by the particular feature (a “repetitive motion pacing system”) to which the Court limited the claims. 778 F.3d at 1025. Here, in contrast, for the reasons discussed above, there is no corresponding “clear and unmistakable statement” limiting the scope of the mobile unit to “a device that must register with and be able to directly communicate with the cellular network.” *Cf.* PO Resp. 13. *Pacing Technologies*, therefore, does not support Patent Owner’ argument. “To disavow claim scope, the specification must contain ‘expressions of manifest exclusion or restriction, representing a clear disavowal of claim scope.’” *Retractable Techs., Inc. v. Becton, Dickinson & Co.*, 653 F.3d 1296, 1306 (Fed. Cir. 2011) (quoting *Epistar v. Int’l Trade Comm’n*, 566 F.3d 1321, 1335 (Fed. Cir. 2009)); *SciMed Life Sys., Inc. v. Advanced Cardiovascular Sys., Inc.*, 242 F.3d 1337, 1341 (Fed. Cir. 2001) (“Where the specification makes clear that the invention does not include a

particular feature, that feature is deemed to be outside the reach of the claims of the patent, even though the language of the claims, read without reference to the specification, might be considered broad enough to encompass the feature in question.”). As discussed above, the ’701 patent claims are directed to the mobile base station communicating with the cellular network, and the specification describes an embodiment which prevents the mobile unit from communicating with the fixed ports. Ex. 1001, 3:20–35; *see also* discussion *supra*. We find that there was no “disavowal or disclaimer” of mobile units that do not communicate directly with a cellular system.

Patent Owner argues further that “it is well established that ‘when the scope of the invention is clearly stated in the specification, and is described as the advantage and distinction of the invention, it is not necessary to disavow explicitly a different scope.’” PO Sur-reply 8 (quoting *On Demand Mach. Corp. v. Ingram Indus.*, 442 F.3d 1331, 1340 (Fed. Cir. 2006)). Patent Owner explains: “The Federal Circuit’s analysis in *On Demand* is similar to the Patent Owner’s claim construction.” *Id.* We disagree. As Patent Owner’s quotation from *On Demand* makes clear, it is not necessary to find an explicit disavowal “when the scope of the invention is clearly stated in the specification, and is described as the advantage and distinction of the invention.” 442 F.3d at 1340 (quoted at PO Sur-reply 8). However, in our analysis above of Patent Owner’s position, we find that the scope of the invention and its advantages as described in the ’701 patent center on the mobile base station, not the mobile device. The ’701 patent specification, therefore, does not favor Patent Owner’s narrow construction of “mobile device.” Thus, *On Demand*’s exception to the normal requirement for an explicit disavowal is not applicable here.

We are not persuaded by Patent Owner's explanation that "the movable base station addressed the handoff problems and data bandwidth constraints of conventional consumer cellular networks in 1995." PO Sur-reply 11 (footnote omitted). There is no dispute that improving cellular technology is included among the goals described in the '701 patent. But Patent Owner acknowledges that the claims require that the movable base station, not the mobile device, be able to communicate directly with the cellular network:

However, the claims of the '701 Patent require the apparatus or movable base station to communicate directly with the cellular network since it is directed towards improving the wireless connections of mobile devices within cellular telephone systems via a movable base station that is interposed between the mobile devices and the base stations of a cellular network.

Id.; see also discussion *supra*. Patent Owner therefore fails to support its argument that the '701 patent "explicitly and exclusively relates to improving the wireless connections of mobile devices within 'cellular telephone systems.'" PO Sur-reply 8 (emphasis omitted). We find, based on the analysis above, that the claims, specification, and prosecution history of the '701 patent reveal a broader goal of also improving wireless communications involving non-cellular devices, such as radios and telephones.

Nor are we persuaded by Patent Owner's suggestion that the patent specification requires the mobile device to "register with the cellular network." PO Resp. 7. Such a registration requirement is not supported by the claims or prosecution history.

We note that the challenged claims do not call for registration. Registration of a mobile unit with a base station is mentioned in the '701

patent specification (*see* PO Resp. 15, PO Sur-reply 7), but the registration process described there occurs only “[w]hen a mobile unit set is first powered up or first enters a service area,” and involves the mobile device transmitting its address to the moving base station, not the fixed base stations. Ex. 1001, 9:52– 54 (“The address will be received by the closest moving base station 30 and transmitted . . . to the telephone network”). We find that in this description, it is the moving base station, rather than the mobile unit, that handles the registration process with the fixed base station, as well as subsequent hand-offs. And the transmission of an address by the mobile unit to the moving base station during start-up uses the generic “standard radio interface” described in the specification. Ex. 1001, 6:37–39.

However, even if the specification were to include an embodiment describing registration by the mobile device, that would not alter the fact that the claims are directed to a mobile base station that communicates directly with the cellular network and a mobile device that communicates directly with the mobile base station through a “standard radio interface,” but not directly with that cellular network. Thus, the patentability of the claimed apparatus (the mobile base station) does not turn on alleged ability of the mobile device to communicate directly with the cellular network, or any other network or device for that matter.

In summary, having considered all the arguments and evidence presented on this issue, we find that Patent Owner’s proposed construction for “mobile device” is not supported by the claim language of the ’701 patent or the other intrinsic evidence, and, therefore, we do not adopt a construction that would limit “mobile device” to cellular phones or other devices “that must register with and be able to directly communicate with the cellular network,” and that would exclude conventional cordless phones.

We agree, therefore, with Petitioner’s reasoning that no construction of “mobile device” is necessary. Pet. 11; Pet. Reply 6.

5. *Other Terms*

Patent Owner proposes that the plain and ordinary meaning of “automotive vehicle,” a term appearing in claim 18, is an automobile. PO Resp. 16. Further, according to Patent Owner, “an ‘automotive vehicle’ travels along a roadway.” *Id.* at 17. Petitioner contends that no construction is necessary for this term. Pet. Reply 7. We find that no construction is necessary to resolve a controversy, as the challenges based on Ito, discussed *infra*, disclose this limitation even under Patent Owner’s construction.

As noted *supra*, Petitioner contends: “Based on the district court’s constructions of ‘fixed port’ and ‘base station,’ a [person of ordinary skill] would understand that disclosure of a cellular base station satisfies both claim terms.” Pet. 8. Patent Owner points out the term “cellular base station” is not used in challenged claims, and therefore no construction is necessary. PO Resp. 18. We agree that no construction of this term is necessary to resolve a controversy.

We do not find it necessary to construe any other terms. Pet. Reply 7.

C. *Description of Prior Art References*

Petitioner’s challenge relies on Ito, Gilhousen761, Gilhousen501, Adachi, and Jakes. *See* Pet. 10. Because our Decision relies on Ito, Gilhousen501, Adachi, and Jakes, we provide the following description of those references

1. *Ito (Exhibit 1003)*

Ito is a patent titled “Mobile Radio Communication System Having Mobile Base and Portable Devices as a Mobile Station.” Ex. 1003, (54). Ito

relates to a cellular-type automobile telephone system that has been known as a mobile radio communication system. *Id.* at 1:15–16.

As described in Ito, in known cellular mobile radio telephone systems, the mobile stations are connected by a radio channel to a base station for the radio communication zone where it is currently located. *Id.* at 1:22–24. The mobile stations are further connected to a wire telephone network by way of the base station and a control station. *Id.* at 1:24–26.

The automobile telephone main unit and the handset assembly are connected by a signal cord. The cradle and the handset are connected by a curled cord. *Id.* at 1:51–54. According to Ito, “[w]ith such an arrangement, the curled cord can constitutes [sic] an annoying obstacle when the driver drives and speaks into the telephone transmitter simultaneously. Moreover, the handset cannot be moved away beyond a limit posed by the curled wire” *Id.* at 1:55–59.

Thus, Ito describes a mobile radio communication system that wirelessly connects a mobile station, or a mobile base device, and a portable device by a radio channel, in order to eliminate the necessity of wiring the mobile base device and portable telephone device together, increasing the maneuverability of the telephone handset. *Id.* at 2:5–12.

This is illustrated by Figure 6 of Ito, reproduced below.

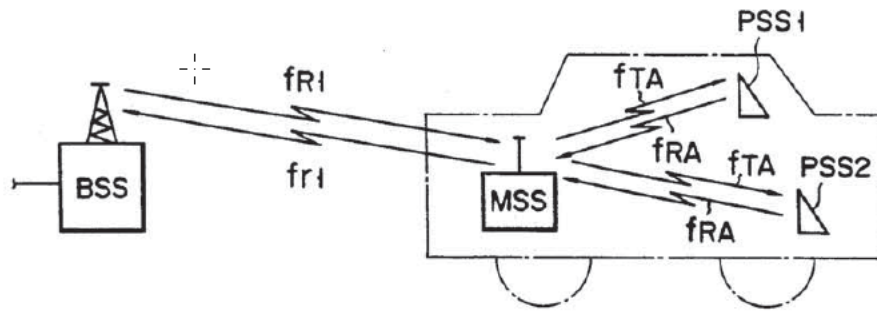


FIG. 6

Figure 6 of Ito depicts a mobile radio communication system. *Id.* at 5:16–18.

In Figure 6 of Ito, mobile base device MSS is wirelessly connected simultaneously with two portable devices PSS1 and PSS2. Ex. 1003, 12:52–56. Base station BSS2 and mobile base device MSS communicate with each other by way of radio frequencies f_{T1} and f_{R1} .¹⁰ *Id.* at 12:57–63. Mobile base device MSS and portable devices PSS1 and PSS2 communicate with each other by way of radio frequencies f_{TA} and f_{RA} . *Id.*

As described by Ito, referring to Figure 3, mobile base device MSS has two transmitter-receiver units. *Id.* at 7:9–12. The first transmitter-receiver unit is used for radio communication with base station BSS by way of a first radio channel. The second transmitter-receiver unit is used for radio communication with its portable devices PSS by way of a second radio channel. *Id.* at 7:12–17.

Further, Ito describes that high speed fading phenomena causes errors in signals. *Id.* at 16:59–60. The rate of errors in signals due to the high speed fading phenomena is increased due to the distance of a signal's

¹⁰ Figure 6 of Ito mislabels f_{T1} as f_{r1} and BSS2 as BSS. See Ex. 1003, 12:57–63.

communication path. *See id.* at 16:56–61. In particular, Ito describes that the communication path between the mobile base device MSS and the portable device PSS is shorter and, therefore, has a smaller rate of errors, than the communication path between the mobile base device MSS and the base station BSS. *Id.*

The embodiment described in Ito makes use of TDMA (Time Division Multiple Access) and FDMA (Frequency Division Multiple Access) techniques for communications between the base station BSS and mobile base device MSS and between the mobile base device and the portable device PSS. *Id.* at 5:47–50.

2. *Gilhousen501 (Ex. 1004)*

Gilhousen501 is a patent titled “Method and System for Providing a Soft Handoff in Communications in a CDMA Cellular Telephone System.” Ex. 1004, (54). Gilhousen501 describes a “soft” handoff scheme, employed for a CDMA cellular telephone system in which a new cell-site modem is assigned to a mobile unit while the old cell-site continues to service the call. *Id.* at 3:9–12. When the mobile unit is located in the transition region between the two cell-sites, the call can be switched back and forth between cell-sites as signal strength dictates. *Id.* at 3:12–15. When mobile unit communications are firmly established with the new cell-site, e.g., the mobile unit is well within the new cell, the old cell-site discontinues servicing the call. *Id.* at 3:19–22. Gilhousen501 describes this “soft” handoff as a “make-before-break switching function,” in contrast to previous cellular telephone systems which used a “break-before-make switching function.” *Id.* at 3:24–28.

Figure 1 of Gilhousen501, reproduced below, depicts a schematic overview of an exemplary CDMA cellular telephone system. *Id.* at 7:1–3.

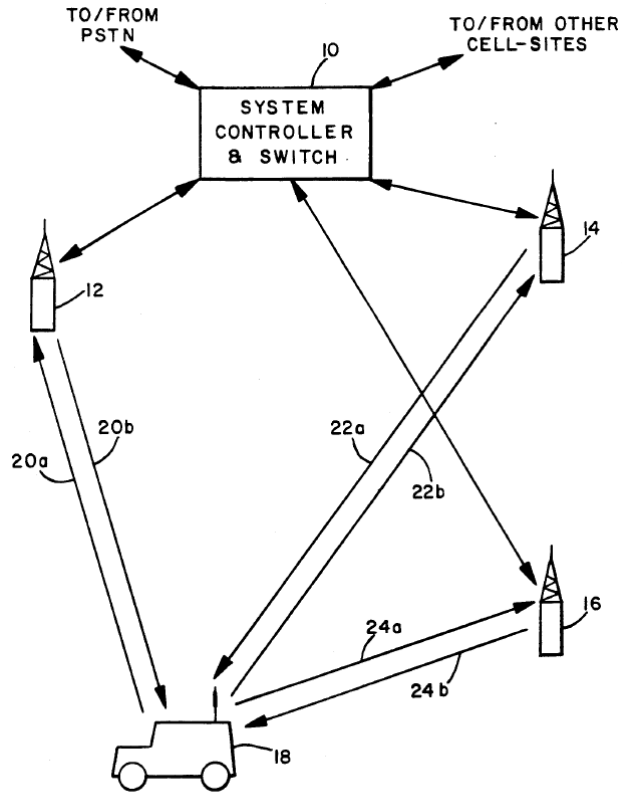


FIG. 1

Figure 1 of Gilhousen501 depicts a CDMA cellular telephone system.

Gilhousen501 explains that in a CDMA cellular telephone system, the same frequency band is used for all cells. *Id.* at 2:58–59. Gilhousen501 further describes that:

In the CDMA cellular telephone system, each cell site transmits a “pilot carrier” signal. This pilot signal is used by the mobile units to obtain initial system synchronization and to provide robust time, frequency and phase tracking of the cell-site transmitted signals.

Each cell-site also transmits a “setup” channel comprised of spread spectrum modulated information, such as cell-site identification, system timing, mobile paging information and various other control signals.

Id. at 3:45–53. When the mobile unit identifies the appropriate setup code for a given cell-site, system information is received and processed. *Id.* at

4:10–12. The mobile unit further monitors the setup channel for control messages, such as messages indicating that a call is waiting for transfer to the mobile unit. *Id.* at 4:12–15.

3. *Adachi (Exhibit 1031)*

Adachi is a patent titled “Receiver and Repeater for Spread Spectrum Communications.” Ex. 1031, (54). Adachi discloses a “repeater improving the effect of a RAKE reception.” *Id.* at Abstract. Figure 2 of Adachi is reproduced below.

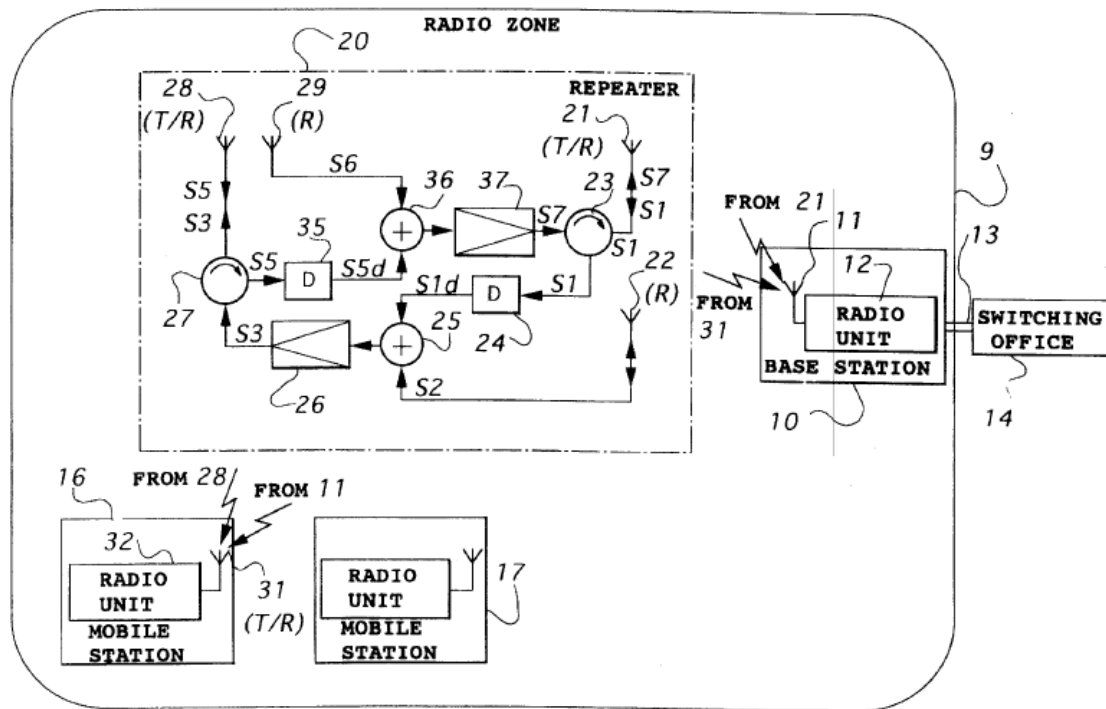


FIG. 2

Figure 2 is a block diagram showing an embodiment of a spread-spectrum communication repeater. Ex. 1031, 5:51–53.

Base station 10 carries out CDMA communications with mobile stations 16 and 17. *Id.* at 6:5–7. Repeater 20 has two antennas 21, 22 for the base station and two antennas 28, 29 for the mobile stations 16. *Id.* at 6:13–16.

Signals from base station 10 are received by repeater 20 by antennas 21 and 22. *Id.* at 6:16–18. The signals are combined, amplified, and sent to mobile stations 16 via antenna 28. *Id.* at 6:26–30. Antenna 31 of the mobile station 16 receives the signal from repeater 20. *Id.* at 6:35–37. In the reverse direction, signals from the mobile station 16 are received at the repeater’s antennas 28 and 29, and are combined, amplified, and retransmitted to base station 16. *Id.* at 6:49–67.

5. *Jakes (Exhibit 1032)*

Jakes is a journal article discussing the use of space diversity system techniques for reducing rapid fading in mobile communication systems. Ex. 1032, Abstract. Jakes describes using multiple spatially separated antennas to improve communications between a base station and mobile subscriber. *See, e.g.*, Figs. 1, 3.

III. ANALYSIS OF THE CHALLENGED CLAIMS

A. *Obviousness*

A claim is unpatentable under 35 U.S.C. § 103(a) if the differences between the claimed subject matter and the prior art are such that the subject matter, as a whole, would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. *KSR Int’l Co. v. Teleflex Inc.*, 550 U.S. 398, 406 (2007). The question of obviousness is resolved on the basis of underlying factual determinations, including: (1) the scope and content of the prior art; (2) any differences between the claimed subject matter and the prior art; (3) the level of skill in the art; and (4) where in evidence, so-called “secondary considerations,” including commercial success, long-felt but unsolved needs, failure of others, and unexpected results. *Graham v. John Deere Co.*, 383 U.S. 1, 17–18 (1966) (“the *Graham* factors”). Neither the Petitioner nor the

Patent Owner presents evidence on the fourth *Graham* factor. We therefore do not consider that factor in this Decision.

*B. Challenge to Claims 10, 16–18, 31, 34, and 35
Based on Ito, Gilhousen501, and Adachi*

Petitioner contends these claims would have been obvious over the combination of Ito, Gilhousen501, and Adachi. Pet. 34–50. Petitioner supports this assertion with testimony from Mr. Fischer. Fischer Decl. ¶¶ 123–160.

Petitioner asserts that a person of ordinary skill would have been motivated to combine these references with a reasonable expectation of success. Pet. 34–43; Fischer Decl. ¶¶ 161–167. Petitioner contends that a person of ordinary “would have been motivated to modify Ito to use the CDMA ‘soft-handoff’ techniques disclosed in Gilhousen501 because CDMA technology solves many known problems with FDMA-based systems, such as Ito.” Pet. 35 (citing Fischer Decl. ¶ 124). Petitioner presents testimony from Mr. Fischer that a person of ordinary skill “would have readily understood that CDMA offers significant advantages over FDMA, *e.g.*, improving the quality of a call connection and reducing dropped calls.” *Id.* at 34–35 (citing Fisher Decl. ¶ 123). Petitioner asserts also that a person of ordinary skill “would have been motivated to incorporate Adachi’s spatially separated antennas with the circuitry disclosed in Gilhousen501 such that signals received by Adachi’s antennas would be processed using Gilhousen501’s ‘soft-handoff’ technique.” Pet. 41–42; Fischer Decl. ¶ 138.

Petitioner argues that in making the Ito-Gilhousen501 combination, a person of ordinary skill would have had a reasonable expectation of success. Pet. 40–41. Supported by testimony from Mr. Fischer, Petitioner contends

“[i]ncorporating the functionality of Gilhousen501 into Ito would have been a routine modification.” *Id.* at 41; Fischer Decl. ¶ 136.

Similarly, Petitioner demonstrates there would have been a motivation to combine Adachi’s spatially separated antennas and Gilshosen501’s “soft handoff” circuitry in Ito’s system with a reasonable expectation of success. Pet. 42–43; Fischer Decl. ¶ 141.

1. Independent Claim 10

Petitioner presents an element-by-element analysis of independent claim 10 in relation to Ito, Gilhousen501, and Adachi. Pet. 43–48. Petitioner supports its analysis with testimony from Mr. Fischer. Fischer Decl. ¶¶ 142–151. As we discuss, Petitioner demonstrates that each element of claim 10 is disclosed or suggested by Ito, Gilhousen501, and Adachi.

a. Preamble and Element 10a (“plurality of . . . antennas”)

Petitioner identifies mobile device MSS in Ito as the “moveable base station” in the preamble of claim 10. Pet. 43 (citing Ex. 1003, Figs. 1, 3). Petitioner asserts that in Ito, “[t]he MSS and car move relative to Earth when the car is in motion.” *Id.* at 44 (citing Fischer Decl. ¶ 142). Patent Owner does not challenge this analysis.

Similarly, Petitioner identifies the “plurality of spatially separated antennas” recited in the claim (element 10a) with Adachi’s multiple antennas. *Id.*; Fischer Decl. ¶ 143. Patent Owner does not challenge this analysis, but does challenge the motivation to combine these references. *See infra.*

b. Element 10b (“receiver”)

Petitioner relies on the combination of Ito, Gilhousen501, and Adachi to meet the limitation (element 10b) of “a receiver configured to receive fixed port signals from a fixed port through a plurality of spatially separated

antennas.” *Id.* at 44–46. Petitioner refers to annotated Figure 3 of Ito, following:

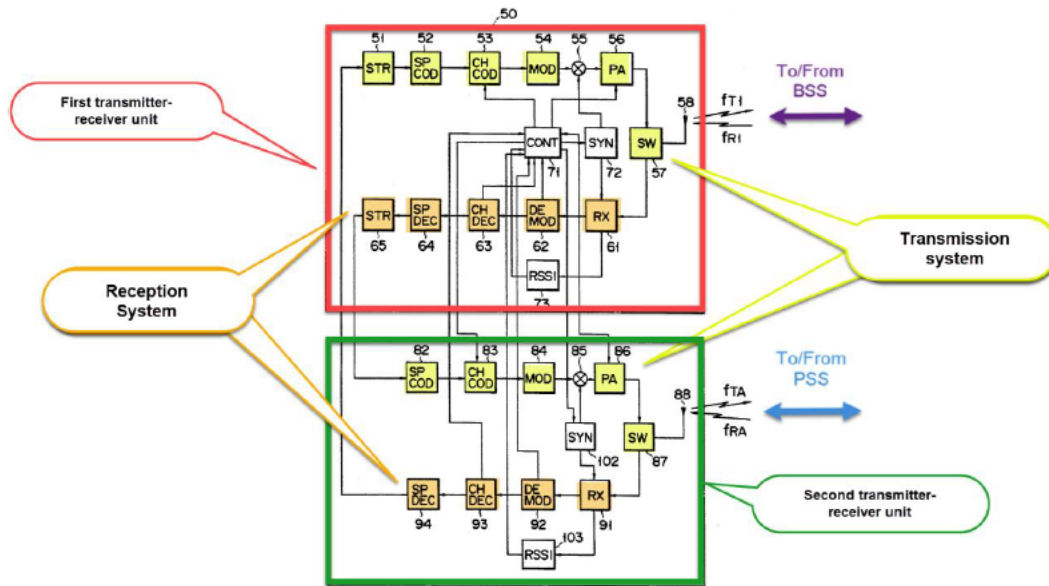


FIG. 3

Annotated Figure 3 of Ito is a block diagram of a mobile base device. Ex. 1003, 3:10–11.

Pet. 45. Figure 3 shows the structure of Ito’s MSS. Ex. 1003, 7:9–12.

Using this figure, Petitioner identifies the claimed receivers and transmitters communicating with the base station BSS and the portable device PSS by color: “Each transmitter-receiver unit includes a transmission system (yellow) and a reception system (orange) that comprise various components related to speech encoding, signal modulation, and power amplification.”

Pet. 45; Fischer Decl. ¶ 145. Mr. Fischer testifies: “As shown in Figure 3, the first transmitter-receiver unit 50 wirelessly communicates with base station BSS (fixed port).” *Id.* at ¶ 146.

Petitioner relies also on Adachi’s teaching of a plurality of spatially separated antennas. Pet. 46. Petitioner explains that “[i]n the modified system of Ito with the CDMA system of Gilhousen501 and the plurality of antennas from Adachi’s repeater, . . . signals from Gilhousen501’s base

station are received through the plurality of spatially separated antennas of Adachi.” *Id.* (citing Fischer Decl. ¶ 147).

Petitioner asserts a person of ordinary skill “would have been motivated to implement Adachi’s spatially separated antennas to Ito’s first transmitter-receiver unit for the same reasons as with respect to the second transmitter-receiver unit: to reduce the effects of fading and promote high-quality communications.” *Id.* at 46 (citing Fischer Decl. ¶ 147).

c. Element 10c (“controller”)

Petitioner asserts that Gilhousen501 discloses “a controller configured to align and combine the received fixed port signals” as recited in claim element 10c. *Id.* at 46–47. Petitioner explains that Gilhousen501 “discloses that its processor uses ‘diversity combining’ to combine a group of two or more signals transmitted from a plurality of fixed radio ports.” Pet. 31–32 (citing Ex. 1004, 5:22–6:35).

Petitioner shows that Gilhousen501 also meets the requirement of the claim to “align and combine” the received signals. Pet. 32–33. According to Petitioner, in an embodiment of Gilhousen501 having two receivers, “[b]oth receiver systems perform similar processing on the received signals and transmit them to combiner and decoder circuitry 80.” *Id.* at 32 (citing Ex. 1004, 11:61–63, 12:45–47 (first receiver), 12:48–52 (second receiver). Petitioner explains that “[a person of ordinary skill would recognize that diversity combiner and decoder circuitry 80 [in Gilhousen501] would also ‘adjust the timing of the two streams of received signals into alignment and add[] them together.’” Pet. 33 (citing Ex. 1004, 10:28–31) (alteration in original); Fischer Decl. ¶ 118).

Further, Petitioner asserts “[a person of ordinary skill] would also be motivated to incorporate Gilhousen501’s mobile unit embodiment having

two receivers to take advantage of the diversity combining functionality described above.” Pet. 33 (citing Fischer Decl. ¶ 119).

d. Element 10d (“transmitter”)

Petitioner relies on Ito’s MSS to meet the limitation (element 10d) of “a transmitter configured to transmit radio frequency signals to a mobile device corresponding to the received fixed port signals.” *Id.* at 47–48; Fischer Decl. ¶¶ 150–151. Referring again to the annotated Figure 3 of Ito, illustrating the MSS, Petitioner explains: “Ito transmits a received call from the base station BSS to the mobile user PSS via transmitter-receiver 80.” Pet. 48 (citing Ex. 1003, 8:27–9:61); Fischer Decl. ¶ 151.

e. Discussion

As noted, Patent Owner does not challenge Petitioner’s analysis of the preamble or claim element 10a. We find that for the reasons given by Petitioner, Ito, Gilhousen501, and Adachi disclose those elements.¹¹

Patent Owner challenges Petitioner’s analysis of “controller” claim element 10c. Patent Owner contends that “the limitation of Claim 10 is not directed towards the controller of the mobile unit or the controller of the cell-site, as Petitioner proposes.” PO Resp. 54. Patent Owner contends the limitation “requires the controller of the moving base station to be ‘configured to align and combine the received fixed port signals.’” *Id.* (emphasis omitted). Patent Owner continues: “Critically, *Gilhousen501* does not disclose any moving base station of any type, let alone a moving base station comprised of ‘a controller configured to align and combine the received fixed port signals.’” *Id.* (citing Lanning Decl. ¶¶ 222–223).

¹¹ Because we determine that the preamble’s “moveable base station” is disclosed by the cited references, we do not express a view on whether the preamble is limiting.

Patent Owner makes similar arguments for Ito and Adachi: “[N]either *Ito* nor *Adachi* disclose any type of moving base station comprised of a controller configured to align and combine the received fixed port signals”, as required by Claim 10.” *Id.* at 56 (citing Lanning Decl. ¶ 225).

We are not persuaded by these arguments. Petitioner relies on Ito’s MSS to meet the requirement of the claims for a moving base station. *See* Pet. 43–44 and discussion of claim 10 preamble, *supra*. Petitioner relies on Gilhousen501 for its disclosure of the claimed controller. Pet. 46–47. Petitioner relies on Adachi for its teaching of multiple antennas. *Id.* at 44. Patent Owner’s arguments that Gilhousen501 and Adachi fail to disclose a moving base station with a controller do not address Petitioner’s contentions, which also rely on Ito’s MSS in combination with Gilhousen501 and Adachi. Thus, Petitioner’s argument is not persuasive because it addresses these references separately, but not the combination. We find that for the reasons given by Petitioner and summarized above, “controller” claim element 10c is disclosed by Ito, Gilhousen501, and Adachi.

For “transmitter” claim element 10d, Patent Owner contends that Ito, Gilhousen501, and Adachi fail to disclose a mobile device. PO Resp. 56–58. This argument is based on Patent Owner’s construction of mobile device as requiring registration and direct communication with the cellular network. *Id.* at 57 (“While *Ito* does disclose a portable device (PSS), this portable device does not register with or directly communicate with the cellular network as required for a ‘mobile device’ in the context of the entire ’904 [sic] Patent.”). For reasons discussed *supra*, Section II.B.4, we do not accept Patent Owner’s construction of mobile device because it is not supported by the language of the claims or the other intrinsic evidence before us.

Nor do we agree with Patent Owner's argument that Ito's portable device PSS is "similar to a cordless phone," and therefore not a mobile device. PO Resp. 57. We find that cordless telephones such as Ito's are not excluded from the scope of the claims for the reasons given *supra*. Because we have not adopted Patent Owner's claim construction, we are not persuaded by these arguments and find, therefore, that Ito's portable device PSS meets the requirement of claim 10 for a mobile device, for the reasons given by Petitioner and summarized *supra*. See Pet. 43–44; Pet. Reply 1–7; Fischer Decl. ¶ 142; Fischer Reply Decl. ¶¶ 4–10. Furthermore, Ito's PSS and MSS operate in a cellular system. Ex. 1003, 1:15–16, 5:31–33. Therefore, Ito's "cordless telephone" is not a "cordless phone" in the sense that Patent Owner describes, where "the base is connected to a fixed telephone line." See PO Resp. 6. Thus, Patent Owner's arguments that Ito's PSS is not a mobile device are unpersuasive for this reason as well.

Still referring to element 10d, Patent Owner contends Petitioner fails to show the references disclose a "transmitter configured to transmit radio frequency signals to a mobile device corresponding to the received fixed port signals." PO Resp. 58–59. Patent Owner asserts: "*Gilhousen501* only discloses a direct communication between its single mobile unit (18) and one or more cell-sites (i.e., fixed base stations) (12, 14, and 16)" *Id.* at 58. Similarly, Patent Owner argues that "*Adachi* only discloses a stationary repeater in a communication system that is used to boost weak spread spectrum (CDMA) signals between a base station and one or more mobile stations (i.e., mobile devices)." *Id.* at 59.

We are not persuaded by these arguments. This is another instance of an argument by Patent Owner that does not respond to Petitioner's contentions. Petitioner relies on Ito (not *Gilhousen501* or *Adachi*) for the

disclosure of a mobile base station (MSS) that communicates directly with a mobile device (PSS). *See* Pet. 43; Fischer Decl. ¶ 142. Patent Owner’s arguments, based on Gilhousen501, alone, or Adachi, alone, are not responsive to Petitioner’s contentions based on the combination of those references with Ito.

f. Motivation to Combine

Patent Owner contends that the Petition “is fatally deficient.” PO Resp. 23–30. According to Patent Owner: “A proper obviousness combination requires the Petitioner to “explain how specific references could be combined.” *Id.* at 23 (citing *ActiveVideo Networks, Inc. v. Verizon Commc’ns, Inc.*, 694 F.3d 1312, 1327-28 (Fed. Cir. 2012)). Specifically, as to Ito and Gilhousen501, Patent Owner contends the Petition fails to explain or address several questions, including “how a [person of ordinary skill] would combine Gilhousen501’s CDMA modulation techniques, CDMA soft-handoff circuitry, and CDMA diversity combiner circuitry with that of Ito’s FDMA/TDMA system;” or “how to combine Adachi’s spatially separated antennas—designed for a CDMA system—with that of Ito’s FDMA/TDMA system.” PO Resp. 24–25 (emphasis omitted); *see also id.* at 38–42.

In addition, Patent Owner contends “*Ito*’s FDMA/TDMA system is not compatible with CDMA systems.” PO Resp. 26; PO Sur-reply 25–27. Patent Owner asserts, “*Ito* explicitly teaches away from utilizing CDMA techniques.” PO Resp. 38. And Patent Owner states that “*Ito*’s FDMA/TDMA system is not capable of utilizing CDMA modulation techniques or even transmitting CDMA signals without replacing *Ito*’s current FDMA/TDMA circuitry with entirely new CDMA circuitry.” *Id.* Mr. Lanning testifies that “these compatibility issues would prohibit *Ito*’s

mobile base stations (MSS) from receiving or transmitting CDMA signals and would further prohibit *Ito*’s pre-existing base stations (BSS) from transmitting or receiving CDMA signals.” Lanning Decl. ¶ 175.

We are not persuaded by these arguments. Our reasoning follows.

Patent Owner cites *KSR* as requiring the Board to consider the motivation to combine in determining obviousness. PO Sur-reply 22. But the Federal Circuit has emphasized that in analyzing obviousness, *KSR* assumes that the person of ordinary skill “is not an automaton”:

KSR does not require that a combination only unite old elements without changing their respective functions. Instead, *KSR* teaches that “[a] person of ordinary skill is also a person of ordinary creativity, not an automaton.” And it explains that the ordinary artisan recognizes “that familiar items may have obvious uses beyond their primary purposes, and in many cases a person of ordinary skill will be able to fit the teachings of multiple patents together like pieces of a puzzle.”

ClassCo, Inc. v. Apple, Inc., 838 F.3d 1214, 1219 (Fed. Cir. 2016) (citations omitted, alteration in original)). The Federal Circuit has further cautioned, in *ClassCo*, against a rigid approach to determining obviousness, stating that “the rationale of *KSR* does not support [the] theory that a person of ordinary skill can only perform combinations of a puzzle element A with a perfectly fitting puzzle element B.” *Id.*

We disagree with Patent Owner’s assertion that Petitioner has failed to demonstrate a motivation to combine the teachings of *Ito* and *Gilhousen*⁵⁰¹ with a reasonable expectation of success. We find that Petitioner has provided persuasive evidence of such a rationale and expectation. Pet. 34–43; Fischer Decl. ¶¶ 123–141; *see* discussion *supra*. Mr. Lanning testifies that CDMA was a “breakthrough technology.” Lanning Decl. ¶ 149. (heading). Given the high level of ordinary skill in the pertinent art before

us, we find that a person having such ordinary skill (an experienced wireless communications systems engineer “familiar with cellular communication technology”) would have readily recognized that combining Ito with Gilhousen501’s teachings of CDMA technology would have had the advantages identified by Petitioner and summarized *supra*. See also Pet. 34–40; Fischer Decl. ¶¶ 123–134.

Moreover, we find that such a highly skilled person would have been able to combine the teachings of those references using known technology, with a reasonable expectation of success. Fischer Decl. ¶ 135 (“Starting with Ito, a [person of ordinary skill] familiar with wireless technology such as CDMA would have naturally sought to implement Ito using CDMA, which allows the improvement of Gilhousen501’s soft handoff, instead of Ito’s FDMA, and to do so would have required only the application of ordinary skill.”). Mr. Fischer continues: “When designing the system described in Ito, a [person of ordinary skill] would have naturally implemented known and commercially available radio communication components with the mobile base station and base station in the Ito system.” *Id.*

This conclusion is further supported by Mr. Lanning’s testimony that the hardware and software necessary to convert a base station, such as in Ito, to CDMA were available from Motorola during the relevant time period. Pet. Reply 20–21; Lanning I Dep. 42:23–43:22. We find that this modification would have been a substitution of known techniques of communications, using available hardware and software, with a reasonable expectation of success. Fischer Decl. ¶¶ 135–137.

We have considered Patent Owner’s arguments and find them not persuasive. As Petitioner points out, Patent Owner’s incompatibility

argument is flawed because it assumes the bodily incorporation of “unmodified CDMA components from Gilhousen501 into Ito’s *unmodified* system.” Pet. Reply 19. We agree that Patent Owner’s approach is flawed. “[T]he test for obviousness is not whether the features of a secondary reference may be bodily incorporated into the structure of the primary reference; nor is it that the claimed invention must be expressly suggested in any one or all of the references. Rather, the test is what the combined teachings of the references would have suggested to those of ordinary skill in the art.” *MCM Portfolio LLC v. Hewlett-Packard Co.*, 812 F.3d 1284, 1294 (Fed. Cir. 2015) (quoting *In re Keller*, 642 F.2d 413, 425 (CCPA 1981); see also *In re Sneed*, 710 F.2d 1544, 1550 (Fed. Cir. 1983) (“[I]t is not necessary that the inventions of the references be physically combinable to render obvious the invention under review.”); *In re Nievelt*, 482 F.2d 965, 968 (CCPA 1973) (“Combining the *teachings* of references does not involve an ability to combine their specific structures.”)).

We are not persuaded by the testimony of Patent Owner’s expert, Mr. Lanning, on this issue. Cf. Lanning Decl. ¶¶ 139–164. His testimony mirrors arguments in Patent Owner’s Response about the combination of Ito and Gilhousen501 resulting in “incompatible systems,” and requiring additional “design and circuitry details.” See *id.* ¶¶ 124, 173, 178; PO Resp. 21, 25. As discussed *supra*, we find that those arguments are unpersuasive and contrary to *KSR*, and Mr. Lanning’s testimony is similarly unpersuasive.

We have considered Patent Owner’s additional arguments and find them no more persuasive. For example, Patent Owner argues repeatedly that Petitioner’s rationale for combining Ito and Gilhousen501 and other references relied on by Petitioner, and the supporting testimony from Mr. Fischer, are “conclusory.” PO Resp. 1, 23, 24, 27; PO Sur-reply 15. We

disagree. We find that Petitioner’s explanation of the rationale for combining the teachings of the references and Mr. Fischer’s supporting testimony, summarized *supra*, are persuasive for the reasons given above.

Nor do we agree with Patent Owner’s argument that the Petition is “fatally deficient” because it does not explain “in sufficient detail” how to combine Ito and Gilhousen⁵⁰¹ (and other references). PO Resp. 23–25. According to the ’701 patent, the invention uses “well-known” equipment and functions. *See, e.g.*, Ex. 1001, 4:26, 5:3–4; 5:20, 5:47, 5:59, 6:10, 6:21, 6:36, 6:39, 6:48, 9:5, 9:18, 9:47. CDMA was a well-known technique at the time of the alleged invention. Fischer Decl. ¶ 127 (citing Ex. 1026, 50 (stating that CDMA was “[c]ommercially introduced in 1995”)). We are persuaded that a more detailed explanation of how to combine such well-known equipment and techniques is not required. *See id.* ¶ 135 (“Starting with Ito, a [person of ordinary skill] familiar with wireless technology such as CDMA would have naturally sought to implement Ito using CDMA, . . . and to do so would have required only the application of ordinary skill.”). Mr. Fischer provided additional details at his deposition. Fischer I Dep. 89:11–91:17.¹² Moreover, Mr. Lanning’s testimony establishes that the necessary hardware and software for the transition was available from Motorola. Lanning I Dep. 42:23–43:22; *see discussion supra*.

Nor do we agree that “*Ito* explicitly teaches away from utilizing CDMA techniques.” PO Resp. 38. A reference may be said to teach away when a person of ordinary skill, upon reading the reference, would be discouraged from following the path set out in the reference, or would be led in a direction divergent from the path that was taken by the applicant. *In re*

¹² Our citations to this transcript refer to the original page numbers.

Gurley, 27 F.3d 551, 553 (Fed. Cir. 1994). The mere fact that Ito chose an alternative technology (FDMA) is not sufficient to teach away from substituting CDMA. *See id.*

We find, therefore, that for these reasons, Petitioner has demonstrated by a preponderance of the evidence, including expert testimony and the references themselves, a motivation to combine the teachings of Ito and Gilhousen501, with a reasonable expectation of success.

Following the same approach, Patent Owner argues that a person of ordinary skill would not have been motivated to combine Adachi's teaching of plural antennas with Ito and Gilhousen501. PO Resp. 40–42. Patent Owner's arguments track those already addressed in connection with combining Ito and Gilhousen501. Thus, Patent Owner argues that "compatibility issues" would arise with Ito's FDMA/TDMA system because Adachi's spatially separated antennas were designed for a CDMA system. *Id.* at 40–41. And Patent Owner argues that a person of ordinary skill would not have been motivated to "mix and match" Adachi's teachings with Ito's mobile base station. *Id.* at 41. With respect to combining Adachi with Gilhousen501, Patent Owner contends "such a combination would have required much new circuitry to result in an operable device." *Id.* at 41.

For the reasons discussed, these arguments overstate the extent of the alleged technical problems and overlook the relatively high level of skill in this art. As Mr. Fischer testifies persuasively, "[a person of ordinary skill] familiar with diversity techniques in wireless communications would have naturally sought to implement Adachi into the Ito-Gilhousen501 combination since the well-known benefits of antenna diversity would have enhanced Ito-Gilhousen501 system's ability to maintain high-quality connections between the mobile devices and base stations." Fischer Decl.

¶ 141; *see also id.* ¶¶ 103–104 (discussing advantageous use of Adachi’s antenna diversity to “mitigate the effects of multipath and fading”).

Accordingly, for the reasons given, we find that Petitioner has demonstrated that Ito in combination with Gilhousen501 and Adachi discloses or suggests each element of claim 10, and further, that it would have been obvious to combine the teachings of those references as proposed by Petitioner, with a reasonable expectation of success. Based on Petitioner’s analysis, and for the reasons explained above, we find Petitioner has shown by a preponderance of evidence that claim 10 would have been obvious in light of Ito, Gilhousen501, and Adachi.

2. Claims 16–18, 31, 34, and 35

Claims 16, 17, and 18 depend (directly or indirectly) from claim 10 and add various features. For example, claim 16 states “the transmitter [is] further configured to transmit the radio frequency signals within time slots of time-division multiplex channels.” Pet. 48. Petitioner contends this additional feature is disclosed by Ito’s MSS. *Id.* (citing Fischer Decl. ¶ 153). As Petitioner explains, in Ito, “[u]pon receiving a call, the MSS searches for an idle radio frequency and time slot to establish a communications channel.” *Id.* (citing Ex. 1003, 5:55–61). Petitioner further explains: “In the proposed combination, Gilhousen501’s CDMA functionality replaces Ito’s FDMA functionality, *leaving its TDMA functionality intact.*” *Id.* at 49. (emphasis added). Petitioner supports this assertion with testimony from Mr. Fischer. Fischer Decl. ¶ 155.

Similarly, Petitioner contends that the limitations added by claims 17 and 18 are disclosed Ito alone, or by the combination of Ito, Gilhousen501, and Adachi. *Id.* at 49. Claim 17 calls for the movable base station to be “conveyed by a vehicle.” Ex. 1001, 12:22–23. Claim 18 requires an

“automotive vehicle.” *Id.* at 12:24–25. Petitioner shows that Ito discloses this limitation. Pet. 49. Petitioner contends claims 31, 34, and 35 contain limitations similar to claims 10, 17, and 18, and therefore relies on the same prior art disclosures for those claims. *Id.* at 49–50.

Patent Owner does not separately address the limitations added by these claims. PO Resp. 59–60. Based on Petitioner’s analysis, and for the reasons explained above, we find Petitioner has shown by a preponderance of evidence that claims 16–18, 31, 34, and 35 would have been obvious in light of Ito, Gilhousen501, and Adachi.

*C. Challenge to Claims 10, 15–18, 31, and 33– 35
Based on Ito and Jakes*

In a separate challenge, Petitioner contends these claims would have been obvious over the combination of Ito and Jakes. Pet. 50–59. Petitioner supports this assertion with testimony from its expert, Mr. Fischer. Fischer Decl. ¶¶ 161–182.

Petitioner asserts that a person of ordinary skill would have been motivated to combine these references with a reasonable expectation of success. Pet. 50–54; Fischer Decl. ¶¶ 161–176. Referring to its previous discussion of Ito, Petitioner contends that person of ordinary skill “would have been highly motivated to modify Ito’s system to use a plurality of spatially separated antennas.” Pet. 50. Petitioner explains further that “Jakes itself confirms the many advantages of using spatially separated antennas, *e.g.*, reduction of random amplitude fading and random changes in phase, mitigating noise, and improvement of transmission power requirements.” *Id.* Still further, Petitioner contends that “Jakes itself

provides an explicit motivation to modify Ito's system to use Jakes' multiple antennas." *Id.* at 51–52 (citing Ex. 1032, 81).¹³

Petitioner asserts that a person of ordinary skill modifying Ito to use the spatially separated antennas of Jakes would have had a reasonable expectation of success. Pet. 53–54. "As confirmed by Mr. Fischer, this functionality was well-known at the time of the '701 patent and it would have been a routine design choice to include this feature." *Id.* at 53; Fischer Decl. ¶ 167.

1. Claim 10

Petitioner's element-by-element analysis of independent claim 10 in relation to Ito and Jakes appears at pages 54–56 of the Petition. Petitioner supports its analysis with testimony from Mr. Fischer. Fischer Decl. ¶¶ 168–174.

Petitioner demonstrates that each element of claim 10 is disclosed or suggested by Ito and Jakes. Petitioner's analysis follows closely its previous analysis based on combining Ito with Gilhousen501 and Adachi.

Petitioner's analysis of the preamble of claim 10 cites Ito and refers back to its prior analysis of the "moveable base station" based on Ito, Gilhousen501, and Adachi. Pet. 54. *See* discussion *supra*, Section III.B.1.a (identifying Ito's MSS as the moving base station).

Petitioner relies on Jakes to meet the element 10a limitation "a plurality of spatially separated antennas," and on the combination of Ito and Jakes to meet the element 10b limitation of "a receiver configured to receive fixed port signals from a fixed port through a plurality of spatially separated antennas." Pet. 54–55.

¹³ Citations to Jakes refer to the original page numbers.

For element 10b, the “receiver” limitation, Petitioner relies on Ito and Jakes, and refers back to its analysis of this limitation in light of Ito and Aduchi. Pet. 55. Petitioner asserts that “Jakes discloses the ‘spatially separated antennas’ limitations” and that a person of ordinary skill “would have been highly motivated to modify Ito’s system to use a plurality of spatially separated antennas.” *Id.* at 50, 55.

Petitioner demonstrates a motivation to combine these references. Pet. 50–54. Petitioner explains that “Jakes itself confirms the many advantages of using spatially separated antennas, e.g., reduction of random amplitude fading and random changes in phase, mitigating noise, and improvement of transmission power requirements.” *Id.* at 50. Mr. Fischer testifies: [A person of ordinary skill] would have been motivated to combine the spatially separated antennas of Jake[s] with the system of Ito, for example, because Ito has a mobile base device in a car in a cell phone system operating inside the vehicle, but with similar fading as was handled by the multiple antennas in Jakes.” Fischer Decl. ¶ 169.

Petitioner shows that Ito in combination with Jakes discloses element 10c, “a controller configured to align and combine the received fixed port signals” as recited in the claim. Pet. 55–56. Referring to Ito’s Figure 3, *supra*, Petitioner states that “Ito discloses a ‘controller’ (control circuit 71) for processing received signals from both the base station (BSS) and mobile device (PSS) as shown in Figure 3. Accordingly, Ito discloses the claimed ‘controller.’” Pet. 55. Petitioner explains further: “Ito’s controller would be programmed to align and combine the received mobile device signals (Ito’s PSS signals) as disclosed in Jakes.” *Id.* at 55–56.

As in its other challenge based on Ito, Petitioner relies on Ito to meet the element 10d limitation of “a transmitter configured to transmit radio

frequency signals to a mobile device corresponding to the received fixed port signals.” *Id.* at 56.

Patent Owner challenges Petitioner’s demonstration of a motivation to combine Ito and Jakes. PO Resp. 42–44. According to Patent Owner, “Petitioner has not articulated any coherent reason why a [person of ordinary skill] would decide to modify *Ito* with *Jakes*, especially, where *Jakes* is not directed towards a cellular system of any type (i.e., *Jakes* does not apply to FDMA-, TDMA- or CDMA-based cellular systems).” *Id.* at 42 (citing Lanning Decl. ¶¶ 192–195).

We do not agree with Patent Owner’s argument. As Petitioner points out, Patent Owner’s argument is contrary to *KSR*, which does not require, to show obviousness, that the elements of the prior art be combined physically, and mandates that their teachings be viewed from the perspective of a person of ordinary skill, not “an automaton.” We are more persuaded by Mr. Fischer’s testimony that a person of ordinary skill “would have been highly motivated” to modify Ito in light of Jakes to take advantage of “reduction of random amplitude fading and random changes in phase, mitigating noise, and improvement of transmission power requirements.” Fischer Decl.

¶ 161. Jakes supports this testimony. For example, Jakes discloses that “a signal made up of some combination of the two [antennas] would have much less severe fading properties than a signal from one antenna alone.” Ex. 1032, 81, *quoted at* Pet. 52; *see also* Ex. 1032, Abstract (disclosing that diversity techniques save power). We find that for the reasons given, a person of ordinary skill would have combined Ito and Jakes with a reasonable expectation of success.

Patent Owner’s further argument that Ito does not disclose a “mobile device” (PO Resp. 60) has been addressed. *See supra*, Section III.B.1.e

(discussion of “transmitter” element 10d). Similarly, the argument that “*Jakes* does not disclose any type of moving base station” (PO Resp. 60) does not respond to Petitioner’s contention that Ito’s MSS is the claimed movable base station. *See supra*, Section III.B.1.a. We find that for the reasons given, Ito and *Jakes* in combination disclose or suggest each of the limitations of claim 10.

Based on Petitioner’s analysis, and for the reasons explained above, we find Petitioner has shown by a preponderance of evidence that claim 10 would have been obvious in light of Ito and *Jakes*.

2. Claims 15–18, 31, and 33–35

Claims 15–18 depend (directly and indirectly) from claim 10 and add various features. For example, claim 15 further recites “a controller configured to compare the received fixed port signals received through the spatially separated antennas and to select a best signal.” Ex. 1001, 12:14–17. Petitioner asserts this limitation is disclosed by Ito and *Jakes*. Pet. 56.

As noted *supra*, claim 16 states “the transmitter [is] further configured to transmit the radio frequency signals within time slots of time-division multiplex channels.” Ex. 1001, 12:18–21. Petitioner shows this additional feature is disclosed by Ito’s MSS. Pet. 56–57. Petitioner refers back to its analysis of this claim in connection with Ito and Adachi. *Id.* at 57; *see* Section III.B.2, *supra*. There, Petitioner elaborates: “Ito explains that in its “FDMA/TDMA technique, a number of radio frequencies are shared by a plurality of stations. These radio frequencies have a time division signal unit format where a time frame is divided into a number of *time slots*” Pet. 48 (citing Ex. 1003, 5:47–61).

Similarly, Petitioner contends that the limitations added by claims 17 and 18 are disclosed by Ito alone, or by the combination of Ito and *Jakes*. *Id.*

at 58–59. Petitioner contends claims 31, 33, 34, and 35 contain limitations similar to claims 10, 15, 17, and 18, and therefore relies on the same prior art disclosures for those claims. *Id.* at 59.

Patent Owner’s response to claims 15, 17, and 18 relies on its response to claim 10. PO Resp. 61. Patent Owner presents additional arguments only for claim 15. *Id.* at 61–63. As discussed, claim 15 requires a moveable base station “further comprising a controller configured to compare the received fixed port signals received through the spatially separated antennas and to select a best signal.” Ex. 1001, 12:14–17. Patent Owner contends “Ito does not disclose the required limitation of a controller ‘select[ing] the best signal’ nor does Petitioner provide any evidence to support its proposition.” PO Resp. 62 (alteration original) (citing Lanning Decl. ¶ 242). We disagree. Petitioner contends that “Ito in combination with Jakes discloses this limitation.” Pet. 56. Patent Owner’s argument fails because it refers to Ito alone, and again does not address the combination of references, Ito and Jakes.

Patent Owner asserts in its Sur-reply that Ito and Jakes fail to disclose the “best signal” limitation of claim 15. PO Sur-reply 33. We disagree. Petitioner provides a detailed description of Jakes’s disclosures of selecting a best signal under the heading for claim 16, immediately following its discussion of claim 15,¹⁴ demonstrating that “[i]n the proposed combination [with Jakes], Ito’s controller would be programmed with the functionality of

¹⁴ From the context, it is apparent that Petitioner’s discussion of Jakes’s disclosure of selecting a best signal was incorrectly placed under the heading for claim 16. For example, Petitioner’s discussion of Jakes mentions a “best” signal three times, which clearly refers to the “best signal” limitation recited in claim 15 and not claim 16’s recitation of transmitting within time slots.

Jakes' receiver, which teaches comparing incoming signals received from spatially separated antennas and selecting the *best one*." Pet. 58 (emphasis added). Petitioner provides an annotated version of Figure 1 of Jakes, following:

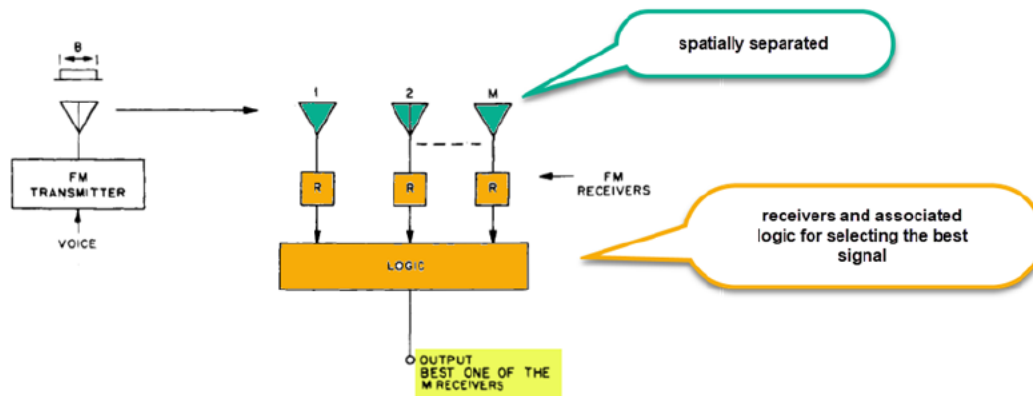


Fig. 1. Principles of selection diversity.

Id. Figure 1 of Jakes, annotated by Petitioner, shows comparing incoming signals from *M* spatially separated antennas from *M* receivers and selecting the best one. As Petitioner explains, the one of the *M* receivers having the highest signal-noise ratio (SNR) is connected to the output. *Id.* (citing Ex. 1032, 82). Further, Jakes explains that the antenna signals could be sampled, and the best one sent to the receiver. *Id.*

Thus, we find that Jakes, which selects a “best” signal based on SNR, in combination with Ito, discloses this limitation of claim 15.

Patent Owner also argues that the “controller” limitation in claim 15 refers to a controller of the base station, and Jakes does not disclose a moving base station “of any type.” PO Resp. 62. Patent Owner made a similar argument in connection with Gilhousen501. *See supra*, Section III.B.1.e. As Petitioner points out, the moving base station is recited in the preamble of claim 10, which Patent Owner does not dispute is met by Ito. Pet. Reply 31–32. Furthermore, we are not persuaded by this argument

because it is directed to Jakes alone, and not to the combination of Ito and Jakes.

Patent Owner does not address claims 31 or 33–35.

We find that for the reasons given, Ito and Jakes disclose or suggest the limitations of claims 15–18, 31, and 33–35. Based on Petitioner’s analysis, and for the reasons explained above, we find Petitioner has shown by a preponderance of evidence that claims 15–18, 31, and 33–35 would have been obvious in light of Ito and Jakes.

D. Summary and Conclusion

After consideration of the record, including Petitioner’s and Patent Owner’s arguments and evidence, we determine that for the reasons given, Petitioner has proven by a preponderance of the evidence that claims 10, 16–18, 31, 34, and 35 of the ’701 patent would have been obvious over Ito, Gilhousen501, and Adachi, and claims 10, 15–18, 31, and 33–35 of the ’701 patent would have been obvious over Ito and Jakes.

E. Other Grounds

As noted above in Section I.F, *supra*, Petitioner presents an additional challenge to claims 10 and 17 of the ’701 patent. Because we determine that those claims are unpatentable in light of Ito, Gilhousen501, and Adachi, and Ito and Jakes, for the reasons discussed above, we do not separately assess the patentability of these claims based on the remaining ground in this proceeding. 35 U.S.C. § 318(a) (2018) (“If an inter partes review is instituted and not dismissed under this chapter, the Patent Trial and Appeal Board shall issue a final written decision with respect to the patentability of any patent claim challenged by the petitioner and any new claim added under section 316(d).”); *Beloit Corp. v. Valmet Oy*, 742 F.2d 1421, 1423

(Fed. Cir. 1984) (finding that an administrative agency is at liberty to reach a decision based on a single dispositive issue).

IV. CONSTITUTIONAL CHALLENGE

Patent Owner contends that “adjudication of the ’701 patent violates the U.S. Constitution.” PO Resp. 63.

In *Arthrex v. Smith & Nephew*, 941 F.3d 1320, 1338 (Fed. Cir. 2019), *cert. granted sub nom. United States v. Arthrex, Inc.*, 2020 WL 6037206 (Oct. 13, 2020), the Federal Circuit determined that the current structure of the Board does not violate Article II as of the date of that precedential decision. *See also Arthrex, Inc. v. Smith & Nephew, Inc.*, 953 F.3d 760, 764 (Fed. Cir. 2020) (Moore, J., concurring in denial of rehearing) (“Because the APJs were constitutionally appointed as of the implementation of the severance, inter partes review decisions going forward were no longer rendered by unconstitutional panels.”). Furthermore, in *Arthrex*, the Federal Circuit found “no constitutional infirmity in the institution decision as the statute clearly bestows such authority on the Director pursuant to 35 U.S.C. § 314.” 941 F.3d at 1340.

Therefore, we disagree with Patent Owner that this adjudication “violates the U.S. Constitution.” PO Resp. 63.

V. CONCLUSION

For the foregoing reasons, we determine that Petitioner has demonstrated by a preponderance of the evidence that claims 10, 15–18, 31, and 33–35 of the ’701 patent are not patentable.

A summary of our conclusions is set forth in the table below.

Claims	35 U.S.C. §	Reference(s)/Basis	Claims Shown Unpatentable	Claims Not Shown Unpatentable
10, 16–18, 31, 34, 35	103(a)	Ito, Gilhousen501, Adachi	10, 16–18, 31, 34, 35	
10, 15–18, 31, 33–35	103(a)	Ito, Jakes	10, 15–18, 31, 33–35	
10, 17	103(a)	Gilhousen761, Gilhousen501, Adachi ¹⁵		
Overall Outcome			10, 15–18, 31, 33–35	

¹⁵ Because we determine that all of the challenged claims are unpatentable on other grounds, we decline to address this remaining ground in the Petition.

IPR2019-01442
Patent 7,848,701 B2

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