

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.

IPR2019-01441
Patent 8,718,543 B2

(Consolidated with IPR2019-01644)

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, 12, 13, 18–21, 23, 25, 26, 44, 45, and 49–55 of U.S. Patent No. 8,718,543 B2 (Ex. 1001, the “’543 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.”).

Two months after filing the Petition, Mercedes-Benz filed a separate petition challenging claims 34 and 66 of the ’543 patent. IPR2019-01644, Paper 1 (“IPR1644 Pet.”). With that petition, Mercedes-Benz filed a motion (“Joinder Motion”) seeking to join IPR2019-01644 with this proceeding. IPR1644, Paper 3. As explained by Mercedes-Benz, a second petition was necessitated by Patent Owner’s assertion of claims in the district court infringement action involving the ’543 patent that were not being asserted when the Petition here was filed. IPR1644 Pet. 65.

We instituted *inter partes* review of claims 34 and 66. IPR1644, Paper 9. However, prior to our Institution Decision in IPR1644, the Federal Circuit decided *Facebook, Inc. v. Windy City Innovations, LLC*, 973 F.3d 1321 (Fed. Cir. 2020), prohibiting same-party joinder in IPRs. We, therefore, denied the Joinder Motion, advised the parties that we would deem the Joinder Motion as a request for consolidation, and consolidated IPR2019-01644 with this case. IPR1644, Paper 9, 36.

Following institution, Patent Owner filed a Response. Paper 14 (“PO Resp.”). Subsequently, Petitioner filed a Reply to Patent Owner’s Response (Paper 23, “Pet. Reply”), and Patent Owner filed a Sur-reply (Paper 29, “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 32 (“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 10, 12, 13, 18–21, 23, 25, 26, 34, 44, 45, 49–55, and 66 (the “challenged claims”) of the ’543 patent are unpatentable.

B. Related Proceedings

The parties identify the following pending district court proceedings involving the ’543 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, 1; Pet. 74.

In addition to this Petition, the ’543 patent was also challenged by a different party (Volkswagen Group of America, Inc.) in IPR2019-01105 and IPR2019-01106. Pet. 73–74; Paper 4, 1.

Patents related to the ’543 patent are challenged in IPR2019-01101, IPR2019-01102, IPR2019-01103, IPR2019-01104, IPR2019-01079,

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IPR2019-01298, IPR2019-01404, IPR2019-01440, and IPR2019-01442.
Pet. 73–74; Paper 4, 1–2.

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. 72–73. Patent Owner identifies Carucel Investments, L.P. as the real party-in-interest. Paper 4, 1.

D. The '543 Patent

The '543 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 1:60–62.

The '543 patent addresses this problem by providing “a moving base station which is interposed between a moving mobile telephone unit and a fixed base station.” Ex. 1001, 3:4–6. 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 3:7–10. 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 3:10–13.

This is illustrated by Figure 1 of the '543 patent, reproduced below.

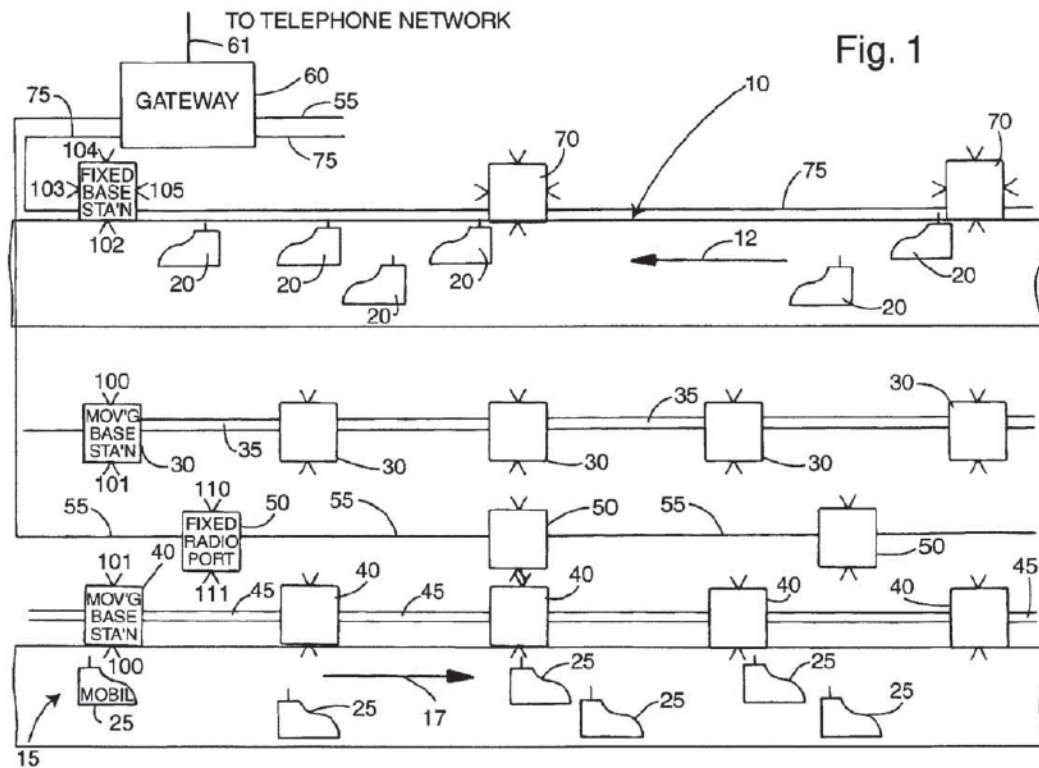


Fig. 1 is a block diagram representation of a roadway structure with fixed base stations, moving base stations, and fixed radio ports. *Id.* at 3:46–48.

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 4:2–4. Moving base stations 30 are disposed along one side of roadway 10. *Id.* at 4:5–6. 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 4:6–8.

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 4:8–12. 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 4:13–15. Moving base stations 40 are moved along rail 45. *Id.* at 4:15–16.

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 4:44–47. 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 4:50–53.

According to the '543 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, in the examples described herein, 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 5:12–21 (emphasis added).

Each of the moving base stations is provided with multiple antennas. *Id.* at 5:22–23. 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 5:28–31.

E. Illustrative Claims

The '543 patent has sixty-seven claims. Twenty-one claims (10, 12, 13, 18–21, 23, 25, 26, 34, 44, 45, 49–55, and 66) are collectively challenged in this consolidated case. *See supra*. Of the challenged claims, six claims (10, 21, 34, 44, 52, and 66) are independent.

Claim 10 recites¹:

10. An apparatus comprising:

[10a] a plurality of spatially separated antennas;

[10b] a receiver configured to receive, through the plurality of spatially separated antennas, a plurality of cellular signals from a plurality of base station interface circuits; and

[10c] a transmitter configured to transmit a mobile device radio frequency signal to a mobile device moving relative to Earth while the apparatus is moving relative to the plurality of base station radio interface circuits and relative to Earth, the mobile device radio frequency signal including data extracted from the cellular signals.

Ex. 1001, 12:8–19 (reference numbers in brackets added).

Claim 34 recites:

34. An apparatus comprising:

[34a] a plurality of spatially separated antennas;

[34b] a first radio interface circuit configured to receive, through the plurality of spatially separated antennas, a first plurality of code division multiple access (CDMA) cellular signals transmitted from a plurality of base station radio interface circuits and configured to transmit, at a cellular

¹ Reference numbers assigned by Petitioner have been added in brackets to claims 19, 34, and 66.

transmission power level, a second plurality of CDMA cellular signals to the plurality of base station radio interface circuits; and

[34c] a second radio interface circuit configured to transmit a first mobile device signal including first data extracted from the first plurality of CDMA cellular signals, the second radio interface circuit configured to transmit the first mobile device signal to a mobile device and configured to receive a second mobile device signal transmitted from the mobile device at a mobile device transmission power level less than the cellular transmission power level,

[34d] the second plurality of CDMA cellular signals including second data extracted from the second mobile device signal,

[34e] the mobile device moving relative to Earth while the apparatus is moving relative to the base station radio interface circuits, and

[34f] the mobile device moving relative to Earth while the apparatus is moving in the same direction that the mobile device is moving.

Ex. 1001, 14:46–15:6.

Claim 66 recites:

66. An apparatus comprising:

[66a] a plurality of spatially separated antennas;

[66b] a first radio interface circuit configured to receive, through the plurality of spatially separated antennas, a first plurality of code division multiple access (CDMA) cellular signals transmitted from a plurality of base station radio interface circuits and configured to transmit, at a cellular transmission power level, a second plurality of CDMA cellular signals to the plurality of base station radio interface circuits; and

[66c] a second radio interface circuit configured to transmit a first mobile device signal including first data extracted from each CDMA signal of the first plurality of

CDMA cellular signals, the second radio interface configured to transmit the first mobile device signal to a mobile device and configured to receive a second mobile device signal transmitted from the mobile device at a mobile device transmission power level less than the cellular transmission power level, each CDMA signal of the second plurality of CDMA cellular signals including second data extracted from the second mobile device signal,

[66d] the mobile device moving relative to Earth while the apparatus is on a vehicle moving relative to the base station radio interface circuits, and

[66e] the vehicle moving in the same direction that the mobile device is moving.

Id. at 18:42–67.

F. 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”).

Pet. 12–21.

In addition, in IPR2019-01441, 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.”) with its Reply. Patent Owner submitted the Declaration of Mark R. Lanning (Ex. 2100, “Lanning Decl.”) with its Patent Owner Response. Also, in IPR2019-01644,

Petitioner submitted a Declaration of Mr. Fischer (IPR1644, Ex. 1008, “Fischer II Decl.”) with its petition. Both parties have submitted deposition transcripts for these declarants.²

G. Asserted Grounds of Unpatentability

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

Claims Challenged	Statutory Basis 35 U.S.C.	References
10, 12, 13, 18, 20, 21, 23, 25, 26, 44, 45, 49, 51–55	§ 103	Gilhousen761, Gilhousen501, Adachi
10, 12, 13, 18, 19, 20, 21, 23, 25, 26, 44, 45, 49–55	§ 103	Ito, Gilhousen501, Adachi
34, 66	§ 103	Gilhousen761, Gilhousen501, Adachi
34, 66	§ 103	Ito, Gilhousen501, Adachi

Pet. 12; IPR1644 Pet. 9.

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. 10 (citing Fischer Decl. ¶¶ 31–32).³

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

³ In IPR2019-01644, Petitioner’s formulation is similar. IPR1644 Pet. 7.

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 ’543 Patent would have had (i) a Bachelor of Science degree in electrical engineering or 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. 8–9. 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. ¶ 60).

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 ’543 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 ’543 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 ’543 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. Sept. 19, 2016) (“*Novatel* Litigation”). Pet. 10. Petitioner refers us to the district court’s construction for three terms: “base station,” “base station [radio] interface circuit,” and “configured to.” *Id.* at 10–11 (alteration in original).

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. 11.

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 responds with three proposed constructions, “base station [radio] interface circuit,” “mobile device,” and “configured to.” PO Resp. 10–14 (alteration in original).

1. “*base station [radio] interface circuit*”

The district court in the *Novatel* Litigation construed this phrase as “a [radio transceiver] circuit in a base station that can transmit and receive cellular signals.” Pet. 10. Patent Owner urges us to adopt the district court’s construction as the plain and ordinary meaning. PO Resp. 10. 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 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. 10. 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.* at 11. Patent Owner contends that no construction is necessary because “[t]he term ‘configured to’ is not used in the preamble of any asserted claim.” PO Resp. 14.

We agree with Patent Owner that no construction is necessary.

3. “*mobile device/mobile unit*”⁴

Patent Owner contends that mobile units are “also known as cell phones or mobile phones.” PO Resp. 7. Patent Owner asks us construe “mobile device” as “a device that must register with and be able to directly communicate with the cellular network.” *Id.* at 10–11. Patent Owner contends that this is “the plain and ordinary meaning of the term.” *Id.* at 11. 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.*

Patent Owner’s proposed construction relies mainly on the ’543 patent specification: “The ’543 Patent specification teaches that a mobile unit must be capable of directly communicating with either a fixed cellular base station or a moving base station.” PO Resp. 11 (citing Ex. 1001, 4:50–53). Also, “[t]he ’543 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 12. 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 11–12 (citing Ex. 1001, 11:1–14). Patent Owner cites also the discussion in the ’543 patent that describes registration by the mobile unit:

⁴ The parties agree that the term “mobile unit” in the ’543 patent has the same meaning as “mobile device.” Hearing Tr. 22:18–23, 88:14–16.

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, 9:65–10:3 (partially quoted at PO Resp. 12). Patent Owner relies on testimony from its expert, Mr. Lanning. *See* PO Resp. 11–12 (citing Lanning Decl. ¶¶ 59, 67, 68, 71, 76–80).

Petitioner opposes Patent Owner’s proposed construction of mobile device. Pet. Reply 2–7. 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.* at 2–3. 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 7.

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 '543 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 units." 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 '543 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, 3:18–21.

As Petitioner shows, in the challenged claims of the '543 patent, it is the moving base station, not the mobile device or mobile unit, that communicates directly with the fixed ports associated with the network. Pet. Reply 3. This important aspect of the '543 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 ’543 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 “apparatus” (the mobile base station) has “a receiver configured to receive . . . a plurality of cellular signals *from a plurality of base station interface circuits,*” and “a transmitter configured to transmit a mobile device radio frequency signal to a mobile device.” Ex. 1001, 12:10–17 (emphasis added). Claim 10 does not require the mobile device to have any functionality to communicate directly with a cellular network, bypassing the claimed moving base “apparatus.”

Claim 21 similarly recites that the claimed “apparatus” (mobile base station) has “a first receiver configured to receive . . . a cellular signal transmitted *from a base station radio interface circuit*” and “a second

transmitter configured to transmit . . . another cellular signal *to the base station radio interface circuit.*” *Id.* at 12:59–61, 13:3–5 (emphasis added). Independent claims 34, 44, 52, and 66 likewise focus on the moving base station “apparatus” and have similar limitations. Ex. 1001, 14:45 (claim 34), 15:60 (claim 44), 16:32 (claim 52), 18:42 (claim 66). Those claims likewise do not refer to signals passing directly between the mobile units and fixed ports.

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 ’543 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 ’543 patent specification does not support Patent Owner’s construction of “mobile device.” *Cf.* PO Resp. 11–13; 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 ’543 patent a clear indication supporting Patent Owner’s contention that conventional non-cellular cordless phones should be excluded. *Cf.* PO Resp. 11 (“A mobile device is more than just a cordless phone handset.”). In the Background section, the ’543 patent describes the goal of the patent as encompassing “all

applications” including cordless phones: “What is desirable is an infra structure which allows use of such terminals *in all applications*, whether in the home or office as a *cordless phone . . .*” Ex. 1001, 2:51–53 (emphasis added); Fischer Reply Decl. ¶ 7.

While the ’543 patent does refer to the fixed base stations as “cell site[s]” (Ex. 1001, 4:65–66), it also describes the radio interfaces between the mobile devices and the base stations in more general terms. Pet. Reply 4; Ex. 1001, 6:48–54. Thus, the ’543 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, 6:52–55. This generic description in the ’543 patent of these radio interfaces as a “standard interface” is broader than a “cellular interface,” and is consistent with the patent’s stated goal of providing “an infra structure which allows use of . . . a cordless phone.” Pet. Reply 4–5 (citing Ex. 1001, 2:51–55); Fischer Reply Decl. ¶¶ 7–8. Elsewhere, the ’543 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, 7:8–10 (emphasis added).⁵

We find further support for our conclusion that Patent Owner’s construction is too limiting in the ’543 patent’s description of an embodiment where the mobile unit is prevented from communicating directly with the fixed ports. Ex. 1001, 3:24–38. 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

⁵ Patent Owner relies on this statement to prove that this interface *must* be cellular. *See infra*.

and the fixed radio ports. *Id.* at 3:27–38. 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 '543 patent is a continuation of U.S. Patent No. 7,221,904 (via a chain of continuations), and shares a common specification⁶ and similar claims with the '904 patent. Ex. 1001, 1:6–12. 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 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

⁶ Although the specifications are not identical, the minor differences between the specification of the '904 patent and the specification of the '543 patent are not pertinent to this discussion.

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 1–2. Patent Owner contends Petitioner’s analysis “is flawed for several reasons.” *Id.* at 2. Patent Owner further argues that “the ’543 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 3 (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 ’543 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 2. Patent Owner argues that “the ’543 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 4–5 (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 5 (citing Ex. 1001, 7:8–10). 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, 7:9. 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 quotes from the specification cited by Patent Owner are merely general references to cellular systems and do not support Patent Owner’s argument. The ’543 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 ’543 patent states the interface between the mobile units and the mobile base stations “is a standard radio interface.” Ex. 1001, 6:52–55. 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 7:8–10; *cf.* PO Sur-reply 4.

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 ’543 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 2–3 (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.” *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 ’543 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, 3:24–38; *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 4 (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 ’543 patent center on the mobile base station, not the mobile device. The ’543 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.” *Id.* at 7 (footnote omitted). There is no dispute that improving cellular technology is included among the goals described in the ’543 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 '543 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.

PO Sur-reply 7; *see also* discussion *supra*. Patent Owner therefore fails to support its argument that the '543 patent “explicitly and exclusively relates to improving the wireless connections of mobile devices within ‘cellular telephone systems.’” PO Sur-reply 4 (emphasis omitted). We find, based on the analysis above, that the claims, specification, and prosecution history of the '543 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 unit to “register . . . with the cellular network.” PO Resp.10–11. Such a registration requirement is not supported by the claims or prosecution history.

We have note that the challenged claims do not call for registration. Registration of a mobile unit with a base station is mentioned in the '543 patent specification (*see* PO Resp. 12, PO Sur-reply 3), 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, 9:65–10:5 (“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 a generic “standard radio interface” described in the specification. Ex. 1001, 6:52–55.

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 ’543 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 7.

C. Description of Prior Art References

Because our Decision relies on Ito, Gilhousen⁵⁰¹, and Adachi, 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.

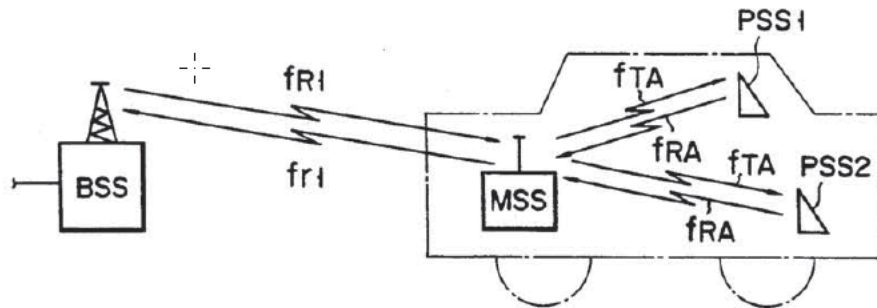


FIG. 6

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} .⁷ *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 (not shown), 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

⁷ Figure 6 of Ito mislabels f_{T1} as f_{r1} and BSS2 as BSS. See Ex. 1003, 12:57–63.

speed fading phenomena is increased due to the distance of a signal's 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.

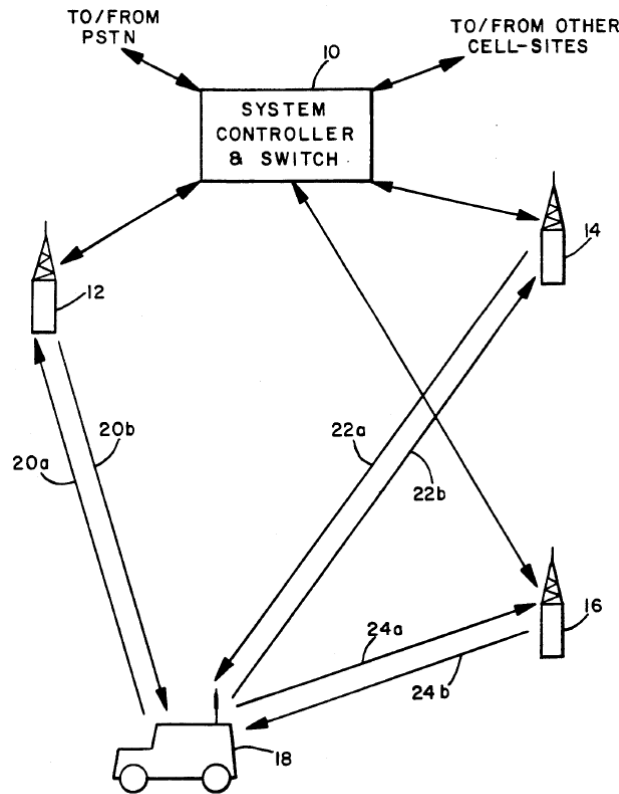


FIG. 1

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.

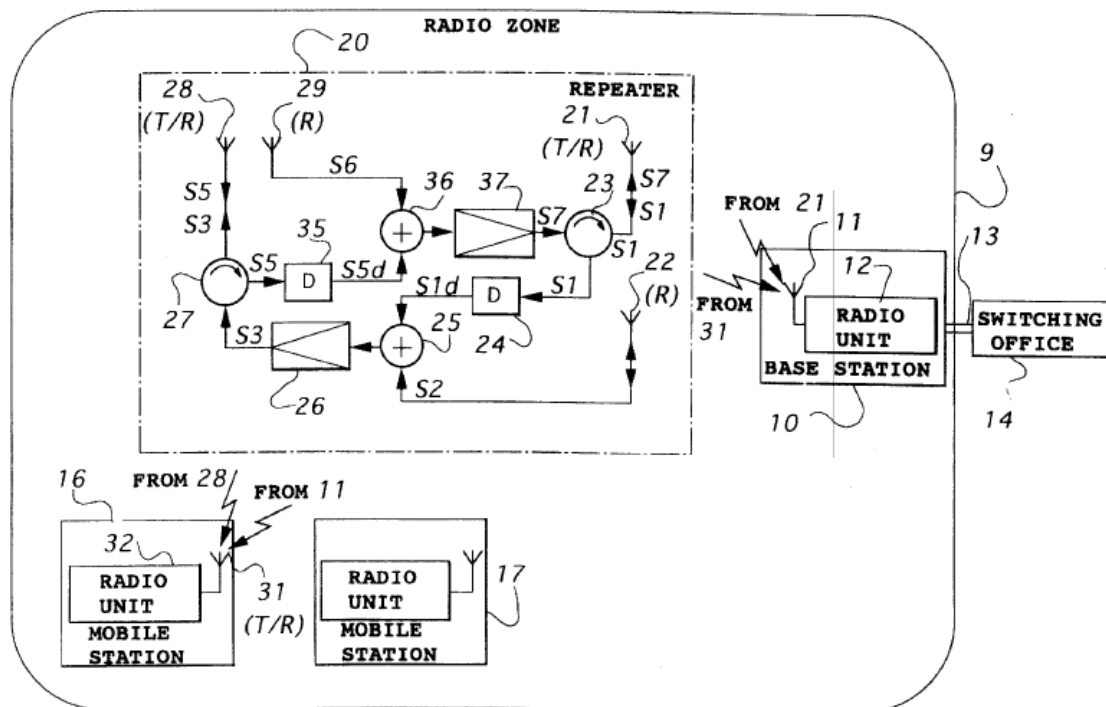


FIG. 2

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.

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, 12, 13, 18–21, 23, 25, 26, 44, 45,
and 49–55 based on Ito, Gilhousen501, and Adachi*

Petitioner contends these claims would have been obvious over the combination of Ito, Gilhousen501, and Adachi. Pet. 47–72. Petitioner supports this assertion with testimony from its expert, Mr. Fischer. Fischer Decl. ¶¶ 152–210.

Petitioner asserts that a person of ordinary skill would have been motivated to combine these references with a reasonable expectation of success. Pet. 47–55; Fischer Decl. ¶¶ 152–170. Petitioner contends a person of ordinary skill “would have been motivated to modify Ito’s FDMA-based system to use the CDMA ‘soft-handoff’ techniques disclosed in Gilhousen501.” Pet. 47. 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.* (citing Fischer Decl. ¶ 152). Petitioner asserts also that a person of ordinary skill “would have been further motivated to modify the Ito-Gilhousen501 combination to use the plurality of spatially separated antennas for a CDMA system described in Adachi, for example, because using a plurality of antennas mitigates fading and undesirable noise and improves transmission power requirements.” *Id.* at 47–48 (citing Fischer Decl. ¶ 152).

Petitioner argues that in making the Ito-Gilhousen501 combination, a person of ordinary skill would have had a reasonable expectation of success. Pet. 53–54. Again relying on Mr. Fischer, Petitioner contends that

“[i]ncorporating the functionality of Gilhousen501 into Ito would have been a routine modification.” *Id.* at 54 (citing Fischer Decl. ¶ 165).

Similarly, Petitioner demonstrates that 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. 54–55; Fischer Decl. ¶¶ 167–170.

1. Independent Claim 10

Petitioner presents an element-by-element analysis of claim 10 in relation to Ito, Gilhousen501, and Adachi. Pet. 56–61. Petitioner supports this analysis with testimony from Mr. Fischer. Fischer Decl. ¶¶ 171–181. As we discuss, Petitioner demonstrates that each element of claim 10 is disclosed or suggested by Ito, Gilhousen501, and Adachi.

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

Petitioner identifies mobile base MSS in Ito as the “apparatus” recited in the preamble of claim 10. Pet. 56 (citing Ex. 1003, Figs. 1, 3). Similarly, Petitioner identifies the “plurality of spatially separated antennas” (element 10a) recited in the claim with Adachi’s multiple antennas. *Id.* (citing Fischer Decl. ¶ 172). Patent Owner does not challenge this analysis.

b. Element 10b (“receiver”)

Petitioner relies on the combination of Ito, Gilhousen501, and Adachi as disclosing the limitation (element 10b) of “a receiver configured to receive, through the plurality of spatially separated antennas, a plurality of cellular signals from a plurality of base station interface circuits.” Pet. 56–58. Petitioner refers to annotated Figure 3 of Ito, following:

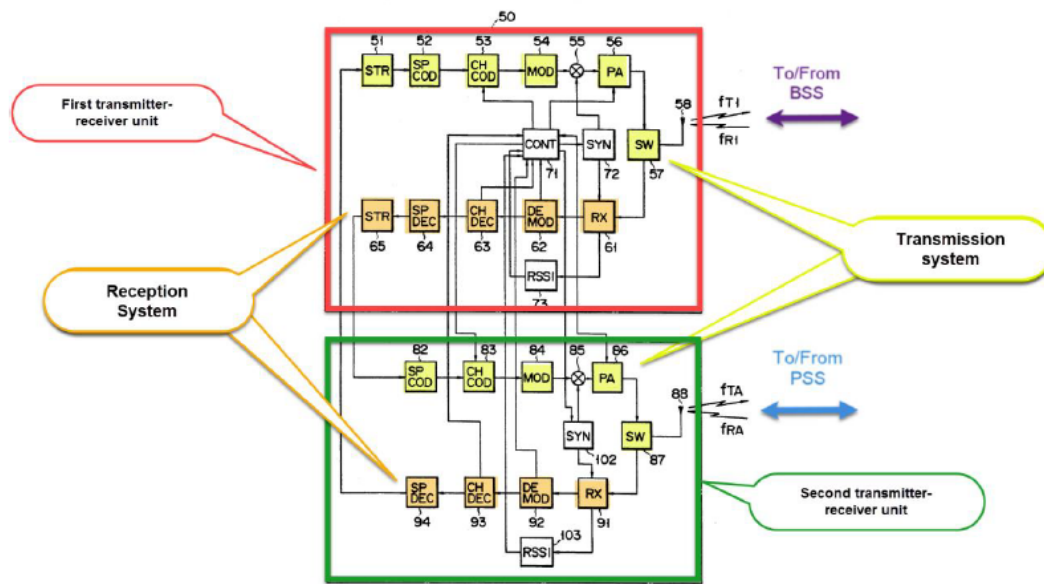


FIG. 3

Annotated Figure 3 of Ito is a block diagram of a mobile base device. Ex. 1003, 3:10–11; Pet. 57.

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. 57 (citing Fischer Decl. ¶ 174).

Petitioner explains further 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.” Pet. 57 (citing Fischer Decl. ¶ 176).

Petitioner argues that 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 58 (citing Ex. 1031, 5:29-45, 10:66-11:2; Fischer Decl. ¶ 176). Patent Owner’s challenge to Petitioner’s analysis of this element and the motivation to combine these references will be discussed *infra*.

c. Element 10c (“transmitter”)

Petitioner relies on Ito’s MSS apparatus to meet the limitation (element 10c) of “a transmitter configured to transmit a mobile device radio frequency signal to a mobile device moving relative to Earth while the apparatus is moving relative to the plurality of base station radio interface circuits and relative to Earth, the mobile device radio frequency signal including data extracted from the cellular signals.” Pet. 58 (citing Fischer Decl. ¶ 177). Referring again to annotated Figure 3 of Ito, Petitioner explains: “The second transmitter-receiver unit 80 wirelessly communicates with portable device PSS (mobile device). Ito transmits a received call from the base station BSS to the mobile user PSS via transmitter-receiver 80.” *Id.* at 59 (citations omitted); Fischer Decl. ¶ 178. Petitioner explains further, “Gilhousen501 teaches ‘data extracted from the cellular signals’ are sent to the mobile device.” Pet. 61 (citing Fischer Decl. ¶ 181).

d. Discussion

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

As to “receiver” element 10b, however, Patent Owner contends “*Gilhousen501* does not disclose any apparatus (moving base station) of any

type, let alone . . . an apparatus that comprises ‘a receiver configured to receive . . . a plurality of cellular signals from a plurality of base station interface circuits’, as required by Claim 10.” PO Resp. 54 (citing Lanning Decl. ¶ 233) (second alteration in original). Patent Owner makes a similar argument for Adachi: “Likewise, *Adachi* does not disclose any apparatus (i.e., a moving base station) of any type.” *Id.* at 55. 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* discussion *supra*. Petitioner relies on Gilhousen501 for its disclosure of “data extracted from the cellular signals.” Pet. 60. Petitioner relies on Adachi for its teaching of multiple antennas. *Id.* at 56. Thus, Patent Owner’s argument that Gilhousen501 and Adachi fail to disclose a moving base station does not address Petitioner’s contentions, which also rely on Ito’s MSS. We find that for the reasons given by Petitioner and summarized above, claim element 10b is disclosed by Ito, Gilhousen501, and Adachi.

For “transmitter” claim element 10c, Patent Owner contends that Ito, Gilhousen501, and Adachi fail to disclose a mobile device. PO Resp. 55–58. This argument is based on Patent Owner’s construction of mobile device as requiring registration and direct communication with the cellular network. *Id.* at 55 (“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 ‘543 Patent.”). For reasons discussed *supra*, Section II.B.3, we do not accept Patent Owner’s construction of mobile device because it is not supported by the language of the claims or other intrinsic evidence before us. Nor are we persuaded by Patent Owner’s argument that cordless telephones

such as Ito's are excluded from the scope of the claims. *See supra*. Because we have not adopted Patent Owner's claim construction, we are not persuaded by these arguments.

Patent Owner argues that its proposed requirement that "a mobile device must register with the cellular network in order to obtain the benefits of the '543 Patent" "does not preclude a mobile device—such as a cell phone—from using a second type of radio interface that is not a standard cellular interface to communicate with the moving base station." PO Sur-reply 9. This argument does not support Patent Owner's position because the only communication interface with the "mobile device" recited in claim 10 is "a transmitter configured to transmit a mobile device radio frequency signal *to a mobile device*." Ex. 1001, 12:14–15 (emphasis added). Thus, based on Patent Owner's arguments, claim 10 encompasses Ito's radio interface between transmitter-receiver unit 80 and portable device PSS. *See* Ex. 1003, 7:9–17 ("[T]he second transmitter-receiver unit 80 is used for radio communication with its portable device PSS by way of a second radio channel.").

We find, therefore, that Ito's portable device PSS meets the requirement of claim 10 for a mobile unit, for the reasons given by Petitioner and summarized *supra*. *See* Pet. 56; Fischer Decl. ¶¶ 178–181.

Still referring to element 10c, Patent Owner contends Petitioner fails to show the references disclose a "mobile device radio frequency signal including data extracted from the cellular signals." PO Resp. 58–60. 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 60. Patent Owner argues, similarly:

“Likewise, Adachi only discloses a stationary repeater that is used as a ‘signal booster’ to boost weak spread spectrum (CDMA) signals between a base station and one or more mobile stations (i.e., mobile devices).” *Id.* at 61 (citing Lanning Decl. ¶ 250).

We are not persuaded by these arguments because they are not responsive to Petitioner’s contentions. Petitioner relies on Ito (not Gilhousen501) for the disclosure of a mobile base station (MSS) that that communicates directly with mobile devices (PSS). *See* Pet. 56–57; Fischer Decl. ¶¶ 179–180. 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.

e. Motivation to Combine

Patent Owner contends that the Petitions “are fatally deficient.” PO Resp. 19–25. According to Patent Owner: “A proper obviousness combination requires the Petitioner to ‘explain how specific references could be combined.’” *Id.* at 19 (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 signal processing, and CDMA processor 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. 20–21 (emphasis and footnotes omitted); *see also id.* at 38–42. According to Patent Owner, Petitioner fails also to show “how a [person of ordinary skill] would combine

Gilhausen501's CDMA modulation techniques with the pre-existing base stations (BSS) of Ito, especially, where Ito lacks the necessary design and circuitry details for these pre-existing base stations.” *Id.* at 23 (emphasis omitted); *see also id.* at 33–35.

Patent Owner also contends “*Ito*’s FDMA/TDMA system is not compatible with CDMA systems.” PO Resp. 21; PO Sur-reply 20–22. Patent Owner asserts, “*Ito* explicitly teaches away from utilizing CDMA techniques.” PO Resp. 33. 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.* at 33–34. Mr. Lanning testifies that “these compatibility issues would prohibit *Ito*’s mobile base stations (MSS) from receiving CDMA signals and further prohibit *Ito*’s preexisting base stations (BSS) from transmitting CDMA signals, as Petitioner proposes.” Lanning Decl. ¶ 165. 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 17–18. 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*, 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 Gilhousen501 with a reasonable expectation of success. We find that Petitioner has provided persuasive evidence of such a rationale and expectation. Pet. 47–54; Fischer Decl. ¶¶ 152–166; *see* discussion *supra*. Mr. Lanning testifies that CDMA was a “breakthrough technology.” Lanning Decl. ¶ 138 (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. 47–54; Fischer Decl. ¶¶ 152–166.

Moreover, we find that such a highly skilled person would have been able to combine the teaching of those references using known technology, with a reasonable expectation of success. Fischer Decl. ¶ 164 (“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.

Moreover, 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 was available from Motorola during the relevant time period. Pet. Reply 20; Lanning I Dep. 42:23–43:22. We find 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. ¶¶ 164–166

We have considered Patent Owner’s arguments and do not find them 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 18. 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. ¶¶ 159–179. 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.* ¶¶ 122, 163, 168. 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. 2, 20, 22; 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 ’543 patent, the invention uses “well-known” equipment and functions. *See, e.g.*, Ex. 1001, 4:30, 5:7–8; 5:23, 5:55, 5:67, 6:15, 6:21, 6:32, 6:50, 6:54–55, 6:64; 7:37; 9:21, 9:34, 9:63. CDMA was a well-known technique at the time of the alleged invention. Fischer Decl. ¶ 156 (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* Fischer Decl. ¶ 164 (“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. 89:11–91:17.⁸ Moreover, Mr. Lanning’s testimony establishes that the necessary hardware and software for the transition were 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. 33. 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 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. 35–37. Patent

⁸ Citations are to the original deposition pages.

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 35–36. 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.* With respect to combining Adachi with Gilhousen501, Patent Owner contends "this combination would have required much new circuitry." *Id.* at 36.

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. ¶ 170; *see also id.* ¶¶ 98–99 (discussing advantageous use of Adachi's antenna diversity to "mitigate multipath fading effects").

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 claim10, 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. Independent Claims 21, 44, and 52

Petitioner’s analysis of claim 21 incorporates its analysis of claim 10. Pet. 64–67; Fischer Decl. ¶¶ 192–201. For the elements of the “second receiver” recited in claim 21, but not claim 10, Petitioner relies on Figure 3 of Ito. Pet. 65. Referring to Figure 3 of Ito, Petitioner asserts: “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.” *Id.* at 65–66. Similarly, for the “second transmitter” recited in the claim, Petitioner relies on Figure 3 and the disclosure of a transmitter-receiver unit in Ito. *Id.* at 66–67.

Petitioner’s analyses of independent claims 44 and 52 in relation to Ito, Gilhousen501, and Adachi also rely on its analysis of claim 10. Pet. 71–72; Fischer Decl. ¶¶ 207–209.

Patent Owner’s response on claim 21 states that for the first transmitter limitation, the Petition refers back to a prior discussion of “Gilhousen761,” which Patent Owner points out is not cited as a reference for this ground. PO Resp. 64. Petitioner responds that “[t]his is a typographical error; the Petition should have referred to Ito.” Reply 30. From the context, is clear that Petitioner was referring to Ito, not Gilhousen761.⁹ Patent Owner’s argument is, therefore, unavailing.

⁹ Petitioner relies on its analysis of claim element 10c, which refers to Ito (not Gilhousen761) as disclosing the transmitter limitation. Pet. 65.

Patent Owner asserts that claims 44 and 52 include limitations similar to those addressed for claims 10 and 21. PO Resp. 66. Thus, Patent Owner does not present additional arguments for claims 44 and 52, referring specifically to its arguments directed to claim elements 10b and 10c, discussed *supra*. *Id.* at 66–68.

Accordingly, for the reasons given in connection with claim 10 and those summarized above, we find that Petitioner has demonstrated that Ito in combination with Gilhousen501 and Adachi discloses or suggests each element of claims 21, 44, and 52. Based on Petitioner’s analysis, and for the reasons explained above, we find Petitioner has shown by a preponderance of evidence that claims 21, 44, and 52 would have been obvious in light of Ito, Gilhousen501, and Adachi.

3. *Dependent claims 12, 13, 18, 19, 20, 45, 49, 50, and 51*

Claims 12, 13, 18, 19, and 20 depend from claim 10 and add various features. For example, claim 12 states that “each cellular signal includes the data.” Ex. 1001, 12:25–26. Petitioner contends this additional feature is disclosed by Gilhousen501. Pet. 61 (citing Fischer Decl. ¶ 182). Claim 19 recites that the transmitter is “further configured to transmit the mobile device radio frequency signal within time slots of time-division multiplex channels.” *Id.* at 62. Petitioner explains that Ito discloses this limitation. *Id.* Specifically, the Petition provides the following explanation: “In the proposed combination, Gilhousen501’s CDMA functionality replaces Ito’s FDMA functionality, *leaving its TDMA functionality intact.*” *Id.* at 63

(emphasis added). Petitioner supports this assertion with testimony from Mr. Fischer. Fischer Decl. ¶ 189.

Similarly, Petitioner contends that the limitations added by claims 13, 18, and 20 are disclosed by the combination of Ito, Gilhousen501, and Adachi, or by Ito or Gilhousen501 alone. *Id.* at 61–63. Petitioner contends claims 45, 49, 50, and 51 contain limitations similar to claims 13, 18, 19, and 20, and therefore relies on the same prior art disclosures for those claims. Pet. 71 (citing Fischer Decl. ¶ 208).

For claims 12, 13, 18, and 20, Patent Owner relies on its previous arguments addressed to claim 10, from which these claims depend. PO Resp. 61–62. For the additional limitation in claim 13 (“wherein the plurality of cellular signals is a plurality of code division multiple access (CDMA) signals”), Petitioner relies on “the combination of Ito, Gilhousen501, and Adachi.” Pet. 61. As Petitioner explains, “in 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. ¶ 184).

Relying on testimony from Mr. Lanning, Patent Owner asserts that this limitation is not met. PO Resp. 62–64 (citing Lanning Decl. ¶ 253). Patent Owner asserts: “*Gilhousen501* does not disclose or imply any moving base station that comprises either a receiver to receive CDMA signals transmitted from a fixed base station or a transmitter to transmit CDMA signals to be received by a fixed base station, as required by Claim 13.” *Id.* at 63. Further, Patent Owner asserts: “*Gilhousen501* only discloses

direct communication between its single mobile unit 18 and one or more cell-sites” *Id.* at 63–64.

We are not persuaded by this argument. As noted *supra*, Petitioner relies on Ito’s disclosure of mobile base station MSS communicating with a cellular base station. Pet. 58–60. Patent Owner’s argument is unavailing because it addresses references individually and fails to address the combination of references including Ito.

For claims 45, 49, and 51, Patent Owner relies on its arguments addressed to claim 44, from which these claims depend. PO Resp. 68. For the additional limitation in claim 45 (“wherein the plurality of cellular signals is a plurality of code division multiple access (CDMA) signals”), Patent Owner relies on arguments directed to claim 13, which included the same limitation. *Id.* at 69. We have addressed this argument *supra* in connection with claim 13 and find it unpersuasive for the reasons given there. Patent Owner does not separately address claim 50.

Accordingly, for the reasons given in connection with claims 10 and 44, and those summarized above, we find that Petitioner has demonstrated that Ito in combination with Gilhousen501 and Adachi discloses or suggests each element of dependent claims 12, 13, 18, 19, 20, 45, 49, 50, and 51. Based on Petitioner’s analysis, and for the reasons explained above, we find Petitioner has shown by a preponderance of evidence that claims 12, 13, 18, 19, 20, 45, 49, 50, and 51 would have been obvious in light of Ito, Gilhousen501, and Adachi.

4. Dependent Claims 23, 25, 26, 53, and 55

Claims 23, 25, and 26 depend from claim 21 and add various features. For example, claim 23 states that “the second transmitter is further

configured to transmit the another cellular signal at a cellular transmission power level higher than a mobile device transmission power level at which the another mobile device signal is transmitted.” Petitioner demonstrates that this additional feature is disclosed by Ito. Pet. 68 (citing Fischer Decl. ¶ 202). Similarly, Petitioner shows that the limitations added by claims 25 and 26 are disclosed by Gilhousen501, alone or with Adachi. *Id.* at 70–71. Petitioner explains that claims 53 and 55 contain limitations similar to claims 23 and 25, and therefore relies on the same prior art disclosures for those claims. *Id.* at 71–72 (citing Fischer Decl. ¶ 208).

Patent Owner’s response to claims 23 and 25 relies on its response to claim 21. PO Resp. 65. For the additional CDMA limitation recited in claim 25, like that in claim 13, Patent Owner relies on its response to claim 13. *Id.* at 66. We find these arguments unpersuasive for the reasons given in connection with claims 21 and 13.

Similarly, Patent Owner’s response to claims 53 and 55 relies on its response to claim 52, which in turn relies on the response to claims 10 and 21. PO Resp. 69. For the additional CDMA limitation recited in claim 25, which is like that in claim 13, Patent Owner relies on its response to claim 13. *Id.* at 70. We find these arguments unpersuasive for the reasons given in connection with claims 10, 13, and 21. Patent Owner does not separately address claim 26.

Accordingly, for the reasons given in connection with claims 10 and 13, and those summarized above, we find that Petitioner has demonstrated that Ito in combination with Gilhousen501 and Adachi discloses or suggests each element of dependent claims 23, 25, 26, 53, and 55. Based on Petitioner’s analysis, and for the reasons explained above, we find Petitioner

has shown by a preponderance of evidence that claims 23, 25, 26, 53, and 55 would have been obvious in light of Ito, Gilhousen501, and Adachi.

5. Dependent Claim 54

This claim depends from claim 52, and recites that “the second transmitter is further configured to transmit the another cellular signal through at least two of the plurality of spatially separated antennas.” Petitioner asserts that Adachi discloses this limitation. Pet. 72 (citing Fischer Decl. ¶ 210). For support, Petitioner refers back to its analysis of how Adachi teaches this subject matter in the ground based on Gilhousen761, Gilhousen501, and Adachi. *See* Pet 45–48; Fischer Decl. ¶¶ 146–151. Citing Adachi’s disclosure of using multiple transmitting and multiple receiving antennas, Mr. Fischer testifies that a person of ordinary skill in the art would have been motivated to use “*all four* antennas from Adachi’s Embodiment 1 . . . as transmit-receive antennas to obtain the benefits of the multiple transmitting antennas.” Fischer Decl. ¶¶ 147–148 (citing Ex. 1031, 7:24–29).

Patent Owner does not separately address claim 54. We are persuaded by Petitioner’s showing that Adachi teaches this feature. Based on Petitioner’s analysis, summarized above, we find Petitioner has shown by a preponderance of evidence that claim 54 would have been obvious in light of Ito, Gilhousen501, and Adachi.

*C. Challenge to Claims 34 and 66
based on Ito, Gilhousen501, and Adachi*

In IPR2019-01644, Petitioner contends these claims would have been obvious over Ito, Gilhousen501, and Adachi. IPR1644 Pet. 9, 42. Petitioner provides an element-by-element analysis for each of the challenged claims

in relation to Ito, Gilhousen501, and Adachi. *Id.* at 50–59. Mr. Fisher testifies that each limitation of claims 34 and 66 is disclosed by the combination of these references. Fischer II Decl. ¶¶ 151–174.

Petitioner shows that the preamble (“apparatus”) is met by Ito’s MSS. Pet. 51; Fischer II Decl. ¶ 152. Petitioner contends that the first limitation of claim 34 (element 34a) is met by Adachi’s spatially separated antennas. Pet. 51; Fischer II Decl. ¶ 152. The preamble and first limitation are not disputed by Patent Owner. *Cf.* PO Resp. 76.

The second limitation of claim 34 (element 34b) has several sub-elements. Petitioner shows that the “first radio interface circuit” is met by Ito’s mobile base device MSS, in which signals are received through Adachi’s plurality of spatially separated antennas. IPR1644 Pet. 52 (citing Fischer II Decl. ¶ 155). Petitioner shows that the “first plurality of code division multiple access (CDMA) cellular signals transmitted from a plurality of base station radio interface circuits” is met by the modification of Ito’s MSS “to include the CDMA capabilities of Gilhousen501.” *Id.* at 53 (citing Fischer II Decl. ¶ 157). Petitioner shows that the element “configured to transmit, at a cellular transmission power level, a second plurality of CDMA cellular signals” is met by Ito’s transmitter-receiver unit. *Id.* (citing Fischer II Decl. ¶ 158). According to Petitioner, the MSS of Ito would be “modified to include the processing functionality of Gilhousen501.” *Id.* (citing Fischer II Decl. ¶ 159).

Patent Owner’s response repeats arguments previously addressed. *Cf.* PO Resp. 76–79. Specifically, Patent Owner refers back to the argument that “*Gilhousen501* does not disclose any apparatus (moving base station) of any type, let alone let alone an apparatus that comprises ‘a first radio

interface circuit configured to receive . . . a first plurality of code division multiple access (CDMA) cellular signals transmitted from a plurality of base station radio interface circuits.’” *Id.* at 76 (citing Section X.C.1 of its Response). We discuss this argument in Section III.B.1.d, *supra*. We are not persuaded by this argument because it does not respond to Petitioner’s contentions based on Ito’s disclosure of moving base station MSS in combination with Gilhousen501 and Adachi.

Patent Owner also repeats the arguments that Ito, Gilhousen501, and Adachi do not disclose a mobile device. PO Resp. 77–79. We address these arguments, including the contention based on a claim construction we have rejected, *supra*, in connection with our discussion of claim 10 in Section III.B.1.d.

Petitioner identifies the third limitation (element 34c) of claim 34 (“a second radio interface circuit configured to transmit a first mobile device signal”) with Ito’s transmitter-receiver unit and Adachi’s antennas. Pet. 54–55 (citing Fischer II Decl. ¶¶ 161–162). Petitioner shows the remaining parts of this limitation are met by Gilhousen501 alone, Gilhousen501 and Adachi, or Ito, Gilhousen501, and Adachi. IPR1644 Pet. 55–57; Fischer II Decl. ¶¶ 163–167.

Petitioner identifies the fourth limitation (element 34d) of this claim (“the second plurality of CDMA cellular signals including second data extracted from the second mobile device signal”) with register circuit 51 in Ito, which “temporarily stores digital speech signals sent from the reception system of the second transmitter-receiver unit.” IPR1644 Pet. 58 (quoting Ex. 1003, 7:25–28).

Petitioner identifies the fifth limitation (element 34e) and final limitation (element 34f) with Ito's MSS and PSS, which "move with a car—relative to the Earth and the fixed base station." Pet. 58 (citing Fischer II Decl. ¶¶ 169–172). Patent Owner does not separately address these contentions.

Petitioner asserts: "Claim 66 is substantively the same as claim 34." IPR1644 Pet. 58. Thus, Petitioner's analysis of claim 66 "relies on the same disclosures and reasoning" as its analysis of claim 34 in light of Ito, Gilhousen501, and Adachi. *Id.* (citing Fischer II Decl. ¶ 172).

Petitioner acknowledges two differences between claims 34 and 66. *Id.* at 59. Petitioner asserts both are met by Ito. *Id.* (citing Fischer II Decl. ¶¶ 173–174). Patent Owner does not separately address Patent Owner's analysis of claim 66

We are persuaded by Petitioner's showing and find that the claim elements of claims 34 and 66 are disclosed by the teachings of Ito, Gilhousen501 and Adachi, and further, that Petitioner has presented a sufficient rationale (summarized *supra*) for combining those teachings with a reasonable expectation of success. IPR1644 Pet. 58–59. Based on Petitioner's analysis, summarized above, we find Petitioner has shown by a preponderance of evidence that claims 34 and 66 would have been obvious in light of Ito, Gilhousen501, and Adachi.

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, 12,

13, 18–21, 23, 25, 26, 34, 44, 45, 49–55, and 66 of the ’543 patent would have been obvious over Ito, Gilhousen501, and Adachi.

E. Other Grounds

As noted above in Section I.G, Petitioner presents additional challenges to claims 10, 12, 13, 18, 20, 21, 23, 25, 26, 34, 44, 45, 49, 51–55, and 66 of the ’543 patent. Because we determine that those claims are not patentable in light of Ito, Gilhousen501, and Adachi, for the reasons discussed above, we do not separately assess the patentability of those claims based on the remaining grounds 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 ’543 patent violates the U.S. Constitution.” PO Resp. 79.

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. 79.

V. CONCLUSION

For the foregoing reasons, we determine that Petitioner has demonstrated by a preponderance of the evidence that claims 10, 12, 13, 18–21, 23, 25, 26, 34, 44, 45, 49–55, and 66 of the ’543 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, 12, 13, 18–21, 23, 25, 26, 44, 45, 49–55	103(a)	Ito, Gilhousen501, Adachi ¹⁰	10, 12, 13, 18–21, 23, 25, 26, 44, 45, 49–55	
10, 12, 13, 18, 20, 21, 23, 25, 26, 44, 45, 49, 51–55	103(a)	Gilhousen761, Gilhousen501, Adachi		
34, 66	103(a)	Ito, Gilhousen501, Adachi ¹⁰	34, 66	

¹⁰ Because we determine that all of the challenged claims are unpatentable on these grounds, we decline to address the remaining grounds in the Petitions.

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34, 66	102(a)	Gilhousen761, Gilhousen501, Adachi		
Overall Outcome			10, 12, 13, 18–21, 23, 25, 26, 34, 44, 45, 49–55, 66	

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