

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

SAMSUNG ELECTRONICS CO., LTD. and
SAMSUNG ELECTRONICS AMERICA, INC.,
Petitioner,

v.

EMPIRE TECHNOLOGY DEVELOPMENT LLC,
Patent Owner.

IPR2024-00896
Patent 8,798,120 B2

Before NABEEL U. KHAN, SHARON FENICK, and
ANDREAS BALTATZIS, *Administrative Patent Judges*.

BALTATZIS, *Administrative Patent Judge*.

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

I. INTRODUCTION

Samsung Electronics Co., Ltd. and Samsung Electronics America, Inc. (collectively, “Petitioner”) filed a Petition requesting an *inter partes* review of claims 25–29 (the “challenged claims”) of U.S. Patent No. 8,798,120 B2 (Ex. 1001, “the ’120 patent”). Paper 3 (“Pet.”). Empire Technology Development LLC (“Patent Owner”) filed a preliminary response. Paper 11. With our authorization, Petitioner filed a preliminary reply (Paper 13) and Patent Owner filed a preliminary sur-reply (Paper 14). We instituted *inter partes* review under 35 U.S.C. § 314(a). Paper 15 (“Inst. Dec.”).

Patent Owner filed a patent owner response. Paper 19 (“PO Resp.”). Petitioner followed with a reply (Paper 22, “Pet. Reply”) and Patent Owner followed with a sur-reply (Paper 23, “PO Sur-Reply”). We held an oral hearing on September 17, 2025, a transcript of which is in the record. Paper 32 (“Tr.”).

We have jurisdiction under 35 U.S.C. § 6. This Final Written Decision is entered pursuant to 35 U.S.C. § 318(a). Having reviewed the complete trial record, we determine that Petitioner has shown, by a preponderance of the evidence, that challenged claims 25–28 are unpatentable. Petitioner has not shown that claim 29 is unpatentable.

II. BACKGROUND

A. *Real Parties in Interest*

Petitioner identifies Samsung Electronics Co., Ltd. and Samsung Electronics America, Inc. as the real parties in interest. *See* Pet. 1. Patent Owner identifies Empire Technology Development LLC as the real party in interest. Paper 9, 1.

B. Related Matters

The parties identify the following district court litigation involving the '120 patent: *Empire Technology Development LLC v. Samsung Electronics Co., Ltd., et al.*, No. 2:23-cv-00427 (E.D. Tex.) (“parallel litigation”). Pet. 1; Paper 9, 1.

C. The '120 Patent (Ex. 1001)

The '120 patent relates to methods and systems for “selecting a transmit mode in a communications system.” Ex. 1001, 2:12–14. The communication system may be capable of transmitting in a multiple-input multiple-output (“MIMO”) mode or a single-input multiple-output (“SIMO”) mode. *Id.* at 2:14–24, 2:32–39. “MIMO and SIMO systems may find use in a variety of applications including, but not limited to, wireless networks, cellular systems including 3G and 4G systems, such as 3GPP LTE-Advanced, local and wide area networks, and wireless broadband systems.” *Id.* at 1:29–33.

Figure 4 illustrates a communication system that can select between MIMO and SIMO modes and is reproduced below.

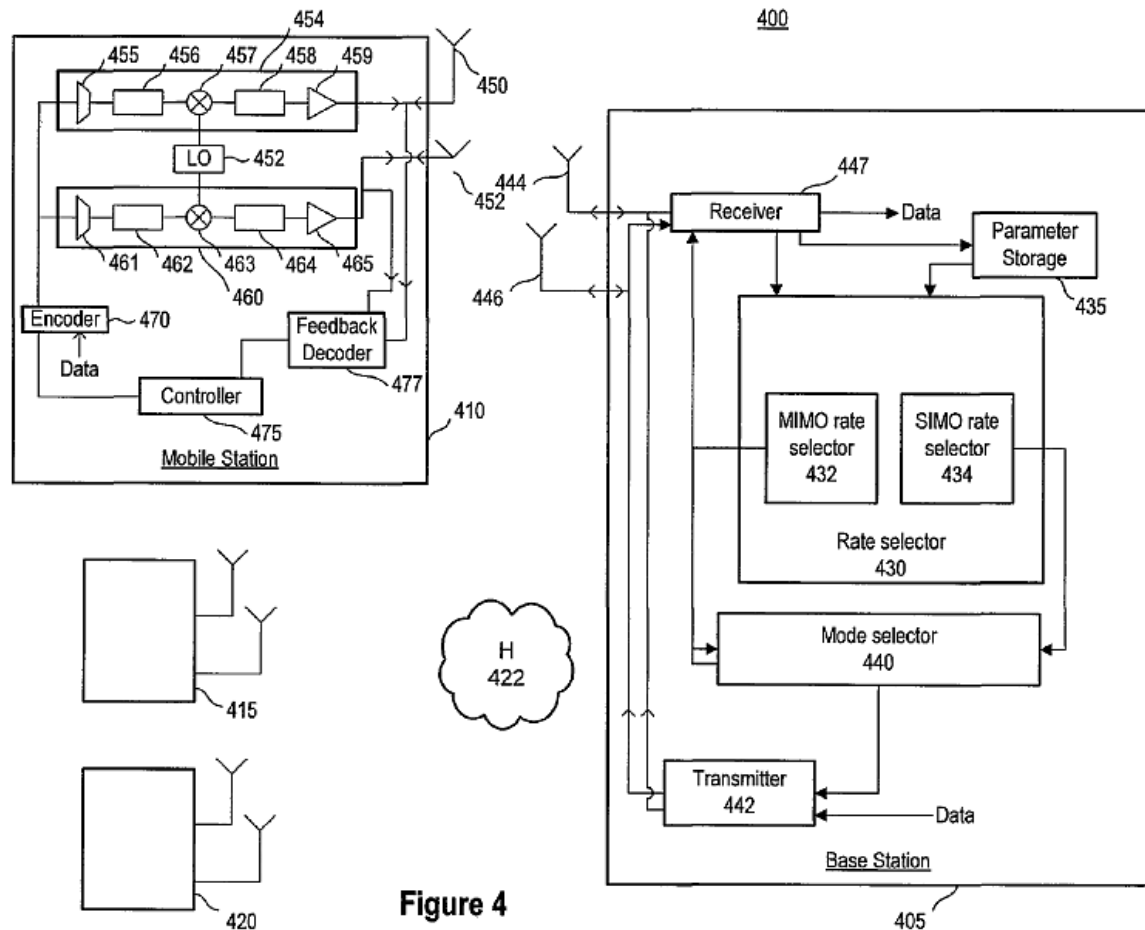


Figure 4

Figure 4 is a schematic illustration of a communication system. *Id.* at 1:55–57.

Figure 4 illustrates communications system 400 including base station 405 “configured to communicate” over communications channel 422 with mobile stations 410, 415, and 420. *Id.* at 7:1–8. Exemplary mobile stations include cellular phones, laptop computers, and “similar computing devices that are configured for MIMO/SIMO communications.” *Id.* at 10:50–62. Figure 4 shows details as to mobile station 410 that may be analogous to mobile stations 415 and 420. *See id.* at 7:36–38. For example, mobile station 410 includes controller 475 coupled to encoder 470 further coupled to first circuitry 454 and second circuitry 460. *Id.* at 7:18–30. “First circuitry 454 is coupled to the antenna 450 and configured to process signals

for transmission by the antenna 450.” *Id.* at 7:18–20. “Second circuitry 460 may be coupled to the antenna 452 and configured to process signals for transmission by the antenna 452.” *Id.* at 7:23–25. Controller 475 is configured to provide a signal to encoder 470 to operate in MIMO mode by using both antennas 450 and 452 or SIMO mode by using either antenna 450 or 452. *Id.* at 7:30–33, 11:44–50.

Base station 405 includes mode selector 440 coupled to rate selector 430 and transmitter 442. *Id.* at 7:8–12. Rate selector 430 may also be provided at mobile stations 410, 415, and 420. *Id.* at 8:10–12. In an example, rate selector 430 includes MIMO rate selector 432 and SIMO rate selector 434. *Id.* 7:8–10, 8:19–20. The rate selectors may be configured to calculate transmission rates based on an energy-optimized rate for each respective mode. *See id.* at 8:23–33. For example:

MIMO and SIMO rate selectors 432 and 434 may . . . make use of one or multiple parameters of the communications system 400 in calculating the first and second transmission rates, as generally described above, including, but not limited to, idle power consumption of one or more mobile stations, transmission circuitry power consumption of one or more mobile stations, number of users of the communications system, number of receive antennas at the base station or one or more mobile stations, and variations in the communications channel 422.

Id. at 8:34–43. “[I]dle time may include times during which the mobile station 410 is waiting to send data over the communications channel.” *Id.* at 8:55–58; *see also id.* at 2:60–62 (“The idle time is a time during which the transceiver may be waiting to send data over the communications channel”), 3:2–10.

D. Illustrative Claims

Independent claims 25 and 29 are representative of the challenged claims and are reproduced below.¹ Challenged claims 26–28 depend from claim 25.

25. [pre] A mobile station for use in a communications system comprising:

- [a] a first antenna and a second antenna;
- [b] first circuitry coupled to the first antenna and configured to process signals for transmission by the first antenna;
second circuitry coupled to the second antenna and configured to process signals for transmission by the second antenna; and
- [c] a controller coupled to the first and second circuitry, wherein the controller is configured to receive a control signal and,
- [d] in accordance with the control signal, to select between a multiple-input multiple-output (MIMO) mode wherein both the first and second antennas transmit data over a communications channel and a single-input multiple-output (SIMO) mode wherein only one of the first and second antennas transmit data over a communications channel,
- [e] wherein the control signal is based, at least in part, on a power consumption of the first and second circuitry,
- [f] wherein the control signal is based, at least in part, on an idle power consumption of the mobile station.

Ex. 1001, 19:1–20.

¹ We adopt Petitioner's bracketed identifiers.

29. [pre] A mobile station for use in a communications system comprising:

- [a] a first antenna and a second antenna;
- [b] first circuitry coupled to the first antenna and configured to process signals for transmission by the first antenna;
second circuitry coupled to the second antenna and configured to process signals for transmission by the second antenna; and
- [c] a controller coupled to the first and second circuitry, wherein the controller is configured to receive a control signal and,
- [d] in accordance with the control signal, to select between a multiple-input multiple-output (MIMO) mode wherein both the first and second antennas transmit data over a communications channel and a single-input multiple-output (SIMO) mode wherein only one of the first and second antennas transmit data over a communications channel,
- [e] wherein the control signal is based, at least in part, on a power consumption of the first and second circuitry,
- [f] wherein the control signal is based, at least in part, on a number of users of the communications system.

Id. at 20:3–24.

E. Asserted Evidence

Petitioner relies on the following references in its asserted grounds of unpatentability:

Name	Reference	Ex. No.
Li	US 2006/0067263 A1	1005
Wu	US 2007/0171808 A1	1009

Name	Reference	Ex. No.
Cui-2003	Shuguang Cui et al., <i>Modulation Optimization Under Energy Constraints</i> , 4 Institute of Electrical and Electronic Engineers International Conference on Communications 2805–2811 (2003)	1007
Tiirola	Esa Tiirola et al., <i>Performance of a UMTS Uplink MIMO Scheme</i> , 1 Institute of Electrical and Electronic Engineers 58 th Vehicular Technology Conference 657–661 (2003)	1008
Siam	Mohammad Z. Siam et al., <i>Adaptive Multi-antenna Power Control in Wireless Networks</i> , International Conference on Wireless Communications and Mobile Computing 875–880 (2006)	1006

F. Asserted Grounds

Petitioner asserts that claims 25–29 would have been unpatentable on the following grounds:

Claim(s) Challenged	35 U.S.C. § ²	Reference(s)/Basis
25, 27, 28	103(a)	Li, Siam
25, 27, 28	103(a)	Li, Siam, Cui-2003
26	103(a)	Li, Siam, Wu
26	103(a)	Li, Siam, Cui-2003, Wu
29	103(a)	Li, Siam, Tiirola

Petitioner supports its contentions with a declaration from Matthew C. Valenti, Ph.D. Ex. 1002. Patent Owner supports its contentions with a declaration from Robert Akl, D.Sc. Ex. 2022.

² The Leahy-Smith America Invents Act, Pub. L. No. 112-29, 125 Stat. 284 (2011) (“AIA”), included revisions to 35 U.S.C. §§ 102 and 103 that became effective on March 16, 2013, after the filing of the application to which the ’120 patent claims priority. *See* Ex. 1001, code (60). Therefore, we apply the pre-AIA versions of Sections 102 and 103.

III. ANALYSIS

A. Legal Standards

“In an [*inter partes* review], the petitioner has the burden from the onset to show with particularity why the patent it challenges is unpatentable.” *Harmonic Inc. v. Avid Tech., Inc.*, 815 F.3d 1356, 1363 (Fed. Cir. 2016) (citing 35 U.S.C. § 312(a)(3) (requiring *inter partes* review petitions to identify “with particularity . . . the evidence that supports the grounds for the challenge to each claim”)). This burden never shifts to Patent Owner. *See Dynamic Drinkware, LLC v. Nat’l Graphics, Inc.*, 800 F.3d 1375, 1378 (Fed. Cir. 2015) (citing *Tech. Licensing Corp. v. Videotek, Inc.*, 545 F.3d 1316, 1326–27 (Fed. Cir. 2008)) (discussing the burden of proof in *inter partes* review). Furthermore, Petitioner must explain with particularity how the prior art would have rendered the challenged claims unpatentable. 35 U.S.C. § 312(a)(3); 37 C.F.R. § 42.104(b)(4) (“The petition must specify where each element of the claim is found in the prior art patents or printed publications relied upon.”).

A claim is unpatentable under 35 U.S.C. § 103(a) if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious to a person having ordinary skill in the art to which said subject matter pertains. *See 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) objective evidence of nonobviousness.³ *See Graham v. John Deere Co. of Kan. City*, 383 U.S. 1, 17–18 (1966).

B. Level of Ordinary Skill in the Art

Petitioner argues that a person of ordinary skill in the art (“POSITA”) relevant to the challenged claims, as of the earliest claimed priority date, “would have had a bachelor’s degree in electrical engineering, computer science, computer engineering, or a related field, and two-to-three years of experience in the research, design, development, or testing of wireless data communication systems at the physical and media access control (MAC) layer.” Pet. 8 (citing Ex. 1002 ¶¶ 30–34).

Patent Owner does not oppose Petitioner’s definition of a person of ordinary skill in the art. *See* PO Resp.; *see also* Ex. 2022 ¶ 22 (adopting “Petitioners’ and Dr. Valenti’s proposed definition of a person of ordinary skill in the art.”)

On the complete record, we determine Petitioner’s proposed level of skill comports with the qualifications a person would have needed to understand and implement the teachings of the ’120 patent and the prior art of record.

C. Claim Construction

We construe claim terms according to the standard set forth in *Phillips v. AWH Corp.*, 415 F.3d 1303, 1312–17 (Fed. Cir. 2005) (en banc), i.e., as construed in a civil action under 35 U.S.C. § 282(b). *See* 37 C.F.R. § 42.100(b). Under *Phillips*, claim terms are afforded “their ordinary and customary meaning.” *Id.* at 1312. “[T]he ordinary and customary meaning of

³ Neither party presents arguments or evidence relating to objective evidence of nonobviousness.

a claim term is the meaning that the term would have to a person of ordinary skill in the art in question at the time of the invention.” *Id.* at 1313.

“Importantly, the person of ordinary skill in the art is deemed to read the claim term not only in the context of the particular claim in which the disputed term appears, but in the context of the entire patent, including the specification.” *Id.*

1. “*idle power consumption*”

Claim 25 recites “wherein the control signal is based, at least in part, on an idle power consumption of the mobile station.” Ex. 1001, 19:18–20. We preliminarily construed the plain and ordinary meaning of “idle power consumption” as “including power consumption during which the transceiver may be waiting to send data, whether the transceiver is on or off.” Inst. Dec. 25.

The parties informed us that, after the Institution Decision, the district court in the parallel litigation issued a final claim construction. Pet. Reply 2; PO Sur-Reply 3–5. The district court construed “idle power consumption” as “a power consumed by the mobile station when the mobile station is powered on and waiting to send.” Ex. 1050, 12. The parties propose that we construe the claims to match the district court’s final construction. *See* Pet. Reply 2; PO Sur-Reply 3; Tr. 26. We agree and adopt the district court’s final claim construction of “idle power consumption” as “a power consumed by the mobile station when the mobile station is powered on and waiting to send,” for the reasons set forth below.

Despite agreeing on adopting the district court’s claim construction, the parties disagree over the meaning of “waiting to send.” Patent Owner argues “when the mobile station is powered on *and waiting to send*, the transceivers must be idling and cannot be powered off.” PO Sur-Reply 6. In

other words, Patent Owner seeks to apply a construction of “power consumed when the mobile station *and first and second circuitry* [configured to process signals for transmission by an antenna] are powered on and waiting to send.”⁴ PO Resp. 12 (emphasis added); *see also* PO Sur-Reply 5 (quoting Ex. 1050, 12) (“idling requires the transceiver circuitry to be on and waiting to send but idling does not require ‘all the circuitry of the mobile station be turned on.’”). In response, Petitioner argues that “***nothing*** in the claims or specification ***requires*** ‘idle power consumption’ to mean the ‘first and second circuitry are powered on.’” Pet. Reply 2–3. We are not persuaded by Patent Owner’s argument that the correct claim construction for this term is limited in this way, based on our examination of the claim language, the Specification, and the prosecution history and extrinsic evidence cited by Patent Owner.

First, we consider the claim itself. Claim 25 recites a mobile station comprising a first and a second antenna, first and second circuitry, and a controller. *See* Ex. 1001, 19:1–20. The controller is configured to receive a control signal to select between MIMO and SIMO mode. *Id.* “[T]he control signal is based, at least in part, on a power consumption of the first and second circuitry, [and additionally] the control signal is based, at least in part, on an idle power consumption of the mobile station.” *Id.* at 19:16–20. Patent Owner does not identify any requirement in the plain meaning of “idle power consumption” that requires the first and second circuitry to be powered on. *See* PO Resp. 13 (“Petitioners’ expert admits that the plain and

⁴ Patent Owner refers interchangeably to powered- on circuits and transceivers for construing the claims. *See* PO Resp. 12–15. Accordingly, we refer to these together (e.g., “circuits or transceivers”) where appropriate. *See infra*.

ordinary meaning of the term ‘idle power consumption’ that would have been understood by a POSITA is the power consumed when the mobile station is idle.”)

Second, we consider the Specification. The Specification provides various disclosures relating to “idle power consumption.” *See* PO Resp. 13–14. Some of these disclosures refer to the transceivers. For example, “idle time is a time during which the transceiver may be waiting to send data over the communications channel.” Ex. 1001, 2:58–62. And “if the transmission rate is too slow, a greater number of transceivers may become idle, waiting to send transmissions over the communications channel. Even if the idling transceivers turn off their transmission chains, some idle power may be consumed due to leakage current or other effects.” *Id.* at 3:2–10. Other disclosures refer to the mobile station. For example, “idle time may include times during which the mobile station 410 is waiting to send data over the communications channel, such as waiting for a scheduled time to begin transmission.” *Id.* at 8:55–58.

Patent Owner argues that “the specification clearly states the scope of the invention by describing idling as when a ***transceiver is waiting to send data***.” PO Sur-Reply 6 (citing *On Demand Mach. Corp. v. Ingram Indus., Inc.*, 442 F.3d 1331, 1340 (Fed. Cir. 2006) (“[W]hen 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.”)). We disagree. Rather, the Specification provides different disclosures, at least one of which expressly refers to the idle time of the *mobile station* and thus mirrors the language of the claim. *See* Ex. 1001, 8:55–58. Accordingly, the construed mobile station powered on and waiting to send (without further limitation requiring the transceivers

not be powered off) is not “of broader scope than the invention set forth in the specification.” *See On Demand*, 442 F.3d at 1340.

As to the transceiver-specific disclosures, we decline to confine the claim to those embodiments. *See Phillips*, 415 F.3d at 1323 (“[A]lthough the specification often describes very specific embodiments of the invention, we have repeatedly warned against confining the claims to those embodiments.”); *see also Bayer AG v. Biovail Corp.*, 279 F.3d 1340, 1348 (Fed. Cir. 2002) (“[A] court may not read into a claim a limitation from a preferred embodiment, if that limitation is not present in the claim itself.”). In sum, the Specification does not support Patent Owner’s argument that the idle power consumption of the mobile station requires that the first and second circuitry, or the transceivers, be powered on.

Third, we consider the prosecution history. Patent Owner argues that the examiner found that the prior art did not teach “the limitations regarding the consideration of power during idle periods in the mode selection processing.” *See* PO Resp. 16 (citing Ex. 1004, 100, 153, 189). Patent Owner argues further that a “reasonable interpretation” of the examiner’s findings is that “the ‘sleep mode’ referenced in the prior art is distinct from the ‘idle time’ and ‘idle power consumption’ limitations found in claim 25.” *Id.* at 17 (citing Ex. 1004, 189; Ex. 2022 ¶ 54). We disagree. Patent Owner does not identify any express statements, made during prosecution, by the examiner or Patent Owner, particularly addressing the claimed idle power consumption of the mobile station as compared to a “sleep mode.” We are not persuaded that we should infer limitations based on the examiner’s reasons for allowance. Accordingly, we find the prosecution history less useful for claim construction than the claim language and Specification to support Patent Owner’s view. *See Phillips*, 415 F.3d at 1317.

Finally, we consider the extrinsic evidence and expert testimony of record. Patent Owner cites two technical dictionaries to support its argument that “‘idle’ refers to times when the circuitry of the device is powered on and waiting to transmit data.” PO Resp. 17 (citing Ex. 2018; Ex. 2019; Ex. 2022 ¶ 55). Patent Owner further argues that “Petitioners’ expert concedes that idle power consumption means that the circuits cannot be powered off.” PO Sur-Reply 10 (citing Ex. 1002 ¶ 86, n. 5; Ex. 2013, 49:20–50:7). We consider this evidence but treat it as “less reliable than the patent and its prosecution history in determining how to read claim terms.” *Phillips*, 415 F.3d at 1318. Accordingly, Patent Owner has not identified any persuasive reason in the extrinsic evidence to further limit the claims.

In conclusion, we construe “idle power consumption” as a power consumed by the mobile station when the mobile station is powered on and waiting to send. We are not persuaded by Patent Owner’s argument to further limit our “waiting to send” construction by requiring that the first and second circuits, or transceivers, are powered on.

2. Additional Claim Terms

For purposes of institution, we determine that no other claim terms require express construction. *See Nidec Motor Corp. v. Zhongshan Broad Ocean Motor Co.*, 868 F.3d 1013, 1017 (Fed. Cir. 2017) (citing *Vivid Techs., Inc. v. Am. Sci. & Eng’g, Inc.*, 200 F.3d 795, 803 (Fed. Cir. 1999) (“[O]nly those terms need be construed that are in controversy, and only to the extent necessary to resolve the controversy.”)).

D. Asserted Obviousness of Claims 25, 27, and 28 over Li and Siam

Petitioner argues that claims 25, 27, and 28 would have been obvious over Li and Siam. Pet. 24–44. Patent Owner disputes Petitioner’s contentions. PO Resp. 31–38.

1. *Li (Ex. 1005)*

Li relates to techniques for improving control and management of “wireless communication devices with multiple antennas [that] include a multiple-input-multiple-output (MIMO) modulation and/or coding system to control receiving and transmitting of RF signals through the multiple antennas.” Ex. 1005 ¶ 1.

Li’s wireless system is illustrated in Figure 1, reproduced below.

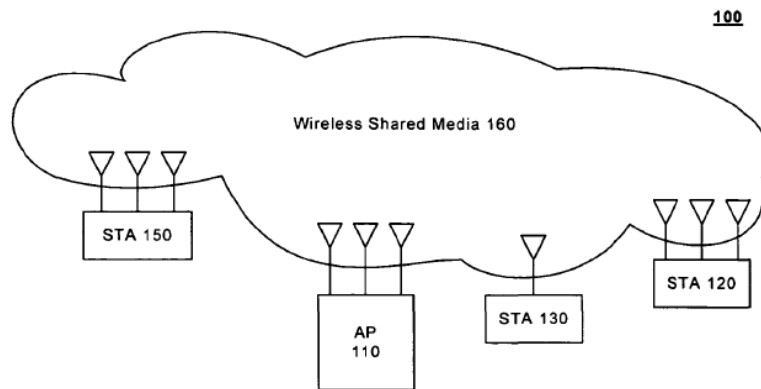


Figure 1 illustrates a block diagram of a wireless communication system. *Id.* ¶ 2.

Li explains that wireless communication system 100 may include access point (AP) 110 and various stations, STA 120, STA 130, and STA 150, all arranged to communicate information signals using wireless shared media 160. *Id.* ¶ 12. The stations “may operate in multiple operating modes.” *Id.* ¶ 17. The operating modes include a “single-input-single-output (SISO) mode, a multiple-input-single-input (MISO) mode, a single-input-multiple-output (SIMO) mode, and/or in a MIMO mode.” *Id.* “In a SIMO operating mode, one transmitter and two or more receivers may be used to communicate information signals over wireless shared media. In a MIMO operating mode, two or more transmitters and two or more receivers may be used to communicate information signals over wireless shared media.” *Id.*

Li discloses that:

One problem associated with wireless communication devices using carrier sense multiple access/collision detection (CSMA/CD) techniques (e.g., 802.11) is power consumption. For example, a station in idle mode waiting for incoming signals may consume approximately 60% of its battery energy. This inefficient use of energy may be exacerbated by MIMO devices, since more than one antenna may be turned on for reception. The power consumed by low noise amplifiers and analog-to-digital converters may be multiplied by the number of antennas. As a result, a station may use less than 20% of its battery energy for communicating actual traffic.

Id. ¶ 18.

Li describes methods for solving the power consumption problem by switching a station's operating mode. *Id.* ¶ 19. More specifically, Li describes AP 110 sending "a request over wireless shared media 160 to switch STA 120 and STA 150 to a SISO or MIMO operating mode, if desired. STA 120 and STA 150 may acknowledge the request and may enable an operation of desired number of receivers and transmitters of the MIMO receivers-transmitters system." *Id.* According to Li, "[i]n this manner, power consumption for STA 120 and STA 150 may be reduced, thereby extending the battery life for STA 120 and STA 150." *Id.*

2. *Siam (Ex. 1006)*

Siam relates to a power-controlled channel access protocol for MIMO-capable wireless local area networks (LANs) with two antennas per node. Ex. 1006, 875 (Abstr.). Siam describes modifying "the classic CSMA/CA access scheme" by dynamically adjusting "the 'transmission mode' and the transmission power on a per-packet basis so as to minimize the total energy consumption." *Id.* Siam's transmission modes are "one of the four possible transmit/receive antenna configurations: 1×1 (SISO), 2×1

(MISO), 1×2 (SIMO), and 2×2 (MIMO).” *Id.* Siam explains that “[w]hile the MIMO mode requires less RF transmission energy than the other three modes, it also incurs the highest circuit energy consumption. Depending on the transmitter-receiver distance, any of the four modes can be the ‘optimal’ one in terms of minimizing the *total* energy consumption.” *Id.*

3. Reason to Combine Li and Siam

Petitioner asserts one of ordinary skill in the art “would have been motivated to combine Li and Siam (‘Li-Siam’), and would have had a reasonable expectation of success in doing so.” Pet. 24. Petitioner argues both references “describe systems that select an optimal data communication mode in a wireless communication system, from among SISO, MISO, SIMO, and MIMO modes, in order to reduce the total energy consumption of the system.” *Id.* (citing Ex. 1005 ¶¶ 18–19; Ex. 1006, 875; Ex. 1002 ¶¶ 85–89). Petitioner adds “Siam’s protocol expressly takes into consideration both radio frequency (RF) transmission power (i.e., what is radiated) and circuit power consumption (i.e., what is dissipated as heat).” *Id.* at 25–26 (citing Ex. 1006, 875–876).

Petitioner argues one skilled in the art “would have been motivated to improve Li’s mode-switching system by adding Siam’s teaching that expressly considers transmission and circuit power consumption to select an optimal transmit mode between SIMO and MIMO (or SISO and MISO) at the mobile station to minimize battery power consumption.” Pet. 26 (citing Ex. 1002 ¶¶ 90–91). And Petitioner argues one skilled in the art “would have had a reasonable expectation of success in combining the teachings of Li and Siam because they teach compatible systems—namely, electronic devices operating in accordance with IEEE 802.11 standard protocols or other data

communications standards for wireless communication systems.” *Id.* at 26–27 (citing Ex. 1005 ¶¶ 12, 18–25; Ex. 1006, 875–78; Ex. 1002 ¶ 92).

Patent Owner responds that “Petitioners’ purported motivation is conclusory, unsupported by the evidence, and based on hindsight.” PO Resp. 32 (citing Ex. 2022 ¶ 81). First, Patent Owner contrasts Li’s wireless communication system from Siam’s academic paper describing a computer simulation. *Id.* Second, Patent Owner argues that Petitioner does not explain “why modifying Li would improve the functionality over what is expressly disclosed in each prior art reference.” *Id.* at 32–33 (citing Ex. 2022 ¶ 83). Specifically, “[e]ven if Li identified and solved a problem with respect to power consumption in idle mode and even if Siam identified and solved a problem with respect to circuit power consumption, neither of which is true, there are many ways of solving these problems” other than the claimed solution *Id.* at 33 (citing Ex. 2022 ¶ 84).

Petitioner replies that “[a]lthough Li addresses *idle* power consumption, a POSITA would have recognized that Siam’s E-BASIC protocol teaches optimization of *total* power consumption per transmitted bit by also considering *circuit power consumption*, which promotes Li’s overall goal to maximize use of the battery for actual data transmission.” Pet. Reply 10 (citing Ex. 1005 ¶ 18; Pet. 24–26; Ex. 1002 ¶¶ 87–91). Petitioner argues that the combination improves Li to address more than one issue, i.e., idle power consumption and power consumption while transmitting. *See id.* at 9–10 (citing *Honeywell Int’l Inc. v. 3G Licensing, S.A.*, 124 F.4th 1345, 1353–54 (Fed. Cir. 2025)). As to combining Li’s system with Siam’s simulation, Petitioner argues that “[t]here is no requirement that printed publications must describe physically realized systems in order to teach a POSITA to

modify a primary reference like Li.” *Id.* at 11 (citing *In re Keller*, 642 F.2d 413, 425 (CCPA 1981); *KSR*, 550 U.S. at 421; Ex-2013, 75:11–77:6).

Patent Owner replies that “neither Li nor Siam considers power consumption when not transmitting, nor is there any suggestion to consider idle power consumption in a control signal for purposes of mode selection.” PO Sur-Reply 11. More specifically, “Li purports to solve the power consumption problem without mention of power consumption when not transmitting . . . and Siam also fails to consider idle power consumption.” *Id.* at 12 (citing Ex. 1005 ¶ 19). Accordingly, Patent Owner argues that “[n]o POSITA would assume that Li is purporting to solve a problem it does not describe . . . and no POSITA would have combined Li and Siam to create a system that uses a control signal based in part on the idle power consumption of the mobile station.” *Id.* (citing Ex. 2022 ¶¶ 83, 84).

On the full record, we find that a preponderance of the evidence supports Petitioner’s argument that one skilled in the art would have been motivated to combine Li and Siam to reduce total power consumption including idle power consumption (Li) and circuit power consumption (Siam). Both Li and Siam describe a need for reducing energy consumption in wireless devices. *See* Ex. 1005 ¶ 18; Ex. 1006, 875–76. Both references further describe switching from MIMO mode to another operating mode to reduce power consumption and optimize battery life. *See* Ex. 1005 ¶ 19; Ex. 1006, 875 (“[W]e dynamically adjust the ‘transmission mode’ . . . so as to minimize the total energy consumption.”). In sum, the references teach the same technique, i.e., mode switching, to achieve the same goal, i.e., reducing energy consumption, in similar devices, i.e., wireless devices. *See KSR*, 550 U.S. at 417 (“[I]f a technique has been used to improve one device, and a person of ordinary skill in the art would recognize that it would

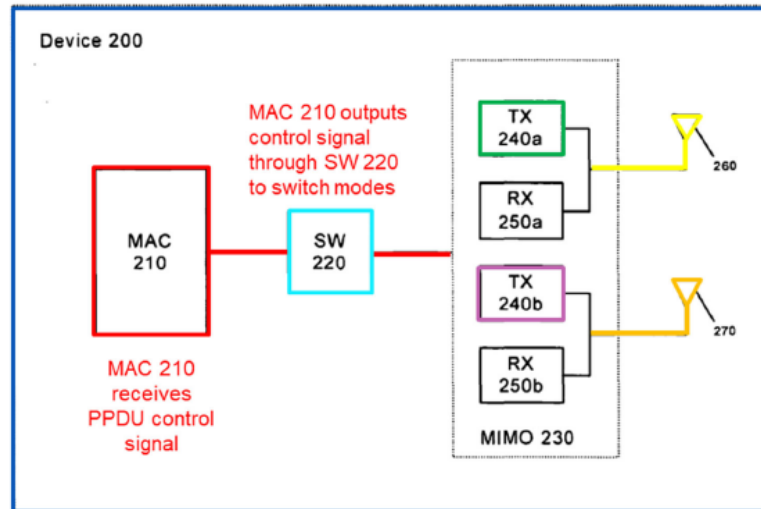
improve similar devices in the same way, using the technique is obvious unless its actual application is beyond his or her skill.”). Accordingly, we are persuaded by Petitioner’s argument and evidence that one skilled in the art would have combined the Li and Siam with a reasonable expectation of success in doing so. *See* Ex. 1002 ¶¶ 91, 92.

4. *Analysis of Claim 25*

a) *Preamble and Limitations 25[a]–25[d]*

Petitioner asserts Li teaches or suggests a mobile station (*see* claim 25 preamble) including a first and a second antenna (*see* limitation 25[a]), and first and second circuitry, coupled to the first and second antenna, configured to process signals for transmission by the first and second antenna, respectively (*see* limitation 25[b]). Pet. 27–31 (citing Ex. 1005 ¶¶ 1, 13–15, 20, 21, 23, 52, 56, Figs. 1, 2; Ex. 1002 ¶¶ 93–98). Petitioner further asserts Li teaches or suggests a controller coupled to the first and second circuitry, configured to receive a control signal (*see* limitation 25[c]) and select between a MIMO mode “wherein both the first and second antennas transmit data” and a SIMO mode “wherein only one of the first and second antennas transmit data” (*see* limitation 25[d]). *Id.* at 31–36 (citing Ex. 1005 ¶¶ 1, 17, 19, 20, 24, 25, 27, 30, Fig. 2; Ex. 1002 ¶¶ 47–51, 99–108).

Petitioner illustrates Li’s mobile station in annotated Figure 2, reproduced below.



Pet. 34. Annotated Li Figure 2 illustrates a block diagram of a wireless device. *See* Ex. 1005 ¶ 3.

Petitioner annotates Li’s Figure 2 as device 200 (dark blue) representing mobile station STA 150 (not identified in Figure 2), including “transmitter circuitry 240a (green) that is ‘operatively coupled’ to first antenna 260 (yellow) and transmitter circuitry 240b (purple) that is ‘operably coupled’ to second antenna 270 (orange).” Pet. 29–30 (citing Ex. 1005 ¶¶ 21, 23, Fig. 2). Additionally, first antenna 260 is coupled to receiver 250a and second antenna is coupled to receiver 250b. Ex. 1005 ¶ 21. Petitioner further annotates Figure 2 as including “Media Access Control (MAC) processor 210 (red)” that is a controller that “outputs a control signal to cause the system ‘to switch between a first operating mode’ and ‘a second operating mode,’ using switch 220 (teal).” Pet. 31–33 (citing Ex. 1005 ¶¶ 19, 24, 25 27, 30, Fig. 2).

Patent Owner does not dispute that Li teaches the preamble and limitations 25[a]–25[d] of claim 25. *See* PO Resp. 34–38. Based on the entire record, we find that Petitioner has shown by a preponderance of the

evidence that Li teaches the preamble⁵ and limitations 25[a]–25[d] of claim 25.

b) Limitations 25[e] and 25[f]

Claim 25 recites (25[e]) “wherein the control signal is based, at least in part, on a power consumption of the first and second circuitry,” and (25[f]) “wherein the control signal is based, at least in part, on an idle power consumption of the mobile station.” Ex. 1001, 19:16–20.

Petitioner asserts the combination of Li and Siam teaches or suggests the claimed control signal limitations. Pet. 36–43. Specifically, Petitioner asserts that “Siam expressly teaches consideration of transmitter circuit power during transmission including during the switch from SIMO to MIMO mode” (*id.* at 37) and “Li teaches that the control signal is based, at least in part, on an idle power consumption of the entire mobile station” (*id.* at 41). We consider each of these arguments in turn.

(1) “power consumption of first and second circuitry”

Petitioner asserts that “Siam teaches a protocol that explicitly selects between SIMO and MIMO (and SISO and MISO) transmission modes in a MIMO-capable wireless network based on consideration of both transmission power and circuit power.” Pet. 37–38 (citing Ex. 1006, 875–76). Petitioner further asserts “Siam’s protocol uses a multi-antenna link layer model” and provides an algorithm that incorporates the number of transmitter and receiver antennas, and transmission power and circuit power, whereby “circuit power . . . increases with each additional transmitter and receiver.” *Id.* at 38–39 (citing Ex. 1006, 876–877; Ex. 1002 ¶¶ 112–116).

⁵ Because Petitioner has sufficiently shown that the prior art teaches the preamble, we need not determine whether the preamble is limiting. *See Nidec*, 868 F.3d at 1017.

Petitioner cites Siam’s conclusion that “MIMO may not lead to the minimum total power consumption due to the large value of circuit power [A]t short distances, SISO is more power efficient than MIMO For intermediate distances, SIMO or MISO may be more power efficient.” *Id.* at 39 (citing Ex. 1006, 377) (emphasis omitted).

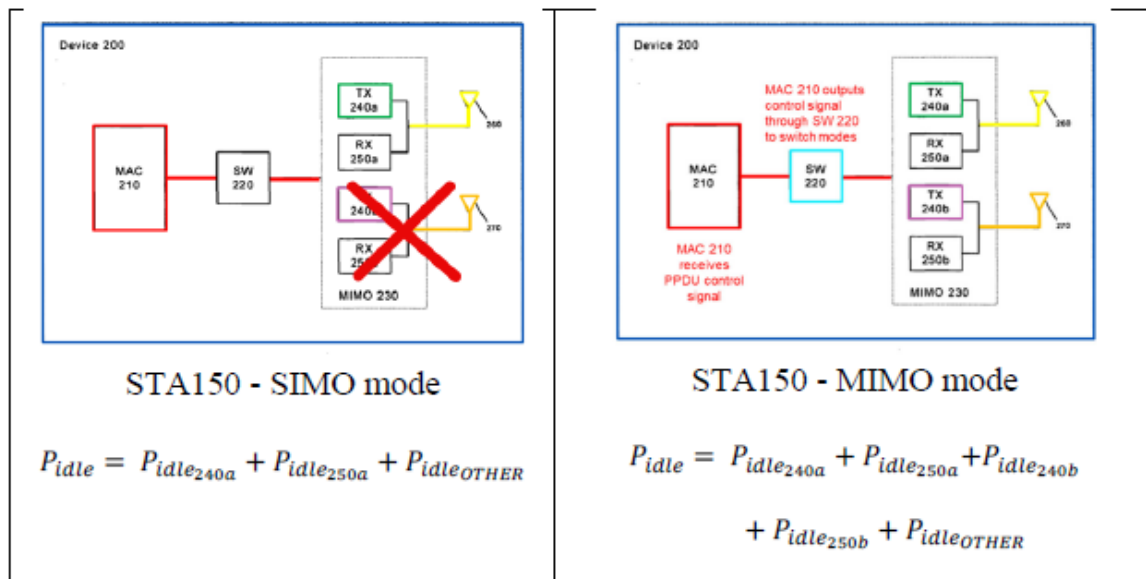
Patent Owner does not dispute Petitioner’s argument that the combination of Li and Siam teaches limitation 25[e] “the control signal is based, at least in part, on a power consumption of the first and second circuitry.” *See* PO Resp. 34–38.

On the full record, we are persuaded by Petitioner’s argument and evidence that the combination of Li and Siam teaches or suggests a control signal based, at least in part, on a power consumption of the first and second circuitry. As discussed above, Li teaches a control signal for switching between operating modes. *See* Ex. 1005, ¶¶ 19, 24, 25. Siam teaches a protocol that selects operating modes, including SIMO and MIMO, based on power consumption of the first and second circuitry. *See* Ex. 1006, 875. Specifically, Siam teaches “MIMO may not lead to the minimum total power consumption due to the large value of circuit power” and that other operating modes may be more efficient in different scenarios when comparing circuit power to transmission power. Ex. 1006, 876. Given that both Li and Siam seek to maximize power efficiency by selecting the appropriate operating mode, we agree with Petitioner that “a POSITA would have been motivated to implement Siam’s teachings that circuit power consumption should be considered, at least in part, when selecting between a SIMO and MIMO transmission mode with Li’s system, and would have had a reasonable expectation of success in doing.” Pet. 40 (citing Ex. 1002 ¶ 118).

(2) “idle power consumption of the mobile station”

Petitioner asserts “Li teaches that ‘a station *in idle mode* waiting for incoming signals may consume approximately 60% of its battery energy’ and that such idle power consumption is particularly a problem in MIMO configurations where multiple antennas and their associated circuitry are enabled.” Pet. 41 (citing Ex. 1005 ¶ 18). Petitioner further asserts one skilled in the art “would have recognized that the overall idle power consumption for the mobile station is the sum of all the transmit and receiver idle power consumption for each activated antenna in MIMO mode plus all of the control circuitry (e.g., MAC 210 and other control circuits).” *Id.* (citing Ex. 1002 ¶¶ 56, 120–122). Accordingly, Petitioner asserts that switching to SIMO mode would turn off Li’s idling transmitter circuit in the mobile station (assuming the receiver is off), so that the idling circuits no longer contribute to station idle power consumption. *Id.* (citing Ex. 1002 ¶ 122).

Petitioner illustrates the “difference in MIMO and SIMO station idle power” in the figure below.



Pet. 42. The annotated figure includes two side-by-side versions of Li's mobile station in SIMO and MIMO mode, accompanied with Dr. Valenti's equations for idle power consumption of each mode. *See* Ex. 1002 ¶ 122.

Li's mobile station in MIMO mode includes antenna 260 coupled to transmitter 240a and receiver 250a, and antenna 270 coupled to transmitter 240b and receiver 250b. Pet. 42. Petitioner illustrates Li's mobile station in SIMO mode by crossing-out (red X) antenna 270, transmitter 240b, and receiver 250b. *Id.* Petitioner argues "Li teaches that AP 110 may send a control signal to STA 150 to switch between SIMO and MIMO" thereby reducing power consumption of the mobile station and extending its battery life. *Id.* at 42 (citing Ex. 1005 ¶ 19); *see* Ex. 1002 ¶¶ 122–124. Petitioner combines this teaching with Siam's "algorithm that expressly takes circuit power into account when selecting between a SIMO and MIMO mode," to assert that "a POSITA would have understood and been motivated to configure Li's control signal for switching communication modes to also be based at least in part on overall circuit power consumption, and more precisely, on circuit power consumed while the mobile station is idle and not receiving or transmitting." *Id.* at 42–43 (citing Ex. 1006, 877).

Patent Owner argues "Li ***does not teach selecting*** a SIMO or MIMO mode in accordance with a control signal based, at least in part, on an idle power consumption of the device." PO Resp. 34–35 (citing Ex. 2022 ¶ 87). More specifically, Patent Owner argues that "Li only mentions idle mode to identify the problem of power consumption but offers no teaching or suggestion about the possible use of idle mode," particularly for power consumption, mode selection, or with respect to a control signal. *Id.* at 35 (citing Ex. 1005 ¶ 18; Ex. 2022 ¶ 87; Ex. 2013, 68:14–69:3, 69:11–19). "Instead, Li teaches that the base station requests that the device switch from

a SISO or MISO operating mode to a SIMO or MIMO operating mode,” but “does not specify that the selection is in accordance with a control signal based, at least in part, on idle power consumption.” *Id.* (citing Ex. 1005 ¶¶ 19–24, 35, 43). Patent Owner further argues “Li does not provide any criteria to determine when mode switching should occur or identify the inputs used in determining mode switching.” *Id.* at 35–36 (citing Ex. 1005 ¶¶ 24–25, 31).

Patent Owner further argues Petitioner does “not point to any disclosure of mode selection in Siam relating to a control signal based, at least in part, on idle power consumption.” *Id.* at 36–37. Patent Owner argues that, rather than discuss idle time, Siam’s “references to variation in circuit power are based on transmitter-receiver *distance*.” *Id.* at 37.

Petitioner replies that Patent Owner does not address the combined references. Pet. Reply 12 (citing *Keller*, 642 F.2d at 425). Petitioner argues that “[b]ecause Li recognizes the problem of circuit power consumption while the transceiver is *idle* and addresses it with a signal that switches transmission modes, the Li-Siam *combination* teaches considering circuit power while idle in selecting a transmission mode.” *Id.* (citing Ex. 1005 ¶¶ 18, 19; Pet. 40–43; Ex. 1002 ¶¶ 119–124) (citations omitted). Petitioner further argues that Patent Owner’s “argument that Li does not disclose ‘inputs or variables’ ([PO Resp.], 35–36) fails to account for Siam’s disclosure of how much power is consumed in circuitry (whether idle or transmitting).” *Id.* (citing Ex. 1006, 876–77).

Patent Owner replies that “[i]t is unrebutted that Li does not disclose how ‘idle mode’ could be used for power consumption, how ‘idle mode’ could be relevant to mode selection, or how ‘idle mode’ might be considered with respect to a control signal received by the mobile station.” PO Sur-

Reply 13–14 (citing Ex. 2022 ¶ 87; Ex. 2013, 69:11–19). Moreover, Patent Owner argues that “Li’s single reference to ‘idle mode’ offers no teaching or suggestion about incorporating the possible use of the power consumed while idling,” nor selecting a mode. *Id.* at 14 (citing Ex. 1005 ¶¶ 18, 24; Ex. 2013, 68:14–69:8). Patent Owner concludes that Siam does not teach idle power and “there would have been no indication to a POSITA that combining [Li and Siam] could or would introduce consideration of idle power consumption.” *Id.* at 14–15 (citing Ex. 2022 ¶ 90).

On the full record, we are persuaded by Petitioner’s argument and evidence that the Li-Siam combination teaches or suggests a control signal based, at least in part, on an idle power consumption of the mobile station. We recognize Patent Owner’s argument that Li includes a single reference to “idle mode.” We disagree, however, with Patent Owner’s argument isolating Li’s discussion of “idle mode” from the reference as a whole. *See In re Gorman*, 933 F.2d 982, 986 (Fed. Cir. 1991) (“[T]he test is whether the teachings of the prior art, taken as a whole, would have made obvious the claimed invention.”).

Both Li and Siam, as a whole, address the problem of power consumption in wireless devices. *See* Ex. 1005 ¶¶ 18, 19, 43; Ex. 1006, 875–77. Both references further teach switching between operating modes to minimize power consumption. *See id.* In this context, Li suggests “a station in idle mode waiting for incoming signals” as a particular problem—exacerbated by MIMO devices—to be solved by switching modes. *See* Ex. 1005 ¶¶ 18, 19. Li further teaches a method for doing so by sending a control signal to change operating modes. *See id.* ¶¶ 24, 25. Accordingly, Li at least suggests changing from MIMO mode to SIMO mode in an idle device waiting for signals, thereby reducing the number of antennas turned

on for reception. *See* Ex. 1002 ¶ 122. “[A] reference must be considered not only for what it expressly teaches, but also for what it fairly suggests.” *In re Baird*, 16 F.3d 380, 383 (Fed. Cir. 1994) (cited by *Bradium Techs. LLC v. Iancu*, 923 F.3d 1032, 1049 (Fed. Cir. 2019)).

To the extent Li does not teach inputs or other variables relevant to power consumption, Siam provides those teachings. *See* Ex. 1006, 876–77. We agree with Petitioner that one skilled in the art, seeking to minimize power consumption, would have considered the inefficient energy use in idle mode along with Siam’s transmission and circuit power, when switching between operating modes, including SIMO and MIMO mode. *See* Ex. 1002 ¶¶ 122, 123).

c) Conclusion as to Claim 25

Based on our review of the complete trial record, we determine that Petitioner establishes by a preponderance of the evidence that independent claim 25 would have been obvious over Li and Siam.

5. Claims 27 and 28

Petitioner presents evidence that the Li-Siam combination teaches the limitations of claims 27 and 28. Pet. 43–44 (citing Ex. 1002 ¶¶ 125–128; Ex. 1005 ¶¶ 19, 25; Ex. 1006, 877). Patent Owner does not present additional arguments for these claims. *See* PO Resp. 38 (relying on the same arguments as to claim 25).

Based on the evidence presented in the Petition and for the reasons discussed above for claim 25, we determine that Petitioner has shown by a preponderance of evidence that claims 27 and 28 of the ’120 patent would have been obvious over Li and Siam.

E. Asserted Obviousness of Claims 25, 27, and 28 over Li, Siam, and Cui-2003

Petitioner argues that claims 25, 27, and 28 would have been obvious over Li, Siam, and Cui-2003. Pet. 45–53. Patent Owner disputes Petitioner’s contentions. PO Resp. 38–51.

1. Cui-2003 (Ex. 1007)

Cui-2003 relates to “radio applications where the nodes operate on batteries so that energy consumption must be minimized while satisfying given throughput and delay requirements.” Ex. 1007, 2805 (Abstr.). To this end, Cui-2003 analyzes “the best modulation strategy to minimize the total energy consumption” including “both the transmission energy and the circuit energy consumption.” *Id.*

Cui-2003 assumes “that the transceiver circuitry works on a multimode basis: when there is a signal to transmit all circuits work in active mode, when there is no signal to transmit they work in sleep mode, and when switching from sleep mode to active mode there is a transient mode.” *Id.* at 2806. According to Cui-2003, “[t]he multi-mode operation provides a significant saving of energy when the sleep mode is deployed.” *Id.*

Cui-2003 describes the total energy consumption as consisting of the combined power consumption of the active mode, sleep mode, and transient mode. *Id.* “The active mode power P_{on} comprises the transmission signal power P_t and the circuit power consumption P_{co} in the whole signal path.” *Id.* “In the sleep mode, the power consumption is dominated by the leaking current I_l of the switching transistors if the circuitry is properly designed.” *Id.*

2. *Reason to Combine Li, Siam, and Cui-2003*

Petitioner asserts one skilled in the art “would have been motivated to combine Li-Siam and Cui-2003 (‘Li-Siam-Cui-2003’) and would have had a reasonable expectation of success in doing so.” Pet. 45. Petitioner contends that all three references “describe systems that select an optimal data communication mode in a wireless communication system, from among SISO, MISO, SIMO, and MIMO modes, in order to reduce the total energy consumption of the system.” *Id.* (citing Ex. 1005 ¶¶ 18–19; Ex. 1006, 875; Ex. 1007, 2805; Ex. 1002 ¶¶ 130–132).

Petitioner asserts “Cui-2003 further improves the method for selecting the best transmission mode for ‘minimizing the total energy consumption’” by transitioning between active mode and sleep mode. *Id.* at 45–46 (citing Ex. 1007, 2805, 2806; Ex. 1002 ¶ 133). Petitioner further asserts one skilled in the art “would have been motivated to improve Li-Siam’s mode-switching system by adding Cui-2003’s express teaching that power consumption during sleep (i.e., idle) mode should be expressly considered in determining the most efficient modulation strategy.” *Id.* at 46 (citing Ex. 1002 ¶¶ 56, 134). In the resulting combination:

Li’s PPDU message (a control signal) received by Li’s MAC 210 for switching communication modes would be based on both Siam’s teaching that both transmission power and circuit power should be considered and Cui-2003’s teaching that power expended in a sleep (i.e., idle) mode should also be considered when selecting the optimal communication mode.

Id. (citing Ex. 1002 ¶ 134). Petitioner also contends that one skilled in the art would have had a reasonable expectation of success in combining the teachings because they are compatible systems that “address the problem of

inefficient power consumption in wireless communication networks in similar and predictable ways.” *Id.* at 47 (citing Ex. 1002 ¶ 136).

Patent Owner responds that Petitioner has not demonstrated that one skilled in the art would have combined Li, Siam, and Cui-2003. PO Resp. 38–41. First, Patent Owner repeats its prior arguments as to the lack of reason to combine Li and Siam. *See id.* at 38–40. We are not persuaded by those arguments for the reasons set forth above in Section III.D.3.

Second, Patent Owner argues that Petitioner’s motivation to combine Li, Siam, and Cui-2003 “is also conclusory, unsupported by the evidence, and based on hindsight.” *Id.* at 40 (citing Ex. 2022 ¶ 98). Specifically, Patent Owner argues that “[a] POSITA would not have considered the power expended in sleep mode to be relevant to transmission mode selection since Cui-2003 sets the power consumed in sleep mode to zero.” *Id.* at 41 (citing Ex. 2022 ¶ 98). Further, Patent Owner argues that “Petitioners provide no explanation for why in a combined Li-Siam system a POSITA would have thought that considering the power consumption in Cui-2003’s sleep mode would improve Li-Siam’s system.” *Id.* (citing Ex. 2022 ¶ 99).

On the full record, we find that a preponderance of the evidence supports Petitioner’s argument that one skilled in the art would have been motivated to combine Li and Siam with Cui-2003 to reduce total power consumption. As discussed above, both Li and Siam describe switching from MIMO mode to another operating mode to reduce power consumption and optimize battery life. Cui-2003 similarly describes a modulation strategy to minimize energy consumption including both transmission energy and circuit energy consumption. Ex. 1007, 2805 (“[T]o find the optimal transmission scheme, the overall energy consumption including both transmission and circuit energy consumption needs to be considered.”). Cui-

2003 further teaches that a multi-mode operation, including switching between active mode and sleep mode, “provides a significant saving of energy when the sleep mode is deployed.” *Id.* at 2806. In sum, the references teach the same technique, i.e., mode switching, to achieve the same goal, i.e., reducing energy consumption, in similar devices, i.e., wireless communication systems. *See KSR*, 550 U.S. at 417. Accordingly, we are persuaded by Petitioner’s argument and evidence that one skilled in the art would have combined the Li, Siam, and Cui-2003 with a reasonable expectation of success in doing so. *See Ex. 1002 ¶¶ 134–136.*

3. *Analysis of Claim 25*

Petitioner asserts Li and Siam teach the preamble and limitations 25(a)–25(e) of claim 25. *See Pet. 48–49.* Patent Owner does not dispute that Li and Siam teach the preamble and limitations 25[a]–25[e]. PO Resp. 38–51. Based on the entire record, we find that Petitioner has shown by a preponderance of the evidence that Li and Siam teach the preamble and limitations 25[a]–25[e]. *See supra*, Section III.D.4(a),(b)(1).

Petitioner cites Cui-2003, in combination with Li and Siam, as discussed above, as improving the determination of the control signal used to select the mode, thus teaching limitation 25(f) “wherein the control signal is based, at least in part, on an idle power consumption of the mobile station.” *Id.* at 49–52.

Specifically, Petitioner asserts Cui-2003 teaches a “multi-mode operation” because “when there is a signal to transmit all circuits work in active mode, ***when there is no signal to transmit they work in sleep mode***, and when switching from sleep mode to active mode there is a transient mode.” *Id.* at 50 (citing Ex. 1007, 2806). According to Petitioner “[t]his

‘multi-mode operation’ allows significant energy to be saved when the sleep mode is used.” *Id.* (citing Ex. 1007, 2806; Ex. 1002 ¶¶ 145–146).

Petitioner further asserts one skilled in the art “would have understood that ‘sleep mode’ means a mode in which the mobile station is idle and not actively transmitting or receiving data but that mobile stations in sleep mode may nevertheless continue to consume power since they are not completely shut down.” Pet. 51 (citing Ex. 1002 ¶¶ 56, 147). Petitioner concludes “Cui-2003 bases modulation selection, in part, on the idle power consumption of a wireless node,” and when combined with Li and Siam would have resulted in a control signal “based, at least in, on an idle power consumption of the mobile station.” *Id.* at 52 (citing Ex. 1002 ¶ 147). “In the combined Li-Siam-Cui-2003 system, Li’s PPDU message (a control signal) received by Li’s MAC 210 for switching communication modes would be based on both Siam’s teaching that both transmission power and circuit power should be considered and Cui-2003’s teaching that power expended in a sleep (i.e., idle) mode should also be considered when selecting the optimal communication mode.” *Id.* at 46 (citing Ex. 1002 ¶ 134).

Patent Owner responds that “Cui-2003 describes a ‘sleep mode,’ not an idle mode, and it certainly does not teach or suggest a ‘control signal based, at least in part, on an idle power consumption of the mobile station.’” PO Resp. 42 (citing Ex. 2022 ¶ 101). Specifically, Patent Owner explains that in Cui-2003’s sleep mode “all the circuits in the signal path ***are shut down*** for energy saving.” *Id.* at 43 (citing Ex. 1007, 2806). Accordingly, Cui-2003 sets the sleep mode power consumption to zero, as sleep mode does not consume significant processing and transceiver power. *Id.* (citing Ex. 1007, 2806; Ex. 2013, 100:7–14).

Patent Owner further distinguishes Cui-2003’s sleep mode from the claimed “idle power consumption” “because there is almost no power consumption in sleep mode, whereas the ’120 Patent is focused on the power consumed while idling since it may be significant.” PO Resp. 44 (citing Ex. 2022 ¶ 104). Patent Owner also argues that “the ’120 Patent recognizes that the ‘idle power spent at a lower transmission rate may accordingly make the lower transmission rate less desirable in some examples.’” *Id.* (citing Ex. 1001, 3:7–10). Similarly, “Li states that a device in idle mode ‘may consume approximately 60% of its battery energy,’” showing a “vast difference in power consumed in sleep and idle mode,” demonstrating that the modes are distinct. *See id.* at 45 (citing Ex. 1005 ¶ 18; Ex. 2022 ¶ 105).

In addition to the ’120 patent and the asserted art, Patent Owner argues that Walton⁶ and articles by Dr. Valenti also explicitly distinguish idle mode from sleep mode. *See* PO Resp. 45–47 (citing Ex. 1031; Ex. 2015; Ex. 2016). For example, “Walton explains that a wireless device may operate in a number of different states, including an idle state, a sleep state, and a communication state.” *Id.* at 45 (citing Ex. 1031 ¶¶ 45–61, Figs. 3A, 3B). Walton describes a wireless device that may operate in different states. *Id.* at 45 (citing Ex. 1031, Fig. 3A). Walton’s operating states include an idle state enabling only a subset of receiver and processing units, compared to a sleep state in which the wireless device shuts down circuit blocks to conserve power. *Id.* at 46 (citing Ex. 1031 ¶¶ 49, 51). Moreover, Walton describes transitioning from a sleep state to an idle state, indicating distinct states. *Id.* (citing Ex. 1031 ¶ 51). Likewise, Patent Owner cites to various articles by Dr. Valenti that distinguish between a sleep mode and an idle

⁶ US 2005/0250452, published Nov. 10, 2005 (Ex. 1031).

channel listening for signals. *See id.* at 46–47 (citing Ex. 2015, 1; Ex. 2016; Ex. 2013, 104:7–105:15, 107:3–17, 108:11–109:7, 111:6–20, 112:6–8, 113:2–12; Ex. 2022 ¶ 109).⁷

Petitioner replies that “Cui-2003 describes the mobile device as “***work[ing]*** in sleep mode” when “there is no signal to transmit” . . . emphasizing that this is a low-power state in which the transmitter is ***waiting to send***.” Pet. Reply 16 (citing Ex. 1007, 2806; Ex. 2013, 89:6–13, 90:15–22). Petitioner elaborates on Cui-2003’s low power state wherein “the power consumption of the shut-down circuitry during sleep mode is ‘dominated by the leaking current [I_l] of the switching transistors if the circuitry is properly designed’ just like the ‘idling transceivers’ of the ’120 Patent that ‘turn off their transmission chains’ yet still consume idle power ‘due to leakage current or other effects.’” *Id.* at 16–17 (citing Ex. 2013 ¶ 91:9–15; Ex. 1001, 3:5–7) (citation omitted). As to “waiting to send,” Petitioner argues that Cui-2003’s sleep mode “describes a time period T during which it must send L bits: ‘[w]e assume a node has L bits to transmit with a deadline T . The transceiver spends time $T_{on} < T$ to communicate these bits . . . and then ***returns*** to sleep mode where all the circuits in the signal path are shut down for energy saving.’” *Id.* at 17 (quoting Ex. 1007, 2806). In other words, Petitioner alleges that Cui-2003’s “sleep mode is a state in which the transceiver is waiting to send.” *Id.* at 18 (citing Ex. 2013, 85:3–86:18).

⁷ Patent Owner further argues that the examiner’s allowance of the claims without citing Cui-2005 during prosecution indicates that the Cui-2003/Cui-2005 sleep mode is distinct from the claimed idle mode. As discussed above in the claim construction section (III.C.1.), we do not infer significance from the examiner’s silence.

Petitioner also addresses Patent Owner’s arguments with respect to Walton and Dr. Valenti’s articles. First, Petitioner argues that Patent Owner’s reliance on Walton’s “idle” state “necessarily assumes that an ‘idle’ state is a defined term of art, contradicting PO’s argument that ‘idle power consumption’ has its plain and ordinary meaning.” Pet. Reply 18 (citing PO Resp. 12, 45–46). Second, Petitioner argues that “Petitioner’s expert explained an ‘idle channel is not . . . the same thing as idle mode’ because an ‘[i]dle channel is a channel with no activity on it,’ meaning ‘no transmissions or reception’ but ‘[i]t is listening . . . for signals.’” *Id.* (citing Ex. 2013, 104:7–105:15) (ellipses in original).

Patent Owner replies that “Cui-2003’s sleep mode is completely different from the claimed ‘idle power consumption’” because in sleep mode the circuit are shut down. . . . not like the “claimed ‘idle’ mode” where circuits are ‘powered on but not transmitting.’” PO Sur-Reply 18 (citing Pet. 46; Ex. 1007, 2806) (citation omitted). Further, “[a] POSITA would recognize that there is no need for a control signal to be based at least in part on this zero-power consumption state, confirming that Cui-2003’s sleep mode is insufficient to teach or suggest the ‘idle power consumption’ limitation.” *Id.* at 18–19 (citing Ex. 2022 ¶ 110).

Patent Owner also argues that Cui-2003’s sleep mode is not “waiting to send.” PO Sur-Reply 19. Instead, “switching from sleep mode to active mode requires powering up the circuits that were shut down . . . unlike idling, where the circuits are powered on.” *Id.* (citing Ex. 2013, 95:9–14; Pet. 46; Ex. 1002 ¶ 96) (citation omitted). Patent Owner concludes that “Petitioners’ and PO’s experts agree that a transceiver cannot be waiting to send data if it is powered off or shut down like in Cui-2003’s sleep mode.” *Id.* (citing Ex. 2013, 60:19–61:5; Ex. 1052, 46:5–8).

On the full record, we are persuaded by Petitioner’s argument and evidence that the Li-Siam-Cui-2003 combination teaches or suggests a control signal based, at least in part, on an idle power consumption of the mobile station. Because we address the combination of Li and Siam above, we focus our discussion below on the combination with Cui-2003.

Before addressing the parties’ arguments as to Cui-2003, we recall our claim construction. We construed “idle power consumption” as “power consumed by the mobile station when the mobile station is powered on and waiting to send.” *See supra*, Section III.C.1. In doing so, we did not adopt Patent Owner’s additional limitation that idle power consumption requires that “the first and second circuitry are powered on,” or that the transceivers are powered on. *See id.* Accordingly, we consider whether Cui-2003 teaches or suggests a control signal based, at least in part, on its teachings regarding “power consumed by the mobile station when the mobile station is powered on and waiting to send.”

There is no dispute that Cui-2003’s mobile station is powered on in both active mode and sleep mode. *See* Tr. 20, 36. And even in sleep mode, the mobile station consumes some low power, even if “is dominated by the leaking current.” *See* Ex. 1007, 2806. Accordingly, we address whether Cui-2003 in sleep mode teaches “waiting to send.”

Cui-2003 teaches “transceiver circuitry [that] works on a multimode basis: when there is a signal to transmit all circuits work in active mode, when there is no signal to transmit they work in sleep mode, and when switching from sleep mode to active mode there is a transient mode.” Ex. 1007, 2806. The transient mode may include a start-up process from sleep mode to active mode. *Id.* After the transceiver communicates in active

mode it “then returns to the sleep mode where all the circuits in the signal path are shut down for energy saving.” *Id.*

Based on these teachings, we find Cui-2003 describes a mobile station with an active mode in which it sends data. When Cui-2003’s mobile station is not sending data, the mobile station returns to sleep mode, but remains powered on. The mobile station then waits in sleep mode and transitions back to active mode to send data. Accordingly, we find that, when the mobile station is waiting to send data, it is in sleep mode. Because Cui-2003 teaches a sleep mode in which the mobile station is powered on and waiting to send data, Cui-2003 teaches an idle power consumption according to claim 25.

We are not persuaded by Patent Owner’s arguments to the contrary because they require reading additional limitations into the claims. Patent Owner’s argument that Cui-2003’s sleep mode is a lower power state than the claimed idle power consumption requires some additional power consumption amount above that of the mobile station being on and waiting to send. Likewise, Patent Owner’s argument that Cui-2003’s sleep mode is not waiting to send because its circuits are off requires reading powered-on circuits or transceivers⁸ into the claimed idle power consumption. Finally, Patent Owner’s arguments that other references, e.g., Walton, and Dr. Valenti’s articles, present different definitions of idle power requires importing extrinsic limitations into the claimed mobile station being powered on and waiting to send. Accordingly, we have considered but are

⁸ Patent Owner refers interchangeably to powered-on circuits and transceivers to distinguish Cui-2003. *See* PO Resp. 43–44; PO Sur-Reply 18–19.

not persuaded by Patent Owner's arguments that Cui-2003 does not teach limitation 25[f].

Based on our review of the complete trial record, we determine that Petitioner establishes by a preponderance of the evidence that independent claim 25 would have been obvious over Li, Siam, and Cui-2003.

4. Claims 27 and 28

Petitioner presents evidence that the combination of Li, Siam, and Cui-2003 teaches the limitations of claims 27 and 28. Pet. 52–58 (citing Ex. 1002 ¶¶ 149–150). Patent Owner does not present additional arguments for these claims. *See* PO Resp. 50 (relying on the same arguments as to claim 25). On the complete record, Petitioner shows by a preponderance of the evidence that the combination of Li, Siam, and Cui-2003 teaches the limitations of claims 27 and 28.

F. Asserted Obviousness of Claim 26 over Li, Siam and Wu or over Li, Siam, Cui-2003, and Wu

Petitioner argues that claim 26 would have been obvious over Li, Siam, and Wu. Pet. 53–58. Petitioner identifies evidence indicating that the Li, Siam, and Wu combination teaches the limitations of claim 26 and that a person of ordinary skill in the art would have had reason to combine these references. *Id.* (citing Ex. 1002 ¶¶ 154–160; Ex. 1005 ¶¶ 18–19; Ex. 1006, 875; Ex. 1009 ¶¶ 7, 56, 71, 73–76, Figs. 11A–12). Alternatively, Petitioner argues that claim 26 would have been obvious over Li, Siam, Cui-2003, and Wu. *Id.* at 59. Petitioner identifies evidence indicating that the Li, Siam, Cui-2003, and Wu combination teaches the limitations of claim 26 and that a person of ordinary skill in the art would have had reason to combine these references. *Id.* (citing Ex. 1002 ¶¶ 161–162).

Patent Owner does not raise any additional arguments against the grounds challenging claim 26. *See* PO Resp. 50 (relying on the same arguments as to claim 25). Based on our review of the complete trial record, we determine that Petitioner establishes by a preponderance of the evidence that claim 26 would have been obvious over Li, Siam, and Wu, or over Li, Siam, Cui-2003, and Wu.

G. Asserted Obviousness of Claim 29 over Li, Siam, and Tirola

Petitioner argues that claim 29 would have been obvious over Li, Siam, and Tirola. Pet. 59–68. Patent Owner disputes Petitioner’s contentions. PO Resp. 51–59.

1. Tirola (Ex. 1008)

Tirola relates to uplink (“UL”) performance in mobile systems assuming different SIMO/MIMO (Single/Multiple Input Multiple Output) approaches. Ex. 1008, 657 (Abstr.). Tirola explains “[e]nhanced uplink performance is crucial for reducing the [user equipment (UE)] transmission power requirements, especially for high data rate applications.” *Id.*

Tirola discloses “[w]hen studying the UL performance of different transmission schemes, the UL load factor . . . plays an important role.” *Id.* at 658. The UL load factor is calculated by considering the ratio of other-cell to own-cell interference, the number of users, and the chip energy per total noise power density. *Id.* Tirola discloses that noise increases along with the number of users. *See id.* at 659.

Tirola concludes “MIMO transmission will provide some benefit (up to 2 dB) for UL coverage and UE battery consumption.” *Id.* at 657. “However, doubling the number of receiving antennas is still much more efficient than introducing the 2nd transmit antenna at the UE. Based on this

study the MIMO concept does not seem feasible for improving [Universal Mobile Telecommunications System (UMTS)] uplink performance.” *Id.*

2. *Reason to Combine Li, Siam, and Tirola*

Petitioner asserts one skilled in the art “would have been motivated to combine Li-Siam and Tirola’s teachings . . . and would have had a reasonable expectation of success in doing so, because all three describe systems that select an optimal data communication mode in a wireless communication system.” Pet. 59 (citing Ex. 1005 ¶¶ 18–19; Ex. 1006, 875; Ex. 1008, 657; Ex. 1002 ¶ 163). Petitioner argues the combination of Li and Siam “teaches or suggests a controller in a wireless communication system that switches between a MIMO and SIMO transmission mode based on a control signal that depends at least in part on circuit power consumption.” *Id.* at 59–60 (citing Ex. 1002 ¶¶ 163–164). Petitioner asserts “Tirola considers the effect of multiple users on the noise level, which can degrade channel performance.” *Id.* at 60.

Petitioner further asserts Li teaches transmitting and receiving spread spectrum signals, such as Direct Sequence Spread Spectrum (DSSS), that “would be impacted by multiple users and would benefit from Tirola’s teachings for mitigating degradation caused by multiple users.” *Id.* at 60. More specifically, Petitioner asserts one skilled in the art “would have been motivated to implement Tirola’s teachings, which specifically consider the number of users of the communications system when selecting and/or switching between SIMO and MIMO modes, with Li’s system for at least its DSSS embodiments.” *Id.* at 61 (citing Ex. 1002 ¶ 165). According to Petitioner, one skilled in the art would have sought to optimize power consumption considering both circuit power and the number of users. *Id.* at 62 (citing Ex. 1002 ¶¶ 54, 57–58, 165).

Petitioner adds that one skilled in the art “would have had a reasonable expectation of success in combining the teachings of Tirola with Li-Siam because they teach compatible systems—namely, electronic devices communicating in wireless communication systems using multiple antennas coupled to circuitry.” *Id.* at 62–63 (citing Ex. 1005 ¶¶ 18–25; Ex. 1006, 879–90; Ex. 1008, 657–58; Ex. 1002 ¶ 167). Petitioner asserts “[i]mplementing Tirola’s teachings to consider the number of users of the system in selecting and/or switching between a SIMO mode or MIMO mode in the Li-Siam system would have been straightforward, well within the capabilities of a POSITA.” *Id.* at 63 (citing Ex. 1002 ¶ 167).

Patent Owner disputes Petitioner’s reason to combine Li, Siam, and Tirola, and we address that argument below.

3. *Analysis of Claim 29*

a) Preamble and Limitations 29[a]–29[e]

Independent claim 29 recites similar subject matter to claim 25, except the last limitation, 29(f), in which claim 29 recites a control signal based on a number of users rather than an idle power consumption (as in 25(f)). *See* Ex. 1001, 20:22–24. Accordingly, Petitioner applies the same teachings of Li and Siam to claim 29. *See* Pet. 63–64.

For example, Petitioner asserts that Li teaches or suggest a mobile station (*see* claim 29 preamble)⁹ including a first and a second antenna (*see* limitation 29[a]), and first and second circuitry coupled to the first and second antenna, configured to process signals for transmission by the first and second antenna, respectively (*see* limitation 29[b]). *Id.* (citing Pet. 27–

⁹ Because Petitioner has sufficiently shown that the prior art teaches the preamble, we need not determine whether the preamble is limiting. *See Nidec*, 868 F.3d at 1017.

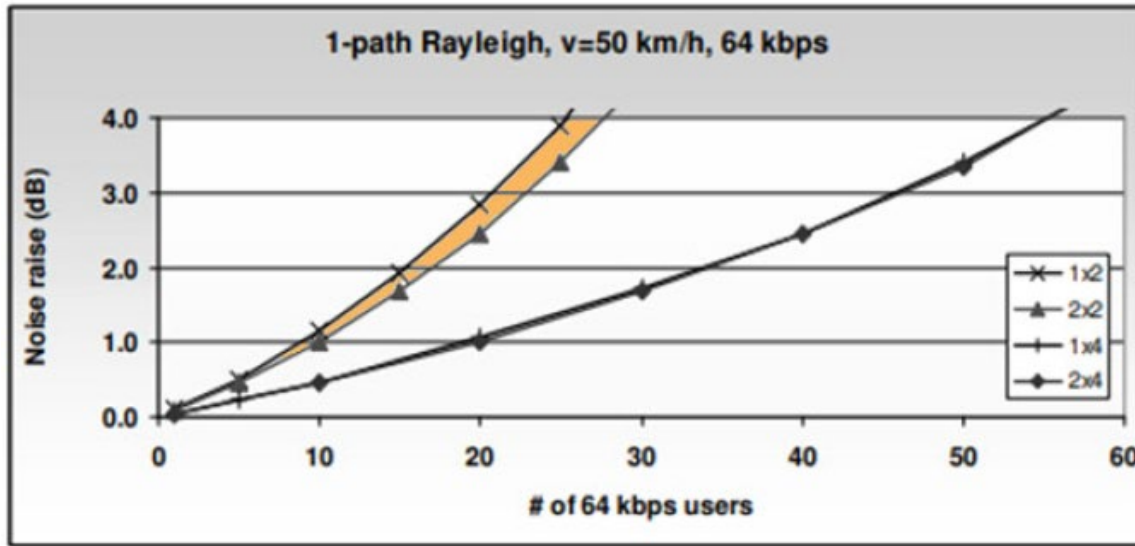
31; Ex. 1002 ¶¶ 168–170). Petitioner further asserts that Li teaches or suggests a controller coupled to the first and second circuitry, configured to receive a control signal (*see* limitation 29[c]) and select between a MIMO mode “wherein both the first and second antennas transmit data” and a SIMO mode “wherein only one of the first and second antennas transmit data” (*see* limitation 29[d]). *Id.* at 64 (citing Pet. 31–36; Ex. 1002 ¶¶ 171–172). Finally, Petitioner asserts that Siam teaches “wherein the control signal is based, at least in part, on a power consumption of the first and second circuitry” (*see* limitation 29[e]). *Id.* (citing Pet. 36–40; Ex. 1002 ¶ 173).

Patent Owner does not dispute that Li and Siam teach the preamble and limitations 29[a]–29[e] of claim 29. *See* PO Resp. 51–59. Based on the entire record, we find that Petitioner has shown by a preponderance of the evidence that Li and Siam teach the preamble and limitations 29[a]–29[e].

b) Limitation 29(f): “a number of users of the communications system”

Claim 29 recites (29[f]) “wherein the control signal is based, at least in part, on a number of users of the communications system.” Ex. 1001, 20:22–24.

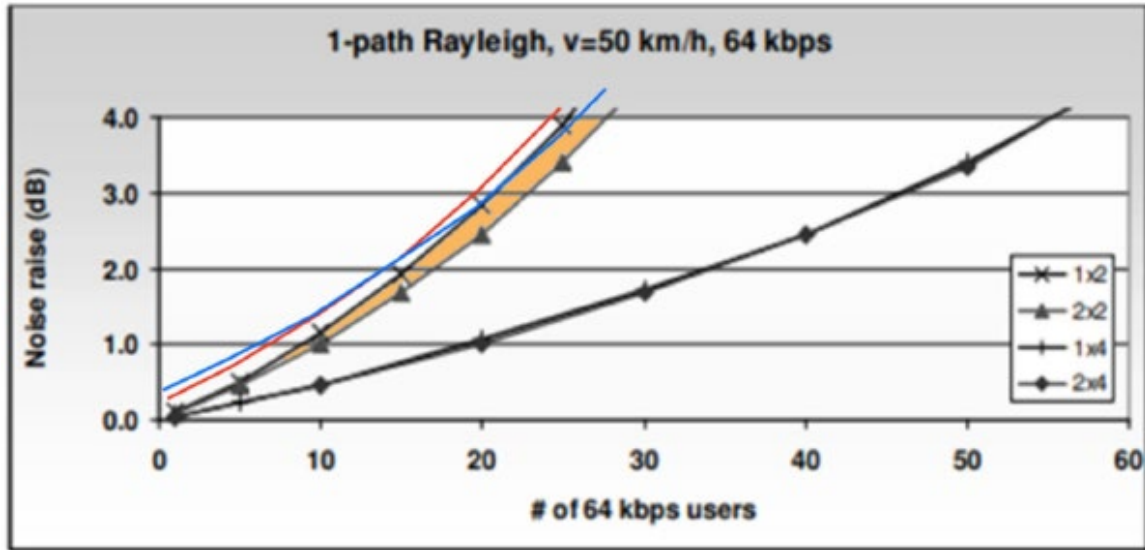
Petitioner asserts “Tirola calculates and simulates the effects of the number of users on uplink performance.” Pet. 65–66 (citing Ex. 1008, 658; Ex. 1002 ¶¶ 176–177). Petitioner further asserts “Tirola also calculates the increase in noise from the UL load factor based on the number of users for various antenna configurations.” *Id.* at 66 (citing Ex. 1008, 658). Petitioner illustrates Tirola’s noise rise simulation in annotated Figure 4(b), reproduced below.



Pet. 67. Tirola’s Figure 4(b) is a chart showing noise raise (dB) as a function of number of users (# of 64 kbps users). Ex. 1008, 661.

Petitioner asserts Figure 4(b) “demonstrates that noise rise is larger for a 1×2 (SIMO) mode than for a 2×2 (MIMO) mode and the advantage of a MIMO mode increases with increasing number of users.” Pet. 66–67 (citing Ex. 1008, 659–61, Fig. 4(b)). Petitioner further asserts one skilled in the art “would have understood based on Tirola’s teachings that channel noise considerations might favor, for example, a MIMO mode over a SIMO mode based on the noise increase in the presence of a large number of users.” *Id.* at 67 (citing Ex. 1002 ¶ 179). Combining Tirola’s teachings with Li and Siam’s teachings about circuit power, Petitioner argues one of ordinary skill in the art “would have understood that there could be a crossover point in Figure 4(b) such that consideration of both the power consumption and the number of users of the system might lead the system to choose a SIMO mode over a MIMO mode.” *Id.* (citing Ex. 1002 ¶¶ 54, 57–58, 179–180).

Petitioner illustrates the crossover point in an annotated Figure 4(b), reproduced below.



Pet. Reply 23 (citing Ex. 1002 ¶ 180). Annotated Figure 4(b) illustrates “shifting Tirola’s 2×2 (MIMO) curve up by a larger amount (blue) than the 1×2 (SIMO) curve (red) to account for the larger circuit power consumption of MIMO over SIMO.” *Id.* According to Petitioner, “in this example, the cross is at 2dB noise rise, which corresponds to approximately 14 users. This would imply that if circuit power is taken into account, there would be some crossover point, i.e., number of users, below which the SIMO system would outperform the MIMO system.” *Id.* (quoting Ex. 1002 ¶ 180).

Patent Owner argues Petitioner focuses “on the only instance where the results in Tirola suggest that MIMO may work” and does not address Tirola’s teachings as a whole. PO Resp. 55 (citing Ex. 2022 ¶ 122). Considering the entirety of Tirola’s examples in Figure 4, “**five examples in Tirola showed the noise rise for MIMO mode was larger**, two showed the noise rise was about the same for MIMO and SIMO mode, **and only one showed the noise rise for SIMO mode was larger.**” *Id.* at 53 (citing Ex. 2013, 143:16–144:3). Thus, Patent Owner argues that “the **entirety** of Tirola’s simulations led the authors to conclude that ‘the doubling of the number of receiving antennas [i.e., SIMO] will almost double the isolated

cell capacity, whereas the increase of the number of transmit antennas [i.e., MIMO] will mostly have ***negative impact*** on the isolated cell capacity.” *Id.* at 54 (quoting Ex. 1008, 660).

Patent Owner further emphasizes that “Tirola does not teach or suggest using a control signal that considers the number of users in determining transmission mode selection.” PO Resp. 57 (citing Ex. 2022 ¶ 126). Particularly, “Tirola does not teach or suggest a crossover point based on the number of users in Figure 4.” *Id.* at 58 (citing Ex. 2022 ¶ 127). Addressing annotated Figure 4(b), Patent Owner argues that “Petitioners’ attempt to recreate the claimed invention through an expert’s ‘modified figure,’ divorced from the teachings of the prior art, is improper.” PO Sur-Reply 23 (citing Ex. 2022 ¶ 127; *TQ Delta, LLC v. CISCO Sys., Inc.*, 942 F.3d 1352, 1361 (Fed. Cir. 2019)).

Considering the entire record, we determine that Petitioner has not shown by a preponderance of the evidence that claim 29 would have unpatentable over Li, Siam, and Tirola. As Patent Owner shows, the prior art does not teach a crossover point such that consideration of both the power consumption and the number of users of the system might lead the system to choose a SIMO mode over a MIMO mode. Instead, Petitioner relies on Dr. Valenti’s modification of Tirola’s Figure 4(b) to arrive at that conclusion.

Dr. Valenti’s modified Figure 4(b) requires extrapolating circuit power from Li and Siam to Tirola’s transmitted power. *See* Ex. 1002 ¶ 179 (“Once these curves are shifted, there *could* be a crossover point”) (emphasis added). But Dr. Valenti’s selecting and modifying Figure 4(b) appears to contradict Tirola’s teachings as a whole that MIMO would have a mostly negative impact, including five out of the eight examples in

Figure 4. Accordingly, Dr. Valenti’s selecting and modifying Figure 4(b), and accompanying testimony, appear “to use the challenged patent as a roadmap to reconstruct the claimed invention using disparate elements from the prior art—i.e., the impermissible *ex post* reasoning and hindsight bias that *KSR* warned against.” *TQ Delta*, 942 F.3d at 1361; *see* Ex. 1002 ¶ 181. Because Dr. Valenti’s testimony as to the combination of Li, Siam, and Tirola is not supported by the record, we find Petitioner has not met its burden of persuasion as to claim 29.

c) Conclusion as to Claim 29

Based on our review of the complete trial record, we determine that Petitioner does not establish by a preponderance of the evidence that independent claim 29 would have been obvious over Li, Siam, and Tirola.

IV. CONCLUSION¹⁰

For the reasons discussed above, Petitioner has shown by a preponderance of the evidence that claims 25–28 of the ’120 patent are unpatentable. Petitioner has not shown that claim 29 is unpatentable.

In summary:

Claim(s)	35 U.S.C. §	Reference(s)/Basis	Claim(s) Shown Unpatentable	Claim(s) Not Shown Unpatentable
25, 27,	103(a)	Li, Siam	25, 27, 28	

¹⁰ Should Patent Owner wish to pursue amendment of the challenged claims in a reissue or reexamination proceeding subsequent to the issuance of this decision, we draw Patent Owner’s attention to the April 2019 *Notice Regarding Options for Amendments by Patent Owner Through Reissue or Reexamination During a Pending AIA Trial Proceeding*. *See* 84 Fed. Reg. 16,654 (Apr. 22, 2019). If Patent Owner chooses to file a reissue application or a request for reexamination of the challenged patent, we remind Patent Owner of its continuing obligation to notify the Board of any such related matters in updated mandatory notices. *See* 37 C.F.R. § 42.8(a)(3), (b)(2).

Claim(s)	35 U.S.C. §	Reference(s)/Basis	Claim(s) Shown Unpatentable	Claim(s) Not Shown Unpatentable
28				
25, 27, 28	103(a)	Li, Siam, Cui-2003	25, 27, 28	
26	103(a)	Li, Siam, Wu	26	
26	103(a)	Li, Siam, Cui- 2003, Wu	26	
29	103(a)	Li, Siam, Tirola		29
Overall Outcome			25–28	29

V. ORDER

In consideration of the foregoing, it is hereby:

ORDERED that claims 25–28 of the '120 patent have been proven to be *unpatentable*;

FURTHER ORDERED that claim 29 of the '120 patent has *not* been proven to be *unpatentable*; and

FURTHER ORDERED that because this is a Final Written Decision, parties to the proceeding seeking judicial review of the Decision must comply with the notice and service requirements of 37 C.F.R. § 90.2.

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