

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

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

v.

SMART MOBILE TECHNOLOGIES LLC,
Patent Owner.

IPR2022-01005
Patent 9,084,291 B1

Before HYUN J. JUNG, NATHAN A. ENGELS, and
PAUL J. KORNICZKY, *Administrative Patent Judges*.

JUNG, *Administrative Patent Judge*.

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

I. INTRODUCTION

We have jurisdiction under 35 U.S.C. § 6. This Final Written Decision is issued pursuant to 35 U.S.C. § 318(a) and 37 C.F.R. § 42.73. For the reasons that follow, we determine that Samsung Electronics Co., Ltd., Samsung Electronics America, Inc., and Apple Inc. (collectively, “Petitioner”) have shown by a preponderance of the evidence that claims 1–3, but not claims 4–16, of U.S. Patent No. 9,084,291 B1 (Ex. 1001, “the ’291 patent”) are unpatentable.

A. *Background and Summary*

Petitioner filed a Petition (Paper 2, “Pet.”) requesting institution of an *inter partes* review of claims 1–16 of the ’291 patent. Smart Mobile Technologies LLC (“Patent Owner”) filed a Preliminary Response (Paper 6). Pursuant to 35 U.S.C. § 314, we instituted an *inter partes* review of claims 1–16 of the ’291 patent on the only presented challenge. Paper 10 (“Inst. Dec.”), 2, 48.

After institution, Patent Owner filed a Response (Paper 19, “PO Resp.”), to which Petitioner filed a Reply (Paper 25, “Pet. Reply”), and Patent Owner thereafter filed a Sur-reply (Paper 31, “PO Sur-reply”). An oral hearing in this proceeding was held on September 15, 2023; a transcript of the hearing is included in the record. Paper 35 (“Tr.”).

B. *Real Parties in Interest*

Petitioner identifies Samsung Electronics Co., Ltd., Samsung Electronics America, Inc., and Apple Inc. as real parties in interest. Pet. 85. Patent Owner only identifies itself as a real party in interest. Paper 4, 1.

C. *Related Matters*

The parties identify *Smart Mobile Techs. LLC v. Samsung Electronics Co., Ltd.*, 6:21-cv-00701 (W.D. Tex.) as the related litigation. Pet. 85;

Paper 4, 1. Related patents are challenged in IPR2022-00766, IPR2022-01004, IPR2022-01222, IPR2022-01248, and IPR2022-01249.

D. The '291 Patent (Ex. 1001)

The '291 patent issued on July 14, 2015 from an application filed on May 8, 2014, which is a continuation application of several previously filed continuation and continuation-in-part applications, the earliest of which was filed on June 4, 1999. Ex. 1001, codes (22), (45), (63), 1:8–15.

According to the '291 patent, an unfulfilled need exists for multiple transmitters and receivers (“T/R”) in a cellular telephone or mobile wireless device (“CT/MD”). Ex. 1001, 1:46–47. Figure 5A of the '291 patent is reproduced below.

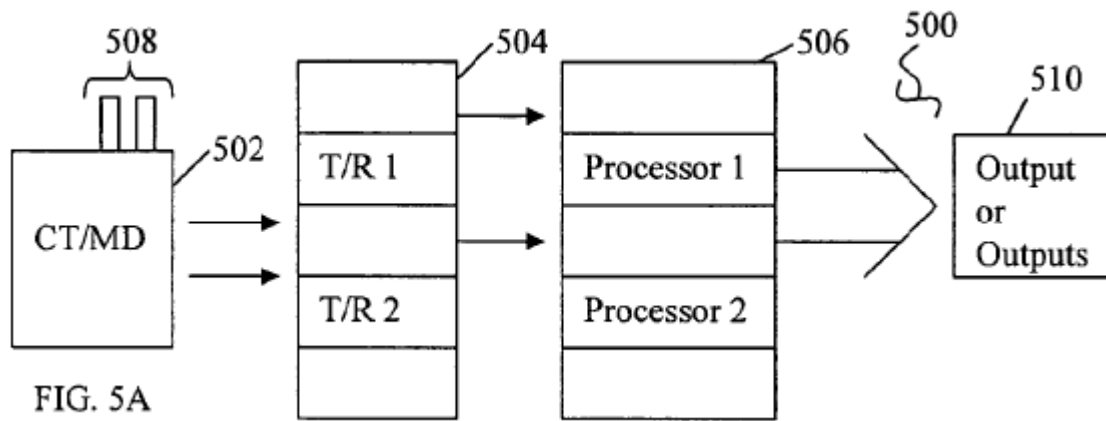


Figure 5A shows a “a dual antenna, dual T/R unit in a CT/MD interfacing with a dual processor.” Ex. 1001, 2:13–15. Dual antenna 508 and dual T/R unit 504 interface with dual processor 506 in dual band system 500. *Id.* at 4:35–37. System 500 can communicate through outputs 510, which can be “fibre optic channel, ethernet, cable, telephone, or other.” *Id.* at 4:40–43.

“The multiple processors 506 allow for parallel and custom processing of each signal or data stream to achieve higher speed and better quality of output.” Ex. 1001, 4:49–51. Alternatively, there can be “a single

processor that has the parallelism and pipeline capability built in for handling one or more data streams simultaneously.” *Id.* at 4:51–54.

Processors 506 include “DSP, CPU, memory controller, and other elements essential to process various types of signals.” *Id.* at 4:54–56.

“The processor contained within the CT/MD 502 is further capable of delivering the required outputs to a number of different ports such as optical, USB, cable and others” and “capable of taking different inputs, as well as wireless.” Ex. 1001, 4:58–62. “Thus the CT/MD 502 has universal connectivity in addition to having a wide range of functionality made possible through the features of multiple antennas, multiple T/R units 504 and processors 506.” *Id.* at 4:65–5:1.

“[T]he CT/MD may use one or more transmission protocols as deemed optimal and appropriate,” and “the CT/MD determines the required frequency spectrum, other wireless parameters such as power and signal to noise ratio to optimally transmit the data.” Ex. 1001, 10:67–11:2, 11:4–6. The CT/MD has “the ability to multiplex between one or more transmission protocols such as CDMA, TDMA to ensure that the fast data rates of the optical network or matched closely in a wireless network to minimize the potential data transmission speed degradation of a wireless network.” *Id.* at 11:7–10. Software residing in the CT/MD “is capable of dynamically determining a number of factors for best data transfer,” such as “determin[ing] the best transmission frequencies and protocols.” *Id.* at 11:17–22. “Thus it is possible that various optical and wireless protocols can co-exist in a network.” *Id.* at 11:24–25.

E. Illustrative Claim

The '291 patent includes claims 1–16, all of which Petitioner challenges. Claims 1 and 5 are independent, and claim 1 is reproduced below.

1. A communication system, comprising:
 - a processor;
 - a first communication component including a first transmitter, and a first receiver for wireless connectivity;
 - a second communication component including a second transmitter, and a second receiver for wireless communication;
 - a plurality of antennas coupled with the first communication component, including two dedicated antennas to receive a plurality of signals;
 - the first communication component configured to transmit a first data stream by simultaneously transmitting a first plurality of signal streams using the plurality of antennas, the first plurality of signal streams collectively representing the first data stream, the first communication component configured to receive a second data stream by simultaneously receiving a second plurality of signal streams using the plurality of antennas and generating the second data stream from the second plurality of signal streams;
 - an adapter configured to receive a signal stream from the communication system, the adapter including a plurality of data ports, wherein the first communication component is configured to transmit or receive the first data stream, the first plurality of signal streams, the second data stream, and the second plurality of signal streams via the plurality of data ports; and wherein at least two antennas are configured for communication of signals at different frequencies, and wherein the signal streams are communicated using a plurality of protocols; and
 - a multi band network switch box system that is capable of operating in a number of network environments sequentially or simultaneously.

Ex. 1001, 11:51–12:16.

Independent claim 5 also recites a “communication system” that is “implemented as a system on a chip” with, *inter alia*, “at least one processor,” “a memory,” “a radio frequency (RF) transmit and receive unit,” and “a second communication component.” Ex. 1001, 12:28–56.

F. Asserted Prior Art and Proffered Testimonial Evidence

Petitioner identifies the following references as prior art in the asserted ground of unpatentability:

Name	Reference	Exhibit
Sainton	US 5,854,985, filed Sept. 4, 1996, issued Dec. 29, 1998	1005
Raleigh	US 6,144,711, filed Aug. 27, 1997, issued Nov. 7, 2000	1004
Gernert	US 6,600,734 B1, filed Dec. 17, 1998, issued July 29, 2003	1008

Pet. 1. Petitioner contends that each of these references is prior art under § 102(e) and that Sainton is also prior art under § 102(a).¹ *Id.* Petitioner also provides a Declaration of Dr. Michael Allen Jensen (Ex. 1003) and a Second Declaration of Dr. Michael Allen Jensen (Ex. 1036).

Patent Owner provides a Declaration of Dr. Todor Cooklev.

Ex. 2004. Deposition transcripts for Dr. Jensen (Ex. 2003) and Dr. Cooklev (Ex. 1037) were filed.

¹ The relevant sections of the Leahy-Smith America Invents Act (“AIA”), Pub. L. No. 112-29, 125 Stat. 284 (Sept. 16, 2011), took effect on March 16, 2013. Because the ’291 patent claims priority to an application filed before that date, our citations to 35 U.S.C. §§ 102 and 103 in this Decision are to their pre-AIA versions. *See also* Pet. 1 (stating that “[t]hese references qualify as prior art to the ’291 patent’s earliest claimed priority date (06/04/1999; ‘Critical Date’)” but “Petitioner does not concede that the ’291 patent is entitled to the claimed priority”).

G. Asserted Ground

Petitioner asserts that claims 1–16 are unpatentable on the following ground:

Claims Challenged	35 U.S.C. §	References/Basis
1–16	103(a)	Raleigh, Sainton, Gernert

Pet. 1.

II. ANALYSIS

A. Legal Standards

In *inter partes* reviews, the petitioner bears the burden of proving unpatentability of the challenged claims, and the burden of persuasion never shifts to the patent owner. *Dynamic Drinkware, LLC v. Nat’l Graphics, Inc.*, 800 F.3d 1375, 1378 (Fed. Cir. 2015). To prevail in an *inter partes* review, the petitioner must support its challenges by a preponderance of the evidence. 35 U.S.C. § 316(e) (2018); 37 C.F.R. § 42.1(d) (2021).

Petitioner contends that the challenged claims of the ’291 patent are unpatentable under § 103. Pet. 1. A claim is unpatentable under § 103 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. *Graham v. John Deere Co.*, 383 U.S. 1, 17–18 (1966). When evaluating a combination of teachings, we must also

“determine whether there was an apparent reason to combine the known elements in the fashion claimed by the patent at issue.” *KSR*, 550 U.S. at 418 (citing *In re Kahn*, 441 F.3d 977, 988 (Fed. Cir. 2006)).

B. Level of Ordinary Skill in the Art

Petitioner asserts that one of ordinary skill in the art “would have had a Bachelor’s degree in electrical engineering, computer engineering, computer science, or a related field, and at least two years of experience related to the design or development of wireless communication systems, or the equivalent.” Pet. 2 (citing Ex. 1003 ¶¶ 27–28). Petitioner also states that “[a]dditional graduate education could substitute for professional experience, or significant experience in the field could substitute for formal education.” *Id.* (citing Ex. 1003 ¶¶ 27–28).

We preliminarily adopted Petitioner’s proposed level of ordinary skill in the art. Inst. Dec. 8. Patent Owner does not dispute Petitioner’s proposal and does not propose its own level of ordinary skill in the art. *See generally* PO Resp.; *see also* Ex. 2004 ¶ 21 (Patent Owner’s declarant accepting Petitioner’s proposed level of ordinary skill in the art).

Based on the full record, we maintain and affirm that one of ordinary skill in the art “would have had a Bachelor’s degree in electrical engineering, computer engineering, computer science, or a related field, and at least two years of experience related to the design or development of wireless communication systems, or the equivalent” and that “[a]dditional graduate education could substitute for professional experience, or significant experience in the field could substitute for formal education.” Pet. 2 (citing Ex. 1003 ¶¶ 27–28).

C. Claim Construction

In an *inter partes* review, the claims are construed

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), including construing the claim in accordance with the ordinary and customary meaning of such claim as understood by one of ordinary skill in the art and the prosecution history pertaining to the patent.

37 C.F.R. § 42.100(b); *see Phillips v. AWH Corp.*, 415 F.3d 1303, 1312–13 (Fed. Cir. 2005) (en banc).

Petitioner states that “no formal claim constructions are necessary in this proceeding.” Pet. 2. We did not interpret preliminarily any claim term. Inst. Dec. 9. Patent Owner argues that the preamble of claim 5 is limiting. PO Resp. 6–7; PO Sur-reply 1–5. Petitioner contends that the preamble is not limiting. Pet. Reply 1–4, 12–13.

“Whether to treat a preamble as a limitation is a determination ‘resolved only on review of the entire[] . . . patent to gain an understanding of what the inventors actually invented and intended to encompass by the claim.’” *Catalina Mktg. Int’l. v. Coolsavings.com, Inc.*, 289 F.3d 801, 808 (Fed. Cir. 2002) (quoting *Corning Glass Works v. Sumitomo Electric U.S.A., Inc.*, 868 F.2d 1251, 1257 (Fed. Cir. 1989)) (alterations in original). In general, a preamble limits the claimed invention “if it recites essential structure or steps, or if it is ‘necessary to give life, meaning, and vitality’ to the claim.” *Id.* (quoting *Pitney Bowes, Inc. v. Hewlett-Packard Co.*, 182 F.3d 1298, 1305 (Fed. Cir. 1999)). The preamble limits claim scope when it is essential to understand limitations or terms in the claim body. *Id.* Conversely, a preamble is not limiting where a structurally complete

invention is defined in the claim body and the preamble only states a purpose or intended use for the invention. *Id.*

The preamble of claim 5 recites “[a] communication system including one or more communication modules and processors for use in a portable handheld mobile device with a plurality of antennas, said communication system implemented as a system on a chip.” Ex. 1001, 12:28–31.

The ’291 patent addresses a problem with a cellular telephone or mobile device and the objects of the ’291 patent are related to the cellular telephone or mobile device. *See, e.g.*, Ex. 1001, 1:22–55, 2:53–58. Thus, “what the inventors actually invented and intended to encompass by the claim” was related to a cellular telephone or mobile device. The ’291 patent indicates that the “portable handheld mobile device with a plurality of antennas” of the preamble of claim 5 should be treated as a limitation.

We also agree with Patent Owner that “the preamble is limiting because several limitations in claim 5’s body ‘rely upon and derive antecedent basis from the preamble,’” specifically “a communication system” and “a plurality of antennas.” PO Resp. 6. The body of claim 5 recites “the system” repeatedly, and “the system” relies upon and derives antecedent basis from the preamble. Ex. 1001, 12:40, 12:44, 12:48, 12:54. The body also recites “the plurality of antennas” that also relies upon and derives antecedent basis from the preamble. *Id.* at 12:46, 12:50. Because the preamble of claim 5 recites that the “communication system includ[es] one or more communication modules and processors for use in a portable handheld mobile device with a plurality of antennas,” the preamble “recites essential structures for the claimed system,” as argued by Patent Owner. PO Resp. 6–7.

Claim 9, which depends from claim 5, also recites “the portable handheld mobile device includes the function of a cellular telephone” and, therefore, relies upon and derives antecedent basis from the preamble of claim 5. Ex. 1001, 13:1–2. The preamble of claim 5, thus, is essential to understand limitations or terms in the claim body and in dependent claim 9.

The preamble recites that the communication system is implemented as a “system on a chip.” Ex. 1001, 12:28–31; *see also* Pet. Reply 12 n.2 (representing that “[i]n the co-pending litigation, the parties agreed that the term ‘system on a chip’ in claim 5 is limiting and Petitioner intends to rely upon that agreement in the co-pending litigation”); Tr. 6:13–7:5 (discussing the claim construction order from the related litigation), 13:20–15:19 (discussing the agreement in the related litigation); Ex. 1099, 2 (Claim Construction Order from the related litigation giving the plain and ordinary meaning to “system on a chip”).

Claim 16, which also depends from claim 5, recites “wherein the communication module is implemented as a system on a chip.” Ex. 1001, 13:19–20. As Patent Owner argues, this dependent claim requires the communication module to be implemented as its own system on a chip. PO Sur-reply 12–13. The use of “a system on a chip” in claim 16 provides additional support that the same phrase in the preamble should be treated as a limitation.

For the reasons above, we do not agree with Petitioner that “a portable handheld mobile device” and “system on a chip” are merely intended uses that could be erased with no impact on features in the body of claim 5 or in the dependent claims. *See* Pet. Reply 1–4, 12–13. Based on the full record, we determine that the preamble of claim 5 is limiting.

Petitioner provides arguments for claim 5 “[t]o the extent the preamble is limiting.” Pet. 25; *see also id.* at 25–31 (arguing that Raleigh modified by Sainton discloses the preamble). In our analysis of claim 5 below, we consider those arguments that treat the preamble as limiting.

Also, based on the full record, we determine that no other claim term requires express interpretation to resolve the parties’ dispute. *Realtime Data, LLC v. Iancu*, 912 F.3d 1368, 1375 (Fed. Cir. 2019) (“The Board is required to construe ‘only those terms that . . . are in controversy, and only to the extent necessary to resolve the controversy.’”) (quoting *Vivid Techs., Inc. v. Am. Sci. & Eng’g, Inc.*, 200 F.3d 795, 803 (Fed. Cir. 1999)).

D. Asserted Obviousness Based on Raleigh, Sainton, and Gernert

1. Raleigh (Ex. 1004)

Raleigh “relates to digital communication and more particularly to a space-time communication system.” Ex. 1004, 1:18–20. According to Raleigh, there is a need for “a system for more effectively taking advantage of multiple transmitter antennas and/or multiple receiver antennas.” *Id.* at 1:60–62.

A wireless embodiment of Raleigh “operates with an efficient combination of a substantially orthogonalizing procedure (SOP) in conjunction with . . . a plurality of both transmitter and receiver antenna elements.” Ex. 1004, 2:10–16. Figure 4 of Raleigh is reproduced below.

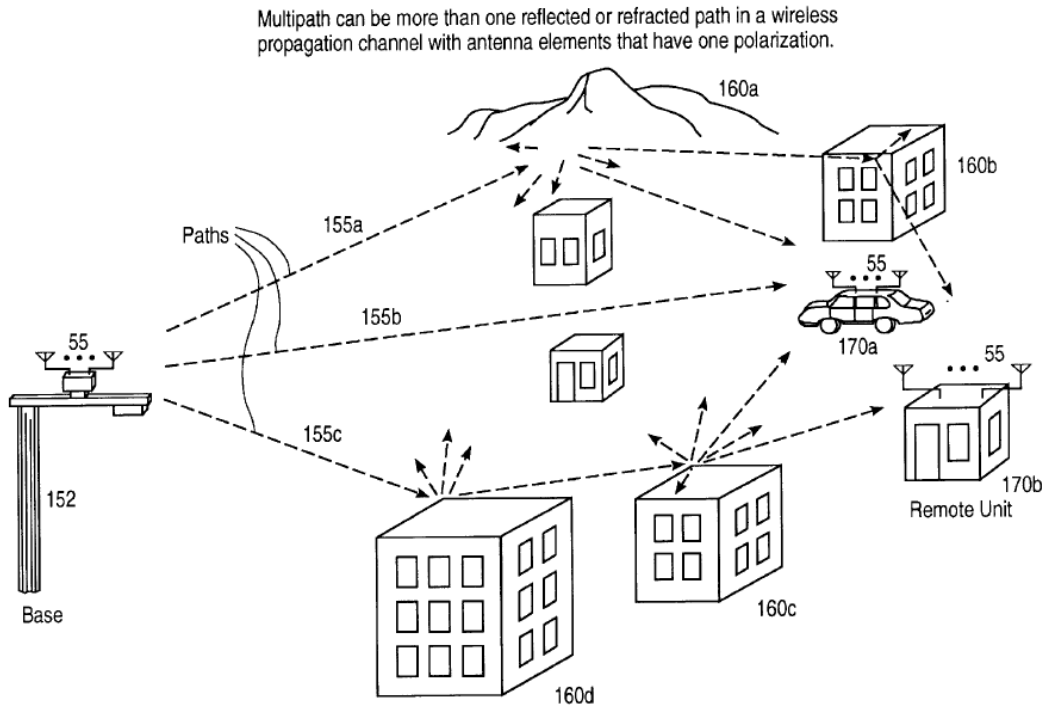


FIG. 4

Figure 4 shows a communication scenario where multipath is found. Ex. 1004, 3:10–11. Base 152 transmits to and receives from remote units 170a, 170b. *Id.* at 10:23–24. Base 152 and remote units 170a, 170b each have one or more antenna elements in array 55. *Id.* at 10:24–27. Transmitted signals propagate along paths 155a–155c. *Id.* at 10:27–29. Figure 1 of Raleigh is reproduced below.

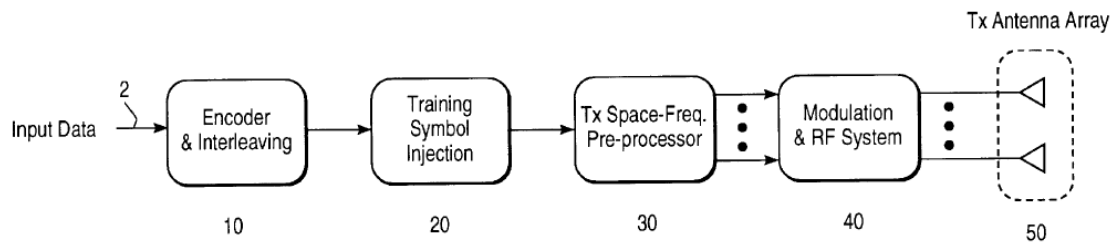


FIG. 1

Figure 1 shows Raleigh's transmitter system. Ex. 1004, 3:3–4, 5:35. Information signal input 2 can be a digital bit sequence or analog data and is

fed into Encoder and Interleaving apparatus 10 “where the data is encoded into a symbol stream.” *Id.* at 5:37–41. Training Symbol Injection block 20 “place[s] a set of known training symbol values” in the symbol stream “to provide a known input within a portion of the transmitted symbol stream so that a receiver may estimate the communication channel parameters” and “to aid in demodulation and decoding of the data sequence.” *Id.* at 6:7–14.

The data stream is fed into Transmitter Space-Frequency Pre-Processor (“TSFP”) 30 that performs a substantially orthogonalizing procedure and spatial processing. Ex. 1004, 6:21–27, 6:41–42. When transmitter and receiver portions of the SOP are combined, parallel bins are created in a manner that information in one bin does not interfere with information in another bin. *Id.* at 6:27–32. TSFP 30 processes its input into a parallel set of sequences that are fed into Modulation and RF System block 40. *Id.* at 7:24–28.

Modulation and RF System block 40 converts the sequences up to the RF carrier frequency. Ex. 1004, 7:28–31. Transmitter Antenna Array 50 radiates the signal. *Id.* at 7:36–37; *see also id.* at 5:21 (stating that “‘antenna array’ is a collection of antenna elements”).

Figure 3 of Raleigh is reproduced below.

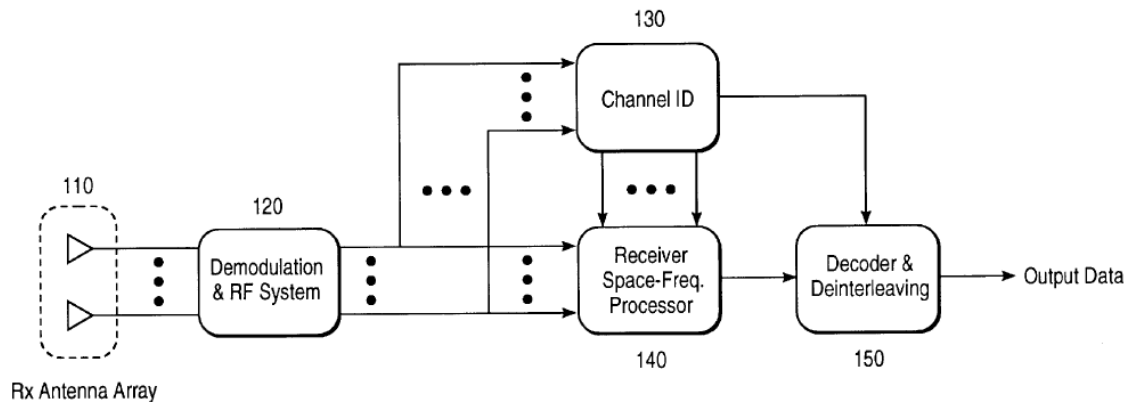


FIG. 3

Figure 3 shows Raleigh's receiver system. Ex. 1004, 3:8–9, 7:54. RF signals from Antenna Array 110 “are downconverted to digital baseband using a Demodulation and RF System 120.” *Id.* at 7:55–57. The digital baseband signal can be fed into Channel ID 130 where “the characteristics of the digital communication channel are estimated” and provided to Receiver Space-Frequency Processor (“RSFP”) block 140. *Id.* at 7:66–8:4, 8:8–10.

RSFP block 140 performs the receiver portion of the SOP and spatial processing. Ex. 1004, 8:34–36, 8:40–41. The output of RSFP block 140 is fed into Decoder and Deinterleaving block 150 where the symbol sequence is decoded. *Id.* at 9:22–23, 9:25–28.

2. *Sainton (Ex. 1005)*

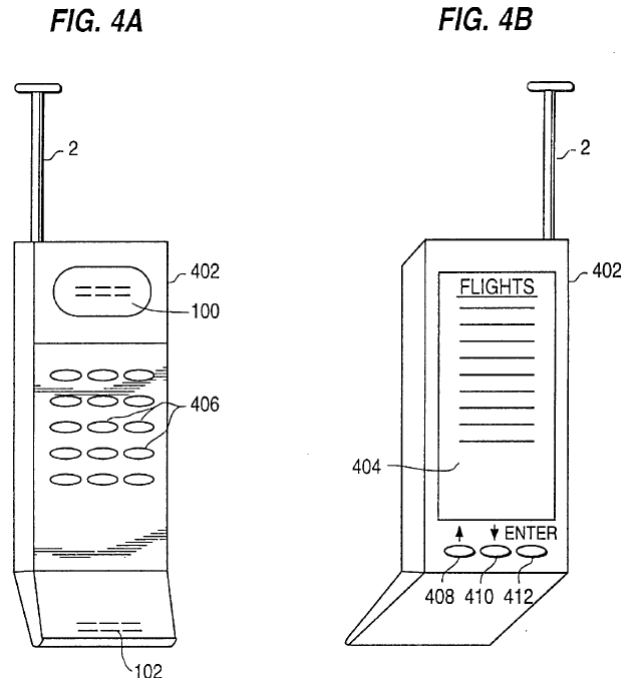
Sainton relates to wireless communication devices and systems for different radio frequencies, transmission protocols, and radio infrastructures. Ex. 1005, 1:8–12.

Sainton's circuit 1 “provides a multi-modal or omni-modal communications capability” and can “transfer information over at least two different radio communications networks, and preferably all networks

available in a particular area within the frequency range of the transceiver of circuit 1.” Ex. 1005, 5:5–13. Sainton also describes and shows “a radio frequency communication system that is capable of operating over a plurality of different radio channels and is further capable of transmitting either analog or digital data information signals as well as analog or digital voice signals.” *Id.* at 10:15–22, Figs. 1A, 1B.

Circuit 1 “may be implemented on a single VLSI chip or on a set of VLSI chips making up a chipset” and “can be advantageously implemented on a removable card with a standardized interface connector or connectors, so that it can then be selectively inserted into and removed from a variety of devices.” Ex. 1005, 4:57–59, 4:66–5:3; *see also id.* at 3:29–62 (listing what such a standard chip or chipset achieves); Ex. 1003 ¶ 90 (explaining that VLSI is “very large-scale integration”). Circuit 1 is also designed to be “a standard building block for radio voice and/or data communications devices” and “provides microprocessor 110 and memory 112 that allow manufacturers to customize the operation of the circuit with little or no additional components.” *Id.* at 10:29–31, 10:34–38.

Sainton provides example radio communications networks that circuit 1 can use, such as personal cellular systems, FM, cordless landline telephones, wireless LAN systems, public switched telephone network (“PSTN”), and others. Ex. 1005, 5:14–29. Figures 4A and 4B are reproduced below.



Figures 4A and 4B are front and back views of a data transmission and display radiotelephone. Ex. 1005, 4:8–12. Communication device 402 could be a cellular phone that employs circuit 1. *Id.* at 12:65–13:3. “Since the device is programmable through the use of microprocessor 110 and memory 112 (FIG. 1B), it is capable of switching between voice and data modes of operation,” which “allows the user to conduct a voice conversation and then to receive data for display on the integrated display device.” *Id.* at 13:22–27. “Alternatively, the omni-modal circuit could access another communication service to receive data for display, or it might receive data over a subchannel during the conversation,” which “would be particularly advantageous if the user desired to continue a voice call while continuing to receive data information.” *Id.* at 13:27–32.

3. Gernert (Ex. 1008)

Gernert specifically “relates to an apparatus which interfaces a wireless IP network and a wide area network or public switched telephone network (PSTN) for voice communications.” Ex. 1008, 1:23–26; *see also*

id. at code (57) (describing “[a]n apparatus for interfacing a wireless local area network with a wide area, cellular or public switched telephone network including the function of a wireless LAN base station or access point, and a gateway”). Figure 3 of Gernert is reproduced below.

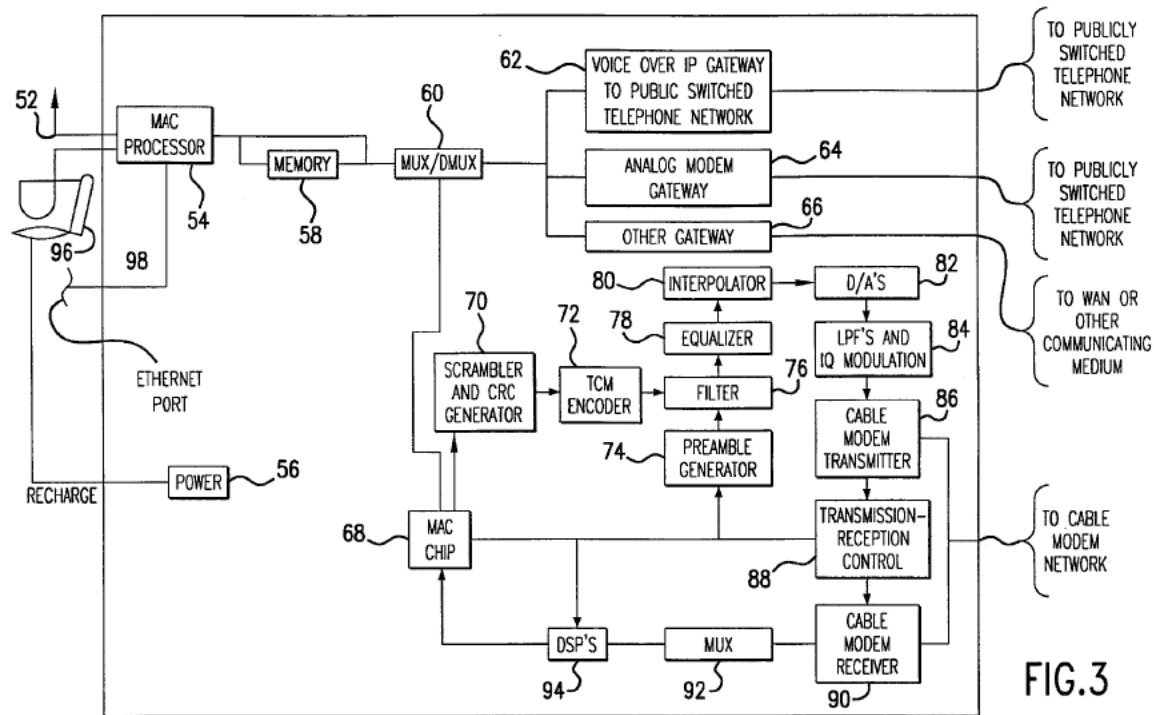


Figure 3 “is a block diagram illustrating an apparatus for interfacing a wireless local area network and a wide area network or public switched telephone network.” Ex. 1008, 6:18–20. Gernert’s apparatus “functions as a data downloading station for a portable computer . . . or the like, and also transmits the downloaded data to an IP network, a WAN, or the PSTN.” *Id.* at 4:44–48; *see also id.* at 6:47–49 (stating that “remote mobile units 15 are hand-held, battery-operated data terminals portable digital assistants or voice communication handsets”).

“[A]pparatus 50 contains one or more transmitter/receivers 52 for radio communications to the mobile units,” and “transmitter/receiver 52 is coupled to an access point Media Access Control (MAC) processor 54” and

“memory 58, which buffers data packets.” Ex. 1008, 8:8–15. “MAC processor 54 utilizes an IEEE 802.11 data link protocol” but can also use “other wireless LANs or WANs and other types of media access control.” *Id.* at 8:16–19. “Different MAC processors may be used to accommodate two or more different access techniques.” *Id.* at 8:21–22.

“The apparatus may also include a docking station or well designed to receive the handset or other portable computer device to recharge the battery of the handset or optionally transfer data or control information when the phone or device is secured in the well.” Ex. 1008, 5:29–33; *see also id.* at 9:63–10:8 (describing a recharging and downloading cradle for devices and “docking station or well 96” for storing mobile unit 15).

4. Independent Claim 5

The preamble of claim 5 recites “[a] communication system including one or more communication modules and processors for use in a portable handheld mobile device with a plurality of antennas, said communication system implemented as a system on a chip.” Ex. 1001, 12:28–31. As discussed above, we determine that the preamble is limiting.

a) “a portable handheld mobile device”

(1) Whether Raleigh’s Remote Unit Includes “a Portable Handheld Mobile Device”

For the “portable handheld mobile device,” Petitioner contends that it would have been obvious for Raleigh’s remote unit to include a portable handheld mobile device. Pet. 29 (citing Ex. 1003 ¶ 88; Ex. 1005, 1:41–56, 12:65–13:33, 20:39–21:2, Figs. 4A–4B).

(a) Patent Owner’s Response

Patent Owner responds that Raleigh does not teach or suggest that its remote unit is a portable handheld mobile device. PO Resp. 7–8. According

to Patent Owner, “for use in a portable handheld mobile device” “imposes significant constraints on the characteristics of the claimed system.” *Id.* (citing Ex. 1001, 12:28–30; Ex. 2004 ¶ 38). Patent Owner argues that Raleigh never teaches or suggests remote units including a portable handheld mobile device and, instead, discloses remote units being a car or building with antenna arrays on their roofs. *Id.* at 8 (citing Pet. 29; Ex. 1004, Figs. 4–6; Ex. 2004 ¶ 41). Patent Owner also argues that Petitioner’s declarant agreed that Raleigh fails to disclose a portable handheld mobile device. *Id.* (citing Ex. 1003 ¶ 88; Ex. 2003, 28:4–7, 28:16–29:24).

(b) Reply Arguments

Petitioner replies that Raleigh’s remote units 170a, 170b are not limited to the depicted car and building. Pet. Reply 4 (citing PO Resp. 8, 14; Ex. 1036 ¶ 5). Petitioner argues that one of ordinary skill in the art would have understood and found obvious that a handheld wireless device could be mounted or coupled to the vehicle. *Id.* at 4–5 (citing Ex. 1036 ¶¶ 6, 7; Ex. 1037, 92:9–22; Ex. 1038, 5:25–35, Fig. 1; Ex. 1039, 5:60–6:13, 8:31–9:63). Petitioner also argues that one of ordinary skill in the art would have understood and found obvious that a base station or other wireless or wired network component could be Raleigh’s building remote unit 170b. *Id.* at 5–6 (citing Ex. 1008, 6:37–7:13, Fig. 1; Ex. 1036 ¶ 8; Ex. 1040, 3, 6–7, Fig. 1). Petitioner, thus, argues that “it was well-known and would have been obvious that Raleigh’s vehicle or building units included ‘portable handheld mobile devices.’” *Id.* at 6 (citing Ex. 1036 ¶ 9). According to Petitioner, Patent Owner does not dispute that “portable handheld mobile devices” were known remote units and examples of Raleigh’s remote units. *Id.* at 6–7 (citing Pet. 14–15, 29; PO Resp. 9; Ex. 1003 ¶¶ 70, 88–89; Ex. 1036 ¶ 10).

Patent Owner replies that Petitioner does not dispute that Raleigh does not teach or suggest that its remote units include a handheld mobile device. PO Sur-reply 5 (citing PO Resp. 8; Ex. 2004 ¶¶ 39–64).

(c) Petitioner Does Not Show that Raleigh’s Remote Units Include “a Portable Handheld Mobile Device”

Petitioner does not cite any portion of Raleigh that describes its remote units as including a portable handheld mobile device. *See* Pet. 29 (citing Ex. 1003 ¶ 88). Petitioner’s declarant testifies that “[b]ased on my experience and knowledge in the field and my review of Raleigh, it would have been obvious to a [person of ordinary skill in the art] that Raleigh’s remote unit includes a portable handheld mobile device” without any citation to the record for supporting that statement. Ex. 1003 ¶ 88. Petitioner’s declarant also provides no testimony that Raleigh describes the inclusion of portable handheld mobile devices. *See id.*

According to Petitioner’s declarant, “I am not aware of anything in the Raleigh reference that expressly discloses a handheld mobile device.” Ex. 2003, 28:4–7. We agree with Patent Owner’s declarant that “[r]emote unit 170a is disclosed as a car with an antenna array on the roof” and that “[r]emote 170b is generally disclosed as a large building with an antenna array on the roof.” Ex. 2004 ¶ 41.

Petitioner does not persuade us that Raleigh teaches or suggests that its remote units are or include “a portable handheld mobile device.” Ex. 1003 ¶ 88; Ex. 2003, 28:4–7; Ex. 2004 ¶ 41.

(2) Whether Raleigh’s Remote Unit Would Have Been Modified as a “Portable Handheld Mobile Device”

Petitioner alternatively argues that it would have been obvious to implement Raleigh’s remote unit as a portable handset telephone in view of

Sainton. Pet. 14–15, 29. The alternative argument also implicates whether it would have been understood that Raleigh’s car and building themselves are not the remote unit, but rather some smaller component carried in the car or placed in or on the building.

In the reasons for combining Raleigh and Sainton, Petitioner argues that one of ordinary skill in the art would have been motivated to modify Raleigh to be a portable handheld device as taught by Sainton for the benefits of “portability and freedom to use without wired connection.” Pet. 14 (citing Ex. 1003 ¶ 70; Ex. 1005, 1:13–40). Petitioner also argues that Raleigh describes remote unit 170a as a vehicle unit, and so it would have been obvious to modify it as a mobile wireless device, like in Sainton. *Id.* at 14–15 (citing Ex. 1003 ¶ 70; Ex. 1004, Fig. 4; Ex. 1005, Figs. 4A–4B; Ex. 1008, 1:34–37, 6:38–53; Ex. 1010, 1:16–27).

In arguments specific to the preamble, Petitioner contends that it would have been obvious to implement Raleigh’s remote unit as a portable handset telephone as taught by Sainton. Pet. 29 (citing Ex. 1003 ¶ 88; Ex. 1005, 1:41–56, 12:65–13:33, 20:39–21:2, Figs. 4A–4B). According to Petitioner, implementing as a portable device includes the benefits of “portability and freedom to use without wired connection” and, thus, would have motivated one of ordinary skill in the art to implement Raleigh as a portable handheld mobile device. *Id.* (citing Ex. 1003 ¶ 88).

(a) Patent Owner’s Response

Patent Owner responds that the assertion Raleigh would have been modified to be a portable handheld mobile device is conclusory because there is no analysis explaining how or why one of ordinary skill in the art would have modified Raleigh’s remote units to be portable handheld mobile devices. PO Resp. 9–12 (citing Pet. 14–15; Ex. 1003 ¶ 70). Patent Owner

contends Petitioner's declarant "conceded at his deposition that there are numerous limits and 'engineering tradeoffs' that would need to be considered before designing a portable handheld mobile device." *Id.* at 11 (citing Ex. 2003, 34:19–35:5, 35:10–37:13, 38:7–39:7, 39:25–41:2).

Petitioner's declarant also testified, according to Patent Owner, that larger buildings and cars would be better suited for spaced-apart multiple antennas and for housing additional components, than smaller portable handheld mobile devices. *Id.* (citing Ex. 2003, 30:23–33:22, 34:11–14, 35:6–36:9, 36:19–37:13, 38:11–41:2; Ex. 2004 ¶¶ 42, 43). Patent Owner also contends that, considering the technology at the Critical Date, one of ordinary skill in the art would not have been motivated to make the proposed modification. *Id.* at 11–12; *see also* Pet. 1 (labeling "06/04/1999" as the "Critical Date").

Patent Owner also responds that Petitioner fails to show that one of ordinary skill in the art would have implemented Raleigh to be a portable handheld mobile device based on the asserted benefits of "portability and freedom to use without wired connection." PO Resp. 12 (citing Pet. 29). Patent Owner argues that the asserted benefits "are spurious and would have been outweighed by the difficulty and detriments of the modified device." *Id.* Patent Owner contends that Raleigh does not teach nor suggest converting its remote unit to a portable handheld device, that Raleigh is not directed to "a more advantageous design for a portable handheld device," that Raleigh teaches "an orthogonalizing algorithm and antenna diversity protocol for use in a communication system *as a whole*," and that there is no specific disclosure of its remote units, other than the figures. *Id.* at 13–14 (citing Ex. 1004, Figs. 1–4; Ex. 2003; Ex. 2004 ¶¶ 41, 44). According to Patent Owner, "[t]he lack of any relevant teachings or suggestions suggests

that Petitioner’s ‘portable handheld’ modification is driven by hindsight.”
Id. at 14.

Patent Owner argues that Raleigh discloses implementing the remote unit on a building as an example and such a building would not be portable and would include wired connections. PO Resp. 14 (citing Ex. 1004, Fig. 4). Patent Owner, thus, argues that one of ordinary skill in the art would not have viewed Raleigh’s building as providing the asserted benefits of “portability and freedom to use without wired connection.” *Id.* (citing Ex. 2004 ¶ 46).

Even if the asserted benefits were characteristics of Raleigh’s remote units, Patent Owner argues that the vehicle example satisfies those benefits, and Petitioner fails to address why the vehicle would have been further modified to be a portable handheld mobile device. PO Resp. 14 (citing Ex. 2004 ¶ 46). Patent Owner also argues that one of ordinary skill in the art would have been discouraged from such a further modification “given the complexity of the Raleigh mobile unit and practical limitations of mobile handheld devices at the Critical Date.” *Id.* at 15 (citing Ex. 2004 ¶ 47). According to Patent Owner, Raleigh’s vehicle example uses a multiple-input and multiple-output (“MIMO”) system with antenna arrays on several bases communicating with multiple antenna arrays spaced apart on opposite ends of the vehicle. *Id.* (citing Pet. 50–51; Ex. 1004, 4:17–25, Figs. 4, 6; Ex. 2003, 63:6–11). Patent Owner contends that, at the time, a known drawback of MIMO systems “was increased complexity and the need for additional hardware for the remote unit.” *Id.* at 15–16 (citing Ex. 2004 ¶ 48; Ex. 2007, 1; Ex. 2011, 297, 298).

In Patent Owner’s view, Raleigh’s remote unit included “special hardware and increased complexity” for use in MIMO systems and used

“complex space-time coding techniques” that “required complex computations and supporting hardware.” PO Resp. 16 (citing Ex. 1004, 1:18–20; Ex. 2004 ¶ 49; Ex. 2013, 1804; Ex. 2016, 277). Patent Owner, thus, argues that one of ordinary skill in the art “would have known that Raleigh’s remote unit was designed to be used in vehicles and buildings so that it could handle additional size, complexity, and hardware needed for the disclosed techniques” and to “allow[] for more physical space for the requisite hardware including a large, rechargeable battery.” *Id.* at 17 (citing Ex. 2003, 31:5–13; Ex. 2004 ¶ 51).

Patent Owner argues that “the same is not true for handheld mobile devices, which would have been a key design consideration,” as admitted by Petitioner’s declarant, because handheld mobile devices have inherent limitations. PO Resp. 17–18 (citing Ex. 2003, 31:5–13, 33:6–13, 34:23–25, 37:9–13, 38:11–39:2, 40:4–7; Ex. 2004 ¶¶ 51–54; Ex. 2008, 68; Ex. 2009, 187; Ex. 2010, 1; Ex. 2012, 1; Ex. 2017, 206). Patent Owner also argues that multiple antennas are required for Petitioner’s remote unit, and deploying multiple antennas in a portable handheld device was viewed as not practical. *Id.* at 18–19 (citing Ex. 2004 ¶¶ 55, 56). According to Patent Owner, “experts in the field were teaching away from using multiple antennas in portable handheld mobile devices when dealing with space-time coding procedures.” *Id.* at 19.

Patent Owner further argues that one of ordinary skill in the art “would have known that computationally intensive technologies (such as Raleigh’s complex space-time procedures) were limited, or could not be implemented at all, on portable handheld mobile devices at the Critical Date.” PO Resp. 19–20 (citing Ex. 2003, 70:11–19; Ex. 2004 ¶ 57; Ex. 2009, 187; Ex. 2010, 2; Ex. 2013, 1804; Ex. 2015, 9; Ex. 2017, 206).

Patent Owner contends that “even years after the Critical Date, there was little commercial implementation of MIMO in cellular systems due to the complexity required for MIMO receivers.” *Id.* at 20 (citing Ex. 2003, 63:24–64:19, 65:22–6:66; Ex. 2004 ¶ 58; Ex. 2008, 11, 69; Ex. 2011, 297, 298). Patent Owner also contends that “there were no commercial implementations of space-time coding techniques in mobile phones or cellular networks at the Critical Date” and Petitioner’s declarant “testified that it would be ‘safe to assume’ that cellular phones did not employ space-time coding techniques for more than five years after the Critical Date.” *Id.* at 20–21 (citing Ex. 2003, 63:24–65:21; Ex. 2004 ¶ 59).

Patent Owner, thus, contends that the numerous known limitations would teach away from converting Raleigh’s vehicle remote unit to a portable handheld device, would have discouraged one of ordinary skill in the art from such a conversion based simply on “portability and freedom to use without wired connection,” and would have been contrary to accepted wisdom. PO Resp. 21 (citing Ex. 2004 ¶ 60).

(b) Petitioner’s Reply

Petitioner replies that technical disadvantages and lack of commercial products does not negate Petitioner’s obviousness analysis. Pet. Reply 7 (citing Ex. 1036 ¶ 11). Petitioner argues that merely raising disadvantages does not overcome Petitioner’s obviousness analysis. *Id.* (citing Pet. 29; PO Resp. 11–12; Ex. 1003 ¶¶ 88–89; Ex. 1036 ¶ 36). Petitioner also argues that Patent Owner fails to show the asserted technical challenges would have been faced by one of ordinary skill in the art or would have deterred the ordinarily skilled artisan. *Id.* at 8 (citing PO Resp. 9–23; Ex. 1037, 109:5–133:9).

Petitioner further argues that it would have been obvious to use Raleigh's techniques in known portable handheld devices. Pet. Reply 8 (citing Ex. 1036 ¶ 12). Petitioner contends that there were numerous motivations for doing so, such as mobile phones increasing in popularity and the huge demand for improving the functionalities of existing mobile phones. *Id.* (citing PO Resp. 14–16, 29; Ex. 1003 ¶¶ 70, 88–89; Ex. 1036 ¶ 13; Ex. 2008, 22). Petitioner also contends that Raleigh's discussion of "remote units" would have encouraged implementing and improving Raleigh's remote unit to meet market demand. *Id.* at 8–9 (citing Pet. 8–9, 14–15; Ex. 1003 ¶¶ 70, 88–89; Ex. 1036 ¶ 14). Petitioner further contends that Raleigh uses "remote unit" without limitation, portable handheld devices would have been known examples of remote units, and Raleigh explicitly states that the embodiments described are illustrative only and can be modified. *Id.* at 9 (citing Ex. 1004, 7:18–21, 36:29–34; Ex. 1036 ¶ 15).

Petitioner, thus, contends that portable handheld devices would have been considered to be additional combinations and examples. Pet. Reply 9 (citing Ex. 1036 ¶ 15). Petitioner also argues that one of ordinary skill in the art with the above-described background would have looked to the solutions of Sainton and Gernert. *Id.* (citing Pet. 8–9, 14–15; Ex. 1003 ¶¶ 70, 88–89; Ex. 1036 ¶ 16). There is no teaching away in Raleigh, Petitioner argues, and instead, Raleigh suggests or discloses a portable handheld device with vehicle unit 170a, as agreed to by Patent Owner's declarant. *Id.* at 9–10 (citing Ex. 1037, 92:9–22). Petitioner further argues that the "handheld" feature would have been obvious to consider and implement. *Id.* at 10 (citing Ex. 1036 ¶ 16).

Petitioner further replies that "Patent Owner's alleged technical challenges merely reflect 'engineering tradeoffs.'" Pet. Reply 10. In

Petitioner's view, portable mobile devices were not new, and implementing Raleigh's technique in such devices was not so challenging so as to deter consideration of such implementing. *Id.* (citing Ex. 1036 ¶ 17; Ex. 2003, 34:19–37:13, 38:7–41:2, 83:24–25). Petitioner points to the limited disclosure of implementation details in the '291 patent and contends that, “[l]ike Raleigh, the '291 patent leaves implementation details up to the knowledge and skill of a [person of ordinary skill in the art].” *Id.* (citing Ex. 1036 ¶ 17), 10–11 (citing Ex. 1036 ¶ 18; Ex. 1037, 80:3–81:25). Petitioner also contends that the '291 patent and Raleigh relate to the similar MIMO techniques, and that additional hardware for MIMO systems were known. *Id.* at 10 (citing PO Resp. 15; Ex. 1004, 11:42–49; Ex. 1037, 78:7–15, 79:8–18, 80:12–23, 81:20–25).

Petitioner additionally replies that Patent Owner's evidence only shows general considerations when implementing handheld devices “but never conveys that such implementations were impossible or impractical.” Pet. Reply 11 (citing PO Resp. 15–22; Ex. 1036 ¶ 19; Ex. 1037, 90:10–14, 90:17–23, 94:24–95:6, 106:8–107:20). Petitioner argues that Patent Owner does not provide “quantitative or objective evidence” that shows such great difficulty in implementing Raleigh in a portable handheld device that it would not have been considered. *Id.* at 11–12 (citing Ex. 1036 ¶¶ 19–20).

(c) Patent Owner's Sur-Reply

Patent Owner replies that Petitioner does not dispute that one of ordinary skill in the art would not have been motivated to modify the remote units to be handheld devices. PO Sur-reply 5 (citing PO Resp. 8; Ex. 2004 ¶¶ 39–64). Patent Owner argues that Petitioner's new exhibits do not show Raleigh's car remote unit has a handset and that Patent Owner's declarant explained the hypothetical car phone would not be portable. *Id.* (citing

Ex. 1037, 93:6–94:20; Ex. 1038; Ex. 1039). Patent Owner also argues that Petitioner newly asserts based on Gernert that Raleigh’s building remote unit has portable digital assistants or voice handsets. *Id.* (citing Pet. Reply 5–6; Ex. 1040). According to Patent Owner, Gernert was not cited before for the portable handheld mobile device. *Id.* at 5–6 (citing Pet. 29; Ex. 1003 ¶ 88). Patent Owner further argues that none of Petitioner’s exhibits show a handheld device incorporating Raleigh’s space-time coding. *Id.* at 6.

Patent Owner also replies that only two motivations, not numerous motivations, were presented for modifying Raleigh’s remote unit to be a portable handheld mobile device. PO Sur-reply 6 (citing Pet. 14–15; Pet. Reply 8). Patent Owner argues that it identified several reasons for why there would have been no motivation to make the proposed modification. *Id.* at 7 (citing PO Resp. 15–23; Ex. 2003, 33:6–13, 34:23–35:25, 37:9–13, 38:11–39:2, 40:4–7, 63:6–11, 63:24–66:6, 70:11–19; Ex. 2004 ¶¶ 47–63; Ex. 2007, 1; Ex. 2008, 11, 68; Ex. 2009, 187; Ex. 2010, 2; Ex. 2011, 297; Ex. 2012, 1; Ex. 2013, 1804; Ex. 2016, 277; Ex. 2017, 206). Patent Owner also argues that Petitioner provides no evidence, other than conclusory declarant testimony, contradicting Patent Owner’s explanation and supporting evidence. *Id.*

Patent Owner further replies that it is not merely raising disadvantages but identifying multiple challenges to the proposed combination that would have dissuaded one of ordinary skill in the art. PO Sur-reply 8. Merely arguing “design tradeoffs,” according to Patent Owner, does not cure defects in Petitioner’s analysis. *Id.* Patent Owner argues that Petitioner does not support the asserted failure to demonstrate the actual challenges faced, and that Petitioner’s declarant only offers conclusory testimony to contradict. *Id.* (citing Pet. Reply 8; Ex. 1036 ¶ 19). Patent Owner also argues that

Petitioner fails to address the multiple references that support Patent Owner's declarant, so his testimony stands unrebutted. *Id.* at 8–9.

Patent Owner additionally replies that Petitioner newly argues another motivation based on mobile phone popularity and demand for improved mobile phone functionalities. PO Sur-reply 9 (citing Pet. Reply 8). Patent Owner argues that the new motivation fails for the same reasons as Petitioner's original motivations, in particular, the challenge of implementing Raleigh's MIMO and space-time coding in a mobile phone. *Id.* Patent Owner also argues that Petitioner provides no evidence of an alleged industry trend, other than conclusory declarant testimony, and motivation based on industry trend fails for the same above reason. *Id.* at 9–10 (citing Pet. Reply 8–9).

Patent Owner further argues that no evidence other than conclusory declarant testimony supports Petitioner's argument regarding "engineering tradeoffs" and Petitioner fails to explain how these tradeoffs bear on the ordinarily skilled artisan being dissuaded from making the proposed modification. PO Sur-reply 10. Patent Owner contends that, if the modification was just a matter of tradeoffs, Petitioner should have been able to identify a portable handheld mobile device incorporating space-time coding but did not. *Id.* Patent Owner also contends that Petitioner's declarant was unaware of any such phone at the Critical Date. *Id.* (citing Ex. 2003, 63:20–64:18).

Patent Owner also replies that Petitioner must show the claims are unpatentable, and it is not Patent Owner's burden to disprove Petitioner's alleged motivations. PO Sur-reply 10–11 (citing Pet. Reply 11). Patent Owner argues that Petitioner fails to rebut evidence that one of ordinary skill

in the art would not have converted Raleigh's remote units to a portable handheld phone. *Id.* at 11 (citing PO Resp. 16–23).

(d) Petitioner Does Not Show Raleigh's Remote Unit Would Have Been "Easily" Implemented as "a Portable Handheld Mobile Device"

Patent Owner's arguments about complexity and practical limitations of mobile devices implicate whether the proposed combination could have been made—i.e., whether there was a reasonable expectation of success. PO Resp. 15–20. Petitioner argues that remote unit 170a "is easily modified as a mobile wireless device, such as those shown in Sainton or other similar references." Pet. 14–15 (citing Ex. 1003 ¶ 70; Ex. 1004, Fig. 4; Ex. 1005, Figs. 4A, 4B; Ex. 1008, 1:34–37, 6:38–53; Ex. 1010, 1:16–27).

The cited testimonial evidence also states merely that one of ordinary skill in the art would have "found it obvious that remote unit 170a . . . is easily modified as a mobile wireless device, such as those shown in Sainton or other similar references." Ex. 1003 ¶ 70 (citing Ex. 1004, Fig. 4; Ex. 1005, Figs. 4A, 4B; Ex. 1008, 1:34–37, 6:38–53; Ex. 1010, 1:16–27). The cited portion of Raleigh shows remote unit 170a, and the cited portion of Sainton shows communication device 402 that could serve as a cellular phone. Ex. 1004, Fig. 4; Ex. 1005, Figs. 4A, 4B. The other cited portions of Exhibits 1008 and 1010 describe advantages of cellular telephones. Ex. 1008, 1:34–37, 6:38–53; Ex. 1010, 1:16–27.

Petitioner's citations to the record do not explain or support why Raleigh's remote unit 170a would have been "easily modified as a mobile wireless device, such as those shown in Sainton or other similar references." Ex. 1003 ¶ 70; Ex. 1004, Fig. 4; Ex. 1005, Figs. 4A, 4B; Ex. 1008, 1:34–37, 6:38–53; Ex. 1010, 1:16–27; Ex. 1036 ¶¶ 11–20.

Patent Owner provides evidence that Raleigh's remote unit 170a would not have been "easily modified as a mobile wireless device." *See, e.g.,* Ex. 2007, 1 (stating that, for MIMO, "[t]here are numerous situations where this degree of hardware complexity is undesirable – this is especially important for the mobile station (MS)"); Ex. 2008, 68 (stating that "[t]he introduction of MIMO techniques into wireless communication systems introduces a number of implementation challenges" "[t]he greatest challenges, however, lie within the terminal where the size, power and cost constraints must be overcome," and "[r]esearch initiatives must address the viability of terminals employing MIMO or diversity techniques, with particular emphasis being placed on maximizing the performance of the terminal antenna system in realistic macrocellular deployment scenarios and within the restricted form factors of future terminals such as laptops, PDAs and handsets"). Petitioner does not address directly Patent Owner's evidence that shows technical difficulties of implementing a system such as Raleigh's in a portable handheld mobile device with its practical limitations on size to accommodate an antenna array, power and battery capacity for all the components of Raleigh combined with Sainton, and required heat dissipation for the proposed combination. *See generally* Pet. Reply.

In view of the full record that includes scant argument and evidence supporting Petitioner's argument that Raleigh's remote unit 170a would have been "easily modified as a mobile wireless device" and Patent Owner's extensive argument and evidence to the contrary, Petitioner does not show by a preponderance that one of ordinary skill in the art would have had a reasonable expectation of success in implementing Raleigh's remote unit as a portable handheld mobile device. Pet. 14–15; PO Resp. 15–23; Ex. 1003 ¶ 70; Ex. 1004, Fig. 4; Ex. 1005, Figs. 4A, 4B; Ex. 1008, 1:34–37, 6:38–53;

Ex. 1010, 1:16–27; Ex. 2003, 33:6–13, 34:23–35:25, 37:9–13, 38:11–39:2, 40:4–7, 63:6–11, 63:24–66:6, 70:11–19; Ex. 1036 ¶¶ 11–20; Ex. 2004 ¶¶ 47–63; Ex. 2007, 1; Ex. 2008, 11, 68; Ex. 2009, 187; Ex. 2010, 2; Ex. 2011, 297; Ex. 2012, 1; Ex. 2013, 1804; Ex. 2016, 277; Ex. 2017, 206. Additionally, based on the full record, Petitioner’s proposed level of ordinary skill in the art would have been insufficient for modifying Raleigh’s remote unit into a portable handheld mobile device in view of Patent Owner’s evidence of technical challenges and practical limitations. *See generally* Pet.; Pet. Reply.

(3) *“said communication system implemented as a system on a chip”*

According to Petitioner, one of ordinary skill in the art would have understood, or found obvious, that the proposed combination is at least partially implemented as a system on a chip because Sainton teaches implementing its circuit 1 on a chipset and so the proposed combination would also be on a chip. Pet. 29–30 (citing Ex. 1003 ¶ 89; Ex. 1005, 3:29–62, 4:55–62). The ordinarily skilled artisan, Petitioner argues, would have also implemented Raleigh’s transmitter and receiver systems on a chip, as taught by Sainton for the benefits of “reduc[ing] footprint and space requirements in mobile devices,” making lighter mobile devices, obtaining higher performance and flexibility with more circuits on a chip, improving system reliability, lowering power requirements, providing better security, and achieving faster execution with high-speed processors and memory. *Id.* at 30 (citing Ex. 1003 ¶ 90). Petitioner also argues that technology at the time would have been able to place Raleigh’s and Sainton’s circuits on a single chip. *Id.* at 30–31 (citing Ex. 1003 ¶ 90; Ex. 1005, 10:29–42).

(a) Patent Owner's Response

Patent Owner responds that Petitioner fails to show a “communication system implemented as a system on a chip” because Petitioner argues adding Sainton’s omni-modal circuit to Raleigh’s remote unit “as a *separate*, second communication unit.” PO Resp. 24–25 (citing Pet. 30–31). Patent Owner argues that Petitioner’s declarant confirmed that “system on a chip” would be a “single integrated circuit” and that Sainton’s omni-modal circuit is being added to Raleigh’s remote unit, which would result in “*two separate chips*.” *Id.* at 24 (citing Ex. 2003, 83:11–12), 25 (citing Ex. 2003, 60:16–61:16; Ex. 2004 ¶ 66).

Patent Owner also argues that the asserted benefits of the combination are only supported by declarant testimony that, in turn, cites to insufficient evidence. PO Resp. 25 (citing Pet. 30; Ex. 1003 ¶ 90). Patent Owner further argues that the “purported benefits are too generic, not tied to the specific combination proposed by Petitioner, and fail to take into account the limitations of Petitioner’s proposed hybrid device.” *Id.* at 26–27 (citing Ex. 2004 ¶ 67).

Patent Owner contends that one of ordinary skill in the art “would not have been motivated, and would have been *discouraged*, from implementing the proposed Raleigh-Sainton-Gernert device as a portable handheld mobile device based on the practical, inherent limitations that existed at the Critical Date” for a portable handheld mobile device. PO Resp. 27–28 (citing Ex. 2004 ¶ 68). Patent Owner also contends that the proposed combination would need to be further accomplished on a single chip. *Id.* at 28 (citing Ex. 2004 ¶ 69).

Patent Owner further contends that Petitioner’s declarant testified that Raleigh employs ten processors and that using multiple processors would be

a consideration for implementing a system on a chip. PO Resp. 28 (citing Ex. 2003, 59:12–24, 83:18–84:15). Patent Owner additionally contends that Raleigh employs supporting hardware and memory in addition to those processors, Sainton employs another three processors with supporting hardware and software, and Gernert requires even more components. *Id.* at 28–29 (citing Pet. 42; Ex. 2003, 46:20–22, 47:18–20, 52:15–21, 53:4–10, 54:19–27, 55:19–57:3, 57:4–22, 60:7–15, 81:20–82:25).

In view of the asserted complexity, Patent Owner argues that Petitioner fails to explain how and why the ordinarily skilled artisan would have been motivated to combine all of the systems and components of Raleigh, Sainton, and Gernert into a single system on a chip. PO Resp. 29. In Patent Owner’s view, the complexity would have dissuaded incorporating all the components into a single system on a chip. *Id.* at 30 (citing Ex. 2004 ¶ 74). Patent Owner also argues that the proposed combination would have required a die size that would have been too large and required an unrealistic power consumption for a portable handheld mobile device at the Critical Date. *Id.* (citing Ex. 2004 ¶¶ 73, 74; Ex. 2006, 25).

(b) Petitioner’s Reply

Petitioner replies that Patent Owner mischaracterizes Petitioner’s analysis and erroneously assumes that Raleigh and Sainton cannot be incorporated into a system on a chip. Pet. Reply 13 (citing PO Resp. 24–25; Ex. 1036 ¶ 23). Petitioner contends that multiple reasons were asserted for combining Raleigh and Sainton and for implementing both as a system on a chip. *Id.* at 13–14 (citing Pet. 8–9, 29–31; Ex. 1037, 109:5–133:9). Petitioner also contends that Patent Owner did not dispute and did not address the “benefits of having the single ‘standard building block’ as

described in Sainton.” *Id.* at 14 (citing Pet. 17, 30–31; PO Resp. 24–25; Ex. 1005, 4:55–62, 10:29–42; Ex. 1036 ¶ 24; Ex. 1037, 120:5–122:22).

Petitioner also replies that it did not argue combining Raleigh’s system with Sainton’s circuit so that they would be separate. Pet. Reply 14 (citing PO Resp. 24–25, 38–44). Petitioner contends that it provided sufficient reasons and motivations for implementing Raleigh and Sainton as separate components in a system on a chip. *Id.* at 14–15 (citing Pet. 17, 29–31; PO Resp. 27; Ex. 1036 ¶ 25; Ex. 1037, 109:5–133:9).

Petitioner further replies that numerous motivations would have prompted one of ordinary skill in the art to implement the combination in a system on a chip and that “Patent Owner fails to show that technical limitations would have actually discouraged the proposed implementation.” Pet. Reply 15 (citing Pet. 29–31; PO Resp. 27–30; Ex. 1003 ¶¶ 89–90; Ex. 1036 ¶ 26; Ex. 1037, 109:5–133:9). Petitioner also argues that the ’291 patent lacks explanation about how to implement in a system on a chip, and thus, one of ordinary skill in the art would have been able to implement the proposed combination for the same reason that the ’291 patent provides adequate disclosure. *Id.* at 15–16 (citing PO Resp. 15; Ex. 1004, 11:42–49; Ex. 1036 ¶ 27; Ex. 1037, 80:12–23).

Petitioner further argues that the blocks shown in Raleigh and Sainton “visualize the **functional** aspects of components” and would have been understood that the blocks “do not necessarily represent or correspond to specific physical structures.” Pet. Reply 16 (citing PO Resp. 28–30, 34; Ex. 1004, 6:21–23, 8:1–2, Figs. 1, 3, 11–16, 22, 24, 25; Ex. 1005, 3:65–4:48; Ex. 1036 ¶ 28; Ex. 1048, 47; Ex. 1049, 101; Ex. 1050, 77; Ex. 1051, 108). In Petitioner’s view, “Patent Owner’s focus on the number of processors takes an impermissibly narrow view of the law of obviousness,”

and it would have been recognized and obvious to implement Raleigh and Sinton as a system on a chip for the asserted benefits. *Id.* at 17 (citing Pet. 29–31; Ex. 1036 ¶ 28).

(c) Patent Owner’s Sur-Reply

Patent Owner replies that “[t]he Petition describes its combination as including all of Raleigh’s structure and, separately, all of Sinton’s structure.” PO Sur-reply 13–16 (citing Pet. 27, 33–34, 38–39, 41; PO Resp. 24–25; Pet. Reply 14–15; Ex. 2003, 60:16–61:16; Ex. 2004 ¶ 66). According to Patent Owner, Petitioner’s asserted “second communication component” based on Sinton “must remain as a *separate* component” to satisfy the limitation “a second communication component which is configured to operate on a plurality of frequencies and protocols,” and Petitioner relies on Sinton’s omni-modal circuit for teaching or suggesting the “second communication component.” *Id.* at 16–17 (citing Pet. 40; Ex. 1005, 3:65–67, Figs. 1A, 1B).

Patent Owner also argues that Petitioner’s declarant “testified that all of Raleigh’s components would necessarily remain intact, and that Sinton’s components would simply be added separately to the Raleigh device.” PO Sur-reply 17 (citing Ex. 2003, 60:19–61:16). Patent Owner reiterates that “according to the Petition itself, Sinton’s omni-modal circuit is incorporated into Raleigh’s remote unit whole as a *separate* component.” *Id.*

Patent Owner also replies that one of ordinary skill in the art “would not have been motivated to implement this kludged-together monstrosity as a single omnibus [‘system on a chip’].” PO Sur-reply 17 (citing Ex. 2003, 46:20–22, 47:18–20, 52:15–21, 53:4–10, 54:19–7, 55:19–57:22, 59:12–24, 60:7–15, 81:20–82:25, 83:18–84:15; Ex. 2004 ¶¶ 65–74). Patent Owner

contends that Petitioner’s reference to purported motivations in the Petition do not relate to the specific combination of Raleigh with Sinton’s circuit or how the ordinarily skilled artisan would have implemented it in Raleigh’s remote units. *Id.* at 17–18. Patent Owner also contends that its declarant provided unrebutted testimony about the difficulties in making Petitioner’s proposed combination for “a system on a chip.” *Id.* at 18 (citing Ex. 2004 ¶¶ 67–74).

Regarding Petitioner’s reply argument that depicted blocks are not necessarily processors, Patent Owner replies that “both Raleigh and Sinton describe the processors identified by Patent Owner in structural terms” and that Petitioner’s declarant identified a need for “numerous processors” for Raleigh and Sinton to function properly. PO Sur-reply 18 (citing Ex. 2003, 58:20–60:64). Patent Owner also argues that “regardless of whether these are functional blocks or structure the number of such elements demonstrates the complexity of Raleigh’s ‘remote unit’ and Sinton’s ‘omni-modal circuit’” and adding Gernert’s video processing would have added even more complexity, thereby discouraging Petitioner’s proposed combination. *Id.* (citing PO Resp. 24–30).

Patent Owner further argues that Petitioner does not address arguments based on die size and power consumption limitations. PO Sur-reply 18–19. Patent Owner additionally argues that Petitioner’s proposed combination would have required physical combinability and, thus, bodily incorporation is not an issue. *Id.* at 19. Regarding the ’291 patent’s disclosure of implementation, Patent Owner argues that the ’291 patent does not claim combining “Raleigh’s space-time coding via ‘remote units’ with Sinton’s ‘omni-modal circuit.’” *Id.* Patent Owner, thus, argues that Petitioner “fails to overcome Patent Owner’s evidence showing that a

[person of ordinary skill in the art] would not have been motivated to attempt to bolt Raleigh's communication components and Sainton's omni-modal circuit together as a single ['system on a chip'].” *Id.*

(d) Petitioner Does Not Show a Motivation to Implement Raleigh and Sainton as “a System on a Chip”

According to Petitioner, “[s]everal known benefits would have motivated a [person of ordinary skill in the art] to use a system on a chip for the transmitter/receiver systems in the combination,” and the identified benefits for “implementing Raleigh-Sainton’s transmitter/receiver systems as a system on a chip” are that doing so

would (i) reduce footprint and space requirements in mobile devices, (ii) provide lightweight mobile devices, (iii) offer higher performance and flexibility due to increased amount of circuits on the chip, (iv) improve system reliability and low power requirements, (v) provide improved design security at hardware and firmware levels, and (vi) offer fast execution due to high-speed processors and memory.

Pet. 30 (citing Ex. 1003 ¶ 90).

Petitioner’s cited testimonial evidence includes the same list of benefits. Ex. 1003 ¶ 90. The testimony does not cite to support in the record for the asserted benefits. *See id.*

We agree with Patent Owner that the “purported benefits are too generic, not tied to the specific combination proposed by Petitioner, and fail to take into account the limitations of Petitioner’s proposed hybrid device.” PO Resp. 26–27. Petitioner proposes putting Raleigh’s transmit and receive systems together with Sainton’s circuit that “provides a multi-modal or omni-modal communications capability” on a chip. Pet. 29–30 (arguing that “at least Sainton’s circuitry in the combination is implemented as a system on a chip” and “Raleigh-Sainton, which modifies Raleigh’s remote unit to

incorporate Sainton’s omni-modal circuit . . . , would also implement Raleigh’s transmitter and receiver systems on a chip or a chipset (***system on a chip***) as taught in Sainton”), 40 (arguing that it would have been obvious “to add Sainton’s ‘omni-modal circuit 1’ to Raleigh’s remote unit as a ***second communication component***, while Raleigh’s remote unit includes the ***RF transmit and receive unit***”); Ex. 2003, 60:16–61:16, 83:11–12 (Petitioner’s declarant confirming that the proposed combination is adding Sainton to Raleigh and that “system on a chip” would be a “single integrated circuit”); *see also* Pet. 10 (arguing that “[i]n this combination, the remote unit would switch between use of Raleigh’s SOP-based multipath network and the other network services contemplated by Sainton, according to various switching techniques described in Sainton”), 13 (arguing that “the Raleigh-Sainton combination does not change the hallmark aspects of either reference, and the respective teachings would work in combination similar to how they did apart, with Sainton’s suggestions merely adding flexibility to Raleigh’s system and providing implementation details related to frequency ranges”), 24 (arguing that “the Raleigh-Sainton-Gernert combination does not change the hallmark aspects of any reference” and their “respective teachings would work in combination just as they did apart”).

Petitioner does not point to any description in Raleigh that the relied-upon transmit and receive systems are, or can be placed, on a chip, such as the one described in Sainton. Pet. 10–11, 29–31, 40. Petitioner acknowledges that Raleigh does not teach or suggest putting its components on a single chip, because Petitioner turns to Sainton for implementing on a single chip. *See id.* at 30; Ex. 1003 ¶ 90. Sainton does not describe additional components for a space-time signal processing system, such as Raleigh’s, “may be implemented on a single VLSI chip” (Ex. 1005, 4:58).

See generally id.; *see also id.* at 10:34–38 (stating that “[c]ircuit 1 is particularly advantageous in facilitating these goals in that it provides microprocessor 110 and memory 112 that allow manufacturers to customize the operation of the circuit with little or no additional components”).

Assuming Raleigh’s components other than its antenna arrays can be placed on a chip like Sinton’s, Petitioner does not point to support in the record that combining the relevant components of Raleigh and Sinton on a single chip would provide the above-listed benefits. *See* Pet. 10–11, 29–31, 40.

For example, Petitioner does not provide further explanation why combining the components of Raleigh and Sinton so as to be able to switch between Raleigh and Sinton “would (i) reduce footprint and space requirements in mobile devices” or “(ii) provide lightweight mobile devices,” if the combination is adding Sinton’s circuit to Raleigh’s systems. *See* Pet. 10–11, 29–31, 40; Ex. 1003 ¶ 90. Petitioner does not explain why the components placed together on a chip would be smaller than when the systems were apart and Petitioner does not propose making the components of Raleigh and Sinton smaller or lighter. *See* Pet. 13 (arguing that “the Raleigh-Sinton combination does not change the hallmark aspects of either reference, and the respective teachings would work in combination similar to how they did apart”), 24 (arguing that “the Raleigh-Sinton-Gernert combination does not change the hallmark aspects of any reference” and their “respective teachings would work in combination just as they did apart”).

Also, because Petitioner’s proposed combination uses the processors of Raleigh and Sinton for the respective described functions, it is unclear how those processors together would “(iii) offer higher performance and

flexibility due to increased amount of circuits on the chip” or “(vi) offer fast execution due to high-speed processors and memory” when Petitioner’s combination would switch between the systems of Raleigh and Sainton. *See* Pet. 10–11, 13, 24, 29–31; Ex. 1003 ¶ 90. The proposed combination further does not clearly “(iv) improve system reliability and low power requirements” or “(v) provide improved design security at hardware and firmware levels,” because the proposed combination switches between Raleigh’s and Sainton’s circuits and these circuits would have the same reliability, power requirement, and security in combination, as they did apart. Pet. 10–11, 13, 24, 29–31.

Because Petitioner does not show sufficiently that the proposed combination would result in the above-listed benefits, Petitioner does not show by a preponderance of the evidence that one of ordinary skill in the art would have been motivated to implement Raleigh and Sainton as a system on a chip.

Even if a motivation to combine were shown, because Raleigh does not teach or suggest implementing its systems on a chip and Sainton does not teach or suggest adding additional transceivers on its chip for a cellular phone, the references themselves do not show one of ordinary skill in the art would have had a reasonable expectation of success in implementing Raleigh and Sainton as a system on a chip for a portable handheld mobile device. We find that Petitioner’s cited evidence for contending that “technologies were sufficiently developed and ready for manufacturing communication modules and processors on a single chip” does not relate directly to implementing multiple transceivers for different frequencies and protocols on a single chip. *See* Ex. 1016 (article titled “A 2.7-V GSM RF Transceiver IC”); Ex. 1017 (article titled “A 2.7 V GSM Transceiver ICs

with On-Chip Filtering”); Ex. 1018 (article titled “A 2.7–4.5 V Single Chip GSM Transceiver RF Integrated Circuit”); Ex. 1019 (“TCM8030 Analog Baseband Processor User’s Guide”).

Furthermore, for the reasons above regarding implementing Raleigh as a portable handheld mobile device, Petitioner does not show by a preponderance of the evidence that one of ordinary skill in the art would have had a reasonable expectation of success in implementing Raleigh and Sainton as a system on a chip for a portable handheld mobile device. Ex. 2004 ¶ 73; Ex. 2006, 25. Petitioner provides insufficient argument and evidence that such a chip would have been used in a portable handheld mobile device.

b) Petitioner Does Not Show that Claim 5 is Unpatentable

For the reasons above, Petitioner does not persuade us by a preponderance of the evidence that claim 5 is unpatentable over Raleigh, Sainton, and Gernert.

5. Dependent Claims 6–16

Claims 6–16 depend directly or indirectly from independent claim 5. Ex. 1001, 12:57–13:20. Petitioner’s arguments for claims 6–16 do not address the deficiencies in the arguments for claim 5. *See* Pet. 44–63.

Also, for the same reasons discussed above for claim 5, Petitioner fails to show that the proposed combination teaches, suggests, or would have rendered obvious the “portable handheld mobile device” of claim 9 and the “system on a chip” of claim 16.

Thus, based on the full record, Petitioner does not persuade us by a preponderance of the evidence that claims 6–16 are unpatentable over Raleigh, Sainton, and Gernert.

6. *Independent Claim 1*

a) *“A communication system, comprising:”*

Petitioner argues that Raleigh describes a multipath wireless communication system with base and remote units, and, alternatively, that one of ordinary skill in the art would have understood the base or remote units to correspond to a communication system. Pet. 63–64 (citing Ex. 1003 ¶¶ 161–162; Ex. 1004, 1:18–20, 10:14–67, 11:1–12:31, Figs. 4–6); Ex. 1001, 11:51.

A cited portion of Raleigh states that it relates “more particularly to a space-time communication system.” Ex. 1004, 1:18–20. We credit Petitioner’s testimonial evidence because the cited portions of Raleigh support it. Ex. 1003 ¶ 161; Ex. 1004, 1:18–20, 10:14–67, 11:1–12:31, Figs. 4–6. Patent Owner does not present a responsive argument for the preamble of claim 1. PO Resp. 57–59.

Based on the full record, Petitioner persuades us, and we find, that Raleigh teaches or suggests the preamble of claim 1, to the extent it is limiting.

b) *“a processor;”*

For “a processor,” Petitioner refers to its arguments for independent claim 5. Pet. 64 (citing Ex. 1003 ¶ 163); Ex. 1001, 11:52. In those arguments, Petitioner contends that Raleigh includes processors, such as TSFP block 30 and RSFP block 140. Pet. 27–28 (citing Ex. 1003 ¶ 83; Ex. 1004, 6:21–50, 8:1–10, Figs. 1, 3).

Petitioner cites portions of Raleigh that describe and show TSFP block 30 and RSFP block 140. Ex. 1004, 6:21–50, 8:1–10, Figs. 1, 3. We credit Petitioner’s testimonial evidence that Raleigh’s transmitter and receiver systems include processors because the cited portions of Raleigh

support it. Ex. 1003 ¶¶ 83, 163; Ex. 1004, 6:21–50, 8:1–10, Figs. 1, 3. Patent Owner does not present a responsive argument for the “processor” of claim 1. PO Resp. 57–59.

Based on the full record, Petitioner persuades us, and we find, that Raleigh teaches or suggests “a processor.”

c) *“a first communication component including a first transmitter, and a first receiver for wireless connectivity;”*

For the limitations quoted above, Petitioner argues that both Raleigh’s base and remote units can each operate as a transmitter and receiver with one transmitting signal streams to be received by the other. Pet. 64–67 (citing Ex. 1003 ¶¶ 164–166; Ex. 1004, 5:35–10:13, 10:23–24, Figs. 1–4); Ex. 1001, 11:53–54. Petitioner also argues that one of ordinary skill in the art would have understood or found obvious that transmitters and receivers are included, as confirmed by other references. Pet. 66–67 (citing Ex. 1003 ¶¶ 167, 168; Ex. 1004, Figs. 9, 11–14, 17, 18, 24, 25; Ex. 1011, 1; Ex. 1015, 4:50–5:9, Fig. 1A).

Patent Owner responds that Petitioner relies on Raleigh’s transmitter and receiver systems for teaching the recited “first communication component,” rather than Raleigh’s modulation/demodulation blocks. PO Resp. 57 (citing Pet. 65–66). According to Patent Owner, that would have been counterintuitive, and Petitioner is suggesting that Raleigh’s modulation/demodulation blocks and entire transmit and receive architecture should both be duplicated by Sainton’s omni-modal circuit. *Id.* Patent Owner also contends that Petitioner’s declarant offers insufficient support for the proposed combination. *Id.*

A cited portion of Raleigh describes a transmitter system shown in Figure 1, a receiver system shown in Figure 3, and filter banks shown in

Figure 2 for the receiver and transmitter systems. Ex. 1004, 5:35–10:13, Figs. 1–3. Another cited portion describes “[b]ase 152 transmits information to and receives information from a remote unit 170A or 170B.” *Id.* at 10:23–24, Fig. 4. We credit Petitioner’s testimonial evidence that Raleigh’s transmitter and receiver systems would have been part of a communication component because the cited portions of Raleigh support it. Ex. 1003 ¶¶ 164–166. Patent Owner’s responsive argument does not identify a deficiency in what Petitioner argues that Raleigh teaches or suggests. PO Resp. 57.

Based on the full record, Petitioner persuades us, and we find, that Raleigh teaches or suggests “a first communication component including a first transmitter, and a first receiver for wireless connectivity.”

d) “a second communication component including a second transmitter, and a second receiver for wireless communication;”

For the limitations quoted above, Petitioner argues that Sainton’s omni-modal circuit 1 teaches a communication component that includes or is associated with a transmitter and a receiver. Pet. 67 (citing Ex. 1003 ¶ 170; Ex. 1005, 6:14–8:18, Figs. 1A, 1B); Ex. 1001, 11:55–57. Petitioner also argues that it would have been obvious to add Sainton’s circuit 1 as a second communication component to Raleigh’s remote unit. Pet. 67 (citing Ex. 1003 ¶ 169), 68 (citing Ex. 1003 ¶ 171).

The cited portion of Sainton describes its omni-modal radio communication radio frequency circuit 1 that includes, at least, analog modulator 22, digital modulator 24, analog detector-demodulator 18, digital demodulator 20, and their associated components. Ex. 1005, 6:14–8:18, Figs. 1A, 1B. We credit Petitioner’s testimonial evidence regarding Sainton

and that, in the proposed combination, Sainton's circuit would be a second communication component because the cited portions of Sainton support it. Ex. 1003 ¶¶ 169–171. Patent Owner does not present a responsive argument for the “second communication component” of claim 1. PO Resp. 57–59.

Based on the full record, Petitioner persuades us, and we find, that Sainton teaches or suggests “a second communication component including a second transmitter, and a second receiver for wireless communication.”

e) *“a plurality of antennas coupled with the first communication component, including two dedicated antennas to receive a plurality of signals;”*

For the limitations quoted above, Petitioner argues that Raleigh's antenna arrays 50, 110 are coupled to its transmitter and receiver systems with the antenna array for the receiver system being separate from the array for the transmitter system. Pet. 68–69 (citing Ex. 1003 ¶¶ 172, 173; Ex. 1004, 5:21, 7:36–65, Figs. 1, 3); Ex. 1001, 11:58–60. Petitioner also argues that one of ordinary skill in the art would have understood, or found obvious, that antenna array for the receiver system is dedicated to receiving signals. Pet. 69–70 (citing Ex. 1003 ¶¶ 174, 175; Ex. 1004, 7:11–16, 21:55–61, 29:64–30:17, 35:24–29; Ex. 1012, 1:27–36).

The cited portions of Raleigh describe and show that a “final step in the transmission process is to radiate the transmitted signal using a Transmit Antenna Array 50” and that “RF signals from each of the elements of an Antenna Array 110 are downconverted.” Ex. 1004, 7:36–37, 7:55–56, Figs. 1, 3; *see also id.* at 5:21 (describing that “[a]n ‘antenna array’ is a collection of antenna elements”). We credit Petitioner's testimonial evidence because the cited portions of Raleigh support it. Ex. 1003 ¶¶ 172–

174. Patent Owner does not present a responsive argument for the above-quoted limitations of claim 1. PO Resp. 57–59.

Based on the full record, Petitioner persuades us, and we find, that Raleigh teaches or suggests “a plurality of antennas coupled with the first communication component, including two dedicated antennas to receive a plurality of signals.”

f) *“the first communication component configured to transmit a first data stream by simultaneously transmitting a first plurality of signal streams using the plurality of antennas, the first plurality of signal streams collectively representing the first data stream,”*

For the limitations quoted above, Petitioner argues that Raleigh’s transmitter system receives input data for generating into signal sequences that are transmitted. Pet. 71 (citing Ex. 1003 ¶¶ 176, 177; Ex. 1004, 4:60–67, 5:34–7:52, Fig. 1); Ex. 1001, 11:61–65.

A cited portion of Raleigh describes and show that its transmitter system receives input data 2 that is acted on by Encoder and Interleaving apparatus 10, Training Symbol Injection block 20, Transmitter Space-Frequency Pre-Processor block 30 to produce a parallel set of signal sequences, and Modulation and RF System block 40 before being transmitted using Transmit Antenna Array 50. Ex. 1004, 5:34–7:52, Fig. 1. We credit Petitioner’s testimonial evidence because the cited portions of Raleigh support it. Ex. 1003 ¶¶ 176, 177. Patent Owner does not present a responsive argument for the above-quoted limitations of claim 1. PO Resp. 57–59.

Based on the full record, Petitioner persuades us, and we find, that Raleigh teaches or suggests “the first communication component configured to transmit a first data stream by simultaneously transmitting a first plurality

of signal streams using the plurality of antennas, the first plurality of signal streams collectively representing the first data stream.”

- g) *“the first communication component configured to receive a second data stream by simultaneously receiving a second plurality of signal streams using the plurality of antennas and generating the second data stream from the second plurality of signal streams;”*

For the limitations quoted above, Petitioner argues that Raleigh’s receiver system uses antennas to receive RF signals that correspond to the signals from multiple paths and those signals are processed to generate output data. Pet. 72 (citing Ex. 1003 ¶¶ 178, 179; Ex. 1004, 6:27–34, 7:36–52, 7:54–10:2, Figs. 3–6); Ex. 1001, 11:65–12:3.

A cited portion of Raleigh describes RF signals received by Antenna Array 110 and acted on by Demodulation and RF System 120, Channel ID block 130, Receiver Space-Frequency Processor block 140, and Decoder and Deinterleaving block 150. Ex. 1004, 7:54–10:2, Fig. 3. We credit Petitioner’s testimonial evidence that Raleigh’s receiver system teaches or suggests the limitation quoted above because the cited portions of Raleigh support it. Ex. 1003 ¶¶ 178, 179. Patent Owner does not present a responsive argument for the above-quoted limitations of claim 1. PO Resp. 57–59.

Based on the full record, Petitioner persuades us, and we find, that Raleigh teaches or suggests “the first communication component configured to receive a second data stream by simultaneously receiving a second plurality of signal streams using the plurality of antennas and generating the second data stream from the second plurality of signal streams.”

- h) “an adapter configured to receive a signal stream from the communication system, the adapter including a plurality of data ports, wherein the first communication component is configured to transmit or receive the first data stream, the first plurality of signal streams, the second data stream, and the second plurality of signal streams via the plurality of data ports; and”*

For the limitations quoted above, Petitioner argues that Gernert teaches an apparatus with a docking station that would correspond to the recited adapter. Pet. 73 (citing Ex. 1003 ¶ 180; Ex. 1008, 5:29–34, 9:63–10:8, Fig. 3); Ex. 1001, 12:4–10. Petitioner also argues that one of ordinary skill in the art would have understood, or found obvious, that Gernert’s apparatus is part of a communication system in the proposed combination and the apparatus includes data ports. Pet. 73 (citing Ex. 1003 ¶ 181).

Petitioner further argues that Raleigh-Sainton’s remote unit is secured and communicatively connected to Gernert’s docking station for transferring data. Pet. 73–74 (citing Ex. 1003 ¶ 182; Ex. 1008, 5:29–34, 9:67–10:8, Fig. 3). Petitioner additionally argues that one of ordinary skill in the art would have understood, or found obvious, that Raleigh-Sainton’s remote unit used with Gernert’s apparatus transmits or receives data streams and signal streams via data ports. *Id.* at 74–76 (citing Ex. 1003 ¶¶ 183–186; Ex. 1008, 5:20–34, 9:67–10:8, 10:44–62, Fig. 3).

Patent Owner responds that Petitioner relies on Tx Antenna Array 50 for the first communication component and relies on Gernert’s docking station for the adapter. PO Resp. 58–59 (citing Pet. 71, 73, 75; Ex. 2004 ¶ 122). In Patent Owner’s view, the asserted first data stream is transferred wirelessly with the antennas and received through a physical connection of the docking station, and such an arrangement is nonsensical because data

transmitted by antenna would not be received through physical ports of a docking station. *Id.* at 59 (citing Pet. 71–75; Ex. 2004 ¶ 123).

Petitioner replies that Patent Owner reads the limitations too narrowly, because claim 1 does not specify where the first data stream is transmitted, and claim 1 “requires that the first data stream be either transmitted to, or received by, the first communication component via the data ports of the adapter, and does not ask the source of the first data stream.” Pet. Reply 27–28 (citing PO Resp. 58–59; Ex. 1036 ¶¶ 43, 44). In reply, Patent Owner refers to arguments for claims 5–16. PO Sur-reply 30 (citing Pet. 78).

The cited portions of Gernert describe that its “apparatus may also include a docking station or well designed to receive the handset,” it “relates to . . . downloading cradles for use with the wireless handset,” and that “[i]t is also possible to design the well 96 so that when the mobile unit 15 is placed in the well 96, the MAC processor downloads or retrieves data from the mobile computer terminal using an appropriate interface (electrical contact or IR) and either stores it, or sends it out over the WAN.” Ex. 1008, 5:29–34, 9:63–10:8, Fig. 3. We credit Petitioner’s testimonial evidence that Gernert’s apparatus meets the limitation quoted above because the cited portions of Gernert support it. Ex. 1003 ¶¶ 180–186.

We agree that the first communication component of Raleigh and Sinton “as used with Gernert’s apparatus, would transmit or receive the first data stream, the first plurality of signal streams, the second data stream, and the second plurality of signal streams via the plurality of data ports provided at Gernert’s apparatus.” Ex. 1003 ¶ 184. We also agree with Petitioner that Patent Owner too narrowly reads the limitation and that Petitioner’s proposed combination does not transmit and receive at the same time using both antennas and data ports. As quoted above, Petitioner’s

declarant states that, when placed in Gernert's apparatus, the proposed combination transmits and receives through Gernert's data ports.

Based on the full record, Petitioner persuades us, and we determine, that the proposed combination of Raleigh, Sainton, and Gernert includes an adapter configured to receive a signal stream from the communication system, the adapter including a plurality of data ports, wherein the first communication component is configured to transmit or receive the first data stream, the first plurality of signal streams, the second data stream, and the second plurality of signal streams via the plurality of data ports.

i) *“wherein at least two antennas are configured for communication of signals at different frequencies, and”*

For the wherein clause quoted above, Petitioner argues that Raleigh creates parallel bins associated with different frequencies, and that each bin is transmitted via antennas. Pet. 76 (citing Ex. 1003 ¶¶ 187, 188; Ex. 1004, 2:9–63, 6:21–50, 7:24–52, 13:38–22:37, 23:39–36:29, Figs. 1, 99, 11–16, 24, 2); Ex. 1001, 12:10–12. Petitioner also argues that one of ordinary skill in the art would have understood that each antenna operates on a range of frequencies. Pet. 76–77 (citing Ex. 1003 ¶ 188; Ex. 1004, Fig. 9). Petitioner further argues that one of ordinary skill in the art would have recognized, or found obvious, that Raleigh's antennas operate on different frequencies. Pet. 77 (citing Ex. 1003 ¶¶ 189, 190; Ex. 1004, 2:9–50, 6:32–34, 13:52–16:7; Ex. 1013, 4:36–49; Ex. 1014, 1:59–2:18, 2:61–3:24; Ex. 1015, code (57), 2:19–37, 3:9–51, 4:37–49, Fig. 1).

Petitioner provides additional arguments to the extent that the term “different frequencies” would require different frequency bands. Pet. 77–78 (citing Ex. 1003 ¶¶ 191, 192; Ex. 1004, 36:22–26). Petitioner additionally contends that Sainton confirms that it was well known to configure a wireless device for multiple frequency bands, and, thus, it would have been

obvious the remote unit of the proposed combination would have antennas configured for communicating signals at multiple frequencies. *Id.* at 78 (citing Ex. 1003 ¶ 193; Ex. 1005, 1:21–40, 5:14–29, 6:49–52, 7:19–41, 8:4–10, 9:20–10:22; Ex. 1009, 2:55–59, 5:43–7:8, 8:34–65, Figs. 6, 7, 11–14; Ex. 1025; Ex. 1026; Ex. 1027; Ex. 1028; Ex. 1029). According to Petitioner, Raleigh uses frequency division duplexing, which requires the receiver to operate on different sub-band than the transmitter, and, thus, one of ordinary skill in the art would have understood that Raleigh’s transmit and receive antennas are configured for communicating signals at different frequencies. *Id.* (citing Ex. 1003 ¶ 194; Ex. 1004, 7:11–16, 21:55–61, 29:64–30:17, 35:24–29).

Petitioner cites portions of Raleigh and Sainton that describe antennas for communicating at different frequencies. Ex. 1004, 2:44–50, 6:21–50, 7:11–16, 7:24–52, 13:38–22:37, 23:39–36:29, Figs. 1, 9; Ex. 1005, 1:21–40, 5:14–29, 6:49–52, 7:19–41, 8:4–10, 9:20–10:22. We also credit Petitioner’s testimonial evidence because the cited portions of the record support it. Ex. 1003 ¶¶ 187–194. Patent Owner does not present a responsive argument for the above-quoted limitation of claim 1. PO Resp. 57–59.

Based on the full record, Petitioner persuades us, and we find, that Raleigh teaches or suggests “wherein at least two antennas are configured for communication of signals at different frequencies.”

j) *“wherein the signal streams are communicated using a plurality of protocols; and”*

For the wherein clause quoted above, Petitioner argues that the proposed combination would communicate signal streams using multiple wireless protocols, as taught by Sainton. Pet. 79 (citing Ex. 1003 ¶ 195; Ex. 1005, 3:38–43, 5:13–29); Ex. 1001, 12:12–13. Petitioner also argues

that one of ordinary skill in the art would have understood, or found obvious, that the proposed combination uses multiple protocols based on signal types, such as Raleigh’s analog, digital, voice, and data signals, as was known in the art. Pet. 79 (citing Ex. 1003 ¶¶ 195–197; Ex. 1004, 5:35–39; Ex. 1005, 3:33–43, 5:13–22, 6:14–10:42; Ex. 1010, 1:16–18, 2:11–37, 12:55–13:50, 14:12–19).

A cited portion of Sainton describes “circuitry for both voice and data communication over AMPS” and “[ano]ther supported protocol[] would include CDPD.” Ex. 1005, 3:38–43; *see also id.* at 1:28–29 (stating “cellular digital packet data (CDPD)”). Another cited portion of Sainton describes other network standards that circuit 1 may be designed to use. *Id.* at 5:13–29. We credit Petitioner’s testimonial evidence because the cited portions of the record support it. Ex. 1003 ¶¶ 195–197. Patent Owner does not present a responsive argument for the above-quoted limitation. PO Resp. 57–59.

Based on the full record, Petitioner persuades us, and we find, that Sainton teaches or suggests “wherein the signal streams are communicated using a plurality of protocols.”

k) *“a multi band network switch box system that is capable of operating in a number of network environments sequentially or simultaneously”*

For the limitations quoted above, Petitioner argues that the Raleigh-Sainton remote unit communicates with Gernert’s apparatus that includes multiple gateways for accessing multiple networks and multiplexor/demultiplexor 60 that can switch between those networks. Pet. 80 (citing Ex. 1003 ¶¶ 198, 199; Ex. 1008, 5:20–33, 8:7–67); Ex. 1001, 12:14–16. Petitioner also argues that one of ordinary skill in the art would have

recognized, or found obvious, that Gernert's apparatus operates in a number of networks and can connect to those networks sequentially or simultaneously, as taught by Gernert's simultaneous voice and data transfers. Pet. 80 (citing Ex. 1003 ¶ 199; Ex. 1008, 7:63–8:2). Petitioner further argues that Gernert's apparatus would have been understood as, or obviously part of, a communication system. *Id.* at 80–81 (citing Ex. 1003 ¶ 200).

The cited portions of Gernert describe its apparatus. Ex. 1008, 5:20–33, 8:7–67. We credit Petitioner's testimonial evidence because the cited portions of Gernert support it. Ex. 1003 ¶¶ 198–200. Patent Owner does not present a responsive argument for the above-quoted limitations of claim 1. PO Resp. 57–59.

Based on the full record, Petitioner persuades us, and we find, that Gernert teaches or suggests “a multi band network switch box system that is capable of operating in a number of network environments sequentially or simultaneously.”

l) Asserted Reason to Combine Raleigh and Sinton

Petitioner argues that one of ordinary skill in the art would have combined Raleigh and Sinton because Raleigh operates on a certain frequency, is silent on which specific wireless frequency, and is not limited to any frequency. Pet. 8 (citing Ex. 1003 ¶ 62; Ex. 1004, 2:1–9, 2:44–50, 7:11–23, 14:39–51, 16:9–17:24, 21:55–61, 29:64–30:18, 35:24–31). Petitioner also argues that Raleigh “does not provide details on specific frequencies or how frequency bands would be selected” and would have been understood to operate or could be modified to operate, using various frequencies. *Id.* at 8–9 (citing Ex. 1003 ¶¶ 62, 66; Ex. 1004, 36:25–27). According to Petitioner, one of ordinary skill in the art would have been

motivated to turn to other references with “details related to implementation and selection of wireless communication frequencies,” such as Sainton “which offers details of using ‘a variety of different radio frequencies, transmission protocols and radio infra-structures.’” *Id.* at 9 (citing Ex. 1003 ¶ 62; Ex. 1009, 1:5–12, 2:46–3:20, 5:14–18, 6:2–3, 6:60–66, 8:19–22; Ex. 1022, 2:28–50).

Petitioner contends that it would have been obvious to modify Raleigh in view of Sainton’s “concept of an ‘omni-modal circuit’ for ‘access[ing] conveniently various wireless services in accordance with a selection process which is sufficiently under the control of the end user’” and the described benefits of multiband and multi-modal operation. Pet. 9 (citing Ex. 1003 ¶ 63; Ex. 1005, 1:8–12, 1:40–49, 2:26–33, 3:4–15, 4:55–5:31, 12:65–13:1, 16:28–31, 18:31–41) (alteration in original). Petitioner, thus, contends that one of ordinary skill in the art would have been motivated to modify Raleigh “to operate using different frequency bands and with different protocols” and “adapt Raleigh’s system to operate using different frequency bands (as suggested in Raleigh itself. . .)” and “be able to switch between different protocols (e.g., switch between Raleigh’s protocol and the additional protocols described by Sainton).” *Id.* at 9–10 (citing Ex. 1003 ¶ 63; Ex. 1004, 36:25–27).

Petitioner argues that, in one example combination, it would have been obvious to modify Raleigh to include Sainton’s omni-modal circuit as an additional component for communication over Raleigh’s multipath wireless network and the other available networks described in Sainton. Pet. 10 (citing Ex. 1003 ¶ 64; Ex. 1004, 2:9–63, 5:34–13:22, Figs. 4–6; Ex. 1005, 4:55–10:42). Petitioner also argues that the example combination would switch between those networks “according to various switching

techniques described in Sainton.” *Id.* at 10–12 (citing Ex. 1003 ¶¶ 64, 65; Ex. 1005, 2:40–52, 2:60–63, 3:10–15, 5:52–6:14, 16:28–19:25).

Petitioner contends that one of ordinary skill in the art would have been motivated to make the combination “to incorporate Sainton’s additional benefits of being able to accommodate and switch between different frequencies/protocols into Raleigh’s remote unit while retaining Raleigh’s own advantages of multi-antenna communication,” so as to be able to use the best quality wireless service at the lowest possible cost. Pet. 12 (citing Ex. 1003 ¶ 66; Ex. 1005, 1:7–13, 1:40–49, 2:40–52, 3:10–15, 18:31–41, claim 1). Petitioner also contends that the proposed combination “would have provided improved geographical coverage” because it would be able to connect to different wireless networks in different places or countries using Sainton’s circuit. *Id.* (citing Ex. 1003 ¶ 67; Ex. 1005, 5:13–29, 16:28–31).

Petitioner further contends that the proposed combination “would improve flexibility of the wireless device and its ease of use when roaming and traveling between different places or countries,” while still providing Raleigh’s benefits of “increasing communication quality, achieving computational efficiency, reducing various types of interference, and increasing spectral data efficiency.” Pet. 12–13 (citing Ex. 1003 ¶¶ 67, 68; Ex. 1004, 1:31–33, 1:60–2:63, 11:29–41, 17:14–17, 17:47–53). Petitioner additionally contends that Raleigh’s and Sainton’s benefits are compatible and the proposed combination “would have accomplished those benefits in the same or similar way that each reference achieves.” *Id.* at 13 (citing Ex. 1003 ¶ 69).

In Petitioner’s view, Raleigh and Sainton would work in combination as they did apart. Pet. 13 (citing Ex. 1003 ¶ 69). Petitioner, thus, contends that one of ordinary skill in the art would have been motivated to make the

proposed combination to achieve Sainton’s benefits in Raleigh with its advantages. *Id.* at 13–14 (citing Ex. 1003 ¶ 69; Ex. 1004, 1:60–63, 1:66–67; Ex. 1005, 2:35–39).

Petitioner contends that one of ordinary skill in the art would have further been motivated to modify Raleigh “to communicate and process signals for both voice and data separately as taught in Sainton.” Pet. 15 (citing Ex. 1003 ¶ 71; Ex. 1005, 5:13–29, 6:15–10:42, Fig. 1B). Petitioner argues that one of ordinary skill in the art would have found it obvious that the proposed combination would separately process voice and data signals from the networks described in Raleigh and Sainton “to achieve the benefits described by Sainton,” such as having a voice conversation and receiving data for display, and, thus, motivated to make the combination. *Id.* at 15–17 (citing Ex. 1003 ¶¶ 71, 72; Ex. 1005, 13:20–32).

Petitioner also argues that one of ordinary skill in the art would have had a reasonable expectation of success in making the proposed combination because the combination involves a “relatively simple switching technology” that is “useful with many types of available networks and with various antenna and transceiver configurations” and easily integrated. Pet. 17 (citing Ex. 1003 ¶ 73; Ex. 1005, 5:8–29, 6:45–55, 10:29–42).

(1) Patent Owner’s Response

Patent Owner responds that “the asserted motivation to incorporate Sainton’s circuit into Raleigh’s ‘remote unit’ as a separate, second communication component is conclusory and belied by the teachings of both Raleigh and Sainton,” for the reasons given for claim 5. PO Resp. 57. Patent Owner also responds that Petitioner fails to show that one of ordinary skill in the art would have had a reasonable expectation of success for the reasons given for claim 5. *Id.* at 58.

(2) Petitioner Shows a Reason to Combine Raleigh and Sainton

As summarized above, Petitioner contends that Raleigh teaches or suggests the “first communication component,” that Sainton teaches or suggests the “second communication component,” and that “relatively simple switching technology” would have been used to switch between Raleigh and Sainton with citations to the record. Pet. 17, 64–68. Patent Owner’s reference to arguments for claim 5 does not address the challenge presented for claim 1 that does not require the communication system used for a portable handheld mobile device or implemented as a system on a chip. PO Resp. 57–58; *see also* Tr. 48:23–50:20 (discussing the reference to arguments for claim 5 for the response to claim 1).

Petitioner cites to portions of Sainton that support Petitioner’s asserted “benefits of multiband and multi-modal operation,” “additional benefits of being able to accommodate and switch between different protocols/frequencies into Raleigh’s remote unit while retaining Raleigh’s own advantages of multi-antenna communication” and Sainton’s benefits of best possible quality and improved geographical coverage due to being able to use any available wireless service. Pet. 9, 12; Ex. 1005, 1:40–49, 2:40–52, 3:4–15, 5:13–29, 16:28–31, 18:31–41. We credit Petitioner’s testimonial evidence that the benefits would have motivated modifying Raleigh’s remote unit to include Sainton’s omni-modal circuit. Ex. 1003 ¶¶ 62, 63, 66, 69, 72.

Petitioner also provides testimonial evidence that the proposed combination would have had a reasonable expectation of success. Pet. 13–14, 17; Ex. 1003 ¶¶ 62, 69, 73. We credit that testimony because the record supports it. Ex. 1003 ¶¶ 62, 69, 73.

Based on our findings above, Petitioner persuades us that one of ordinary skill in the art would have been motivated to modify Raleigh’s

remote unit to include Sainton's omni-modal circuit as an additional component for communication over Raleigh's multipath wireless network and the other available networks described in Sainton with a reasonable expectation of success. Pet. 8–17.

m) Asserted Reason to Combine Raleigh and Sainton with Gernert

Petitioner argues that one of ordinary skill in the art would have been motivated to combine Raleigh, Sainton, and Gernert “to implement Raleigh-Sainton's wireless device to be used with Gernert's apparatus in the same or similar way to Gernert's mobile unit being used with the apparatus.” Pet. 19 (citing Ex. 1003 ¶ 74). According to Petitioner, one of ordinary skill in the art would have been motivated “based on Gernert's teaching (e.g., connecting a mobile unit to an access point/gateway apparatus) to enable the remote unit to be used as a voice over IP phone, which provides a reliable connection at a low cost, compared to traditional circuit-switched telephone networks” and the “describe[d] benefits of ‘faster speeds and higher bandwidth.’” *Id.* at 20 (citing Ex. 1003 ¶ 75; Ex. 1005, 5:28–29; Ex. 1008, 1:56–2:7, 8:25–48, 9:1–63, Fig. 3).

Petitioner also argues that one of ordinary skill in the art would have been motivated to make the proposed combination to “improve[] the communication capability of its wireless device by permitting it to selectively communicate on various digital and analog protocols, as taught in Gernert (as well as Sainton)” and “to take advantage of the additional functionality and flexibility offered by the variety of communication services offered in Gernert.” Pet. 20–22 (citing Ex. 1003 ¶ 76; Ex. 1005, 1:8–12, 5:13–29, 9:50–10:15, 12:34–59; Ex. 1008, 4:31–56, 5:21–34, 7:59–8:67).

Petitioner further argues that one of ordinary skill in the art would have been motivated to make the proposed combination to “utiliz[e] Gernert’s storage and recharging functionality” and “achieve the associated benefits of recharging, storage, and wired connection to Gernert’s apparatus.” Pet. 22 (citing Ex. 1003 ¶ 77; Ex. 1008, 9:63–10:52). Petitioner contends that “docking stations were well-known for mobile devices” and Sinton teaches an interface similar to Gernert’s for connecting to a docking station. *Id.* (citing Ex. 1003 ¶ 77; Ex. 1005, 10:66–11:30; Ex. 1008, 9:63–10:52).

Petitioner additionally argues that the ordinary skilled artisan would have been motivated to make the proposed combination “to employ Gernert’s solution for conveniently retrieving data from Raleigh-Sinton’s remote unit for storage or transmission over a network.” Pet. 22–23 (citing Ex. 1003 ¶ 78). According to Petitioner, the proposed combination would have enabled the Raleigh-Sinton phone to be placed in the docking station of Gernert’s apparatus and “to achieve the benefits of ‘recharg[ing] the mobile computer terminal, while also automatically accessing information contained on the mobile computer terminal.’” *Id.* at 23 (citing Ex. 1003 ¶ 78; Ex. 1008, 10:3–43) (alteration in original).

Petitioner also contends that one of ordinary skill in the art would have been motivated to make the proposed combination “to take advantage of the benefits offered by Gernert’s connection to a local network, such as a private or corporate network” and “to enable secure connections to the networks described in Gernert, such as local/private/corporate networks.” Pet. 23 (citing Ex. 1003 ¶ 79; Ex. 1008, 4:4–10, 8:15–24, 14:27–15:43).

In Petitioner’s view, the proposed combination would have been merely “applying a known technique (Gernert’s access point/gateway

apparatus) to a known device (Raleigh-Sainton's phone) that was ready for improvement to yield predictable results (e.g., the Raleigh-Sainton phone modified as connectable to Gernert's apparatus)." Pet. 23–24 (citing Ex. 1003 ¶ 79). Petitioner contends that one of ordinary skill in the art would have recognized that combining with Gernert provides quality, speed, bandwidth, security, and convenience in voice/data communications along with recharging, storage, and automated downloads. *Id.* at 24 (citing Ex. 1003 ¶ 79). Petitioner also contends that the combination would have yielded no more than predictable results, worked just as described in the individual references, and had a reasonable expectation of success. *Id.* (citing Ex. 1003 ¶ 80; Ex. 1008, 1:28–2:37).

Patent Owner does not present a response regarding Petitioner's asserted reason to combine Raleigh, Sainton, and Gernert. *See generally* PO Resp. Based on the full record, Petitioner's citations to the record support that one of ordinary skill in the art would have been motivated to make the combination in the manner proposed with a reasonable expectation of success. Pet. 19–24; Ex. 1003 ¶¶ 74–80.

n) Petitioner Shows that Claim 1 is Unpatentable

"Once all relevant facts are found, the ultimate legal determination [of obviousness] involves weighing of the fact findings to conclude whether the claimed combination would have been obvious to an ordinary artisan." *Arctic Cat Inc. v. Bombardier Recreational Prods. Inc.*, 876 F.3d 1350, 1361 (Fed. Cir. 2017). Above, based on full record before us, we provide our factual findings regarding (1) the level of ordinary skill in the art, (2) the scope and content of the prior art, (3) any differences between the claimed subject matter and the prior art, and (4) objective evidence of nonobviousness.

We find that (1) Petitioner’s proposed level of ordinary skill in the art is consistent with the prior art of record, (2) Raleigh, Sainton, and Gernert teach or suggest all the limitations of claim 1, (3) one of ordinary skill in the art would have combined these references with a reasonable expectation of success, and (4) no objective evidence of nonobviousness has been presented in relation to any challenged claim.

Weighing these underlying factual determinations, Petitioner persuades us by a preponderance of the evidence that claim 1 of the ’291 patent is unpatentable over Raleigh, Sainton, and Gernert. *Arctic Cat*, 876 F.3d at 1361.

7. Dependent Claim 2

Claim 2 depends from claim 1 and recites “wherein the first communication component is configured to communicate via cellular frequency bands.” Ex. 1001, 12:18–20. Petitioner argues that Raleigh teaches a capability to choose different frequency bands for communicating and Sainton describes various cellular protocols with cellular frequency bands. Pet. 81 (citing Ex. 1003 ¶ 201; Ex. 1004, 36:25–27; Ex. 1005, 5:14–23). Petitioner, thus, argues that one of ordinary skill in the art would have understood, or found obvious, that the remote unit communicates via cellular frequency bands. *Id.* (citing Ex. 1003 ¶ 202).

Petitioner cites a portion of Raleigh that describes a “transceiver has the capability of choosing alternate frequency bands for communicating” and a portion of Sainton that lists various cellular telephone network standards. Ex. 1004, 36:25–27; Ex. 1005, 5:14–23. We credit Petitioner’s testimonial evidence for claim 2 because the cited portions of the record support it. Ex. 1003 ¶¶ 201–202. Patent Owner does not present a responsive argument specifically for claim 2. PO Resp. 59.

Weighing the underlying factual determinations, Petitioner persuades us by a preponderance of the evidence that claim 2 of the '291 patent is unpatentable over Raleigh, Sainton, and Gernert. *Arctic Cat*, 876 F.3d at 1361.

8. *Dependent Claim 3*

Claim 3 depends from claim 1 and recites “wherein the first communication component is configured to communicate via at least one of amplitude modulation (AM) frequency bands and frequency modulation (FM) frequency bands.” Ex. 1001, 12:21–24. Petitioner argues that Raleigh includes a modulator for frequency converting signals and a demodulator for downconverting signals and that Sainton’s circuit can demodulate FM and AM radio signals. Pet. 81–82 (citing Ex. 1004, 7:24–35, 7:54–65; Ex. 1005, 5:13–25, 7:19–31). According to Petitioner, one of ordinary skill in the art would have understood, or found obvious, that the remote unit communicates in AM and FM frequency bands, as taught by Sainton. *Id.* at 82 (citing Ex. 1003 ¶¶ 203–204; Ex. 1004, 5:35–39).

Petitioner cites a portion of Raleigh that describes a modulator and a demodulator and a portion of Sainton that describes a circuit that can demodulate AM and FM radio signals. Ex. 1004, 7:24–35, 7:54–65; Ex. 1005, 5:13–25, 7:19–31. We credit Petitioner’s testimonial evidence for claim 3 because the cited portions of the record support it. Ex. 1003 ¶¶ 203–204. Patent Owner does not present a responsive argument specifically for claim 3. PO Resp. 59.

Weighing the underlying factual determinations, Petitioner persuades us by a preponderance of the evidence that claim 3 of the '291 patent is unpatentable over Raleigh, Sainton, and Gernert. *Arctic Cat*, 876 F.3d at 1361.

9. Dependent Claim 4

Claim 4 depends from claim 1 and recites “wherein the communication system comprises a portable handheld wireless device including functions of a cell phone.” Ex. 1001, 12:25–27. Petitioner argues with reference to its contentions for claims 5 and 9 that, in the proposed combination, Raleigh’s remote unit would have been implemented as a portable handheld wireless device with cell phone functions. Pet. 82 (citing Ex. 1003 ¶¶ 205–207; Ex. 1004, Fig. 4; Ex. 1005, 10:43–65, 11:30–51, 12:65–13:33, 14:10–15:6, 20:39–21:37, Figs. 2, 4A, 4B, 6A, 6B, 12, 14; Ex. 1008, 1:34–37, 6:38–53, 7:17–20, 7:63–8:2, 8:49–67; Ex. 1010, 1:16–27).

For reasons discussed above, for claim 5, Petitioner does not show by a preponderance of the evidence that one of ordinary skill in the art would have implemented Raleigh’s remote unit as a portable handheld wireless device.

III. CONCLUSION²

In summary:

Claims	35 U.S.C. §	References/Basis	Claims Shown Unpatentable	Claims Not Shown Unpatentable
1–16	103(a)	Raleigh, Sainton, Gernert	1–3	4–16
Overall Outcome			1–3	4–16

IV. ORDER

In consideration of the foregoing, it is hereby:

ORDERED that claims 1–3 of U.S. Patent No. 9,084,291 B1 have been shown, by a preponderance of the evidence, to be unpatentable;

FURTHER ORDERED that claims 4–16 of U.S. Patent No. 9,084,291 B1 have not been shown, by a preponderance of the evidence, to be unpatentable; and

FURTHER ORDERED that, because this is a Final Written Decision, the 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.

² Should Patent Owner wish to pursue amendment of the challenged claim 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).

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