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Paper 35
Date: June 20, 2023

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

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

v.

STATON TECHIYA, LLC,
Patent Owner.

IPR2022-00243
Patent 8,111,839 B2

Before NATHAN A. ENGELS, SCOTT B. HOWARD, and RUSSELL E. CASS, *Administrative Patent Judges.*

CASS, *Administrative Patent Judge*.

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

I. INTRODUCTION

A. Background

In this *inter partes* review, Samsung Electronics Co., Ltd, and Samsung Electronics America, Inc. ("Petitioner") challenge the patentability of claims 1–4 (the "challenged claims") of U.S. Patent No. 8,111,839 B2 (Ex. 1001, "the '839 patent"), which is assigned to Staton Techiya, LLC. ("Patent Owner").

We have jurisdiction under 35 U.S.C. § 6. This Final Written Decision, issued pursuant to 35 U.S.C. § 318(a), addresses issues and arguments raised during the trial in this *inter partes* review. For the reasons discussed below, Petitioner has proven by a preponderance of the evidence that claims 1–4 are unpatentable.

B. Procedural History

In this proceeding, Petitioner relies upon the following references:

Le et al., US 2003/0161097 A1, published Aug. 28, 2003 (Ex. 1006, "Le");

Armstrong, US 7,430,299 B2, issued Sep. 30, 2008 (Ex. 1014, "Armstrong");

Kvaløy, US 6,728,385 B2, issued Apr. 27, 2004 (Ex. 1009, "Kvaløy");

Hall, US 6,021,325, issued Feb. 1, 2000 (Ex. 1015, "Hall").

Paper 3 ("Pet."), iii, 2. Petitioner submits declarations from Dr. Les Atlas, Ph.D. (Exs. 1003, 1054). Patent Owner submits declarations from Daniel P. Anagnos (Exs. 2001, 2006).

Petitioner challenges the patentability of claims 1–4 of the '839 patent based on the following grounds:

Claim(s) Challenged	35 U.S.C. §	Reference(s)/Basis
1	103(a)[1]	Le, Armstrong, Kvaløy
2–4	103(a)	Le, Armstrong, Kvaløy, Hall

Pet. i–ii, 2. Patent Owner filed a Preliminary Response. Paper 12. We instituted trial on all grounds of unpatentability. Paper 15 ("Inst. Dec."), 60.

During the trial, Patent Owner filed a Response (Paper 21, "PO Resp."), Petitioner filed a Reply (Paper 24, "Pet. Reply"), and Patent Owner filed a Sur-reply (Paper 25, "PO Sur-reply").

An oral hearing was held on March 23, 2023, a transcript of which appears in the record. Paper 34 ("Tr.").

C. Real Parties in Interest

Petitioner states that the real parties in interest are Samsung Electronics Co., Ltd, and Samsung Electronics America, Inc. Pet. 1, 50. Patent Owner states that Staton Techiya, LLC and Synergy IP Corporation are the real parties in interest. Paper 7, 1.

D. Related Proceedings

The Petitioner states that the '839 patent was asserted in *Staton Techiya, LLC et al. v. Samsung Electronics Co., Ltd. et al.*, Case No. 2:21-cv-00413 (E.D. Tex.), which was filed on November 5, 2021, and consolidated with *Staton Techiya, LLC v. Samsung Electronics Co., Ltd.*,

[1] The Leahy-Smith America Invents Act, Pub. L. No. 112-29, 125 Stat. 284 (2011) ("AIA"), included revisions to 35 U.S.C. § 103 that became effective after the filing of the application that led to the '839 patent. Therefore, we apply the pre-AIA version of 35 U.S.C. § 103.

Case No. 2:22-cv-00053 (E.D. Tex.), filed February 14, 2022 ("the District Court Litigation"). Pet. 50; Paper 7, 1; Paper 33, 1.

Petitioner is also challenging the '839 patent in *Samsung Electronics Co. v. Staton Techiya*, IPR2022-00242. Petitioner has challenged a related patent, U.S. Patent No. 9,124,982, in IPR2022-00234. *See* Pet. 50; Paper 7, 1.

E. The '839 Patent (Ex. 1001)

The '839 patent is directed to "a device (e.g., earpiece) that can record acoustic signals measured by microphones in the device" and "An Always-On Recording System (AORS)." Ex. 1001, 1:55–59. The '839 patent explains that "[t]he AORS records audio information from at least one acoustic sound sensor(s) (microphones) mounted in [an] ear-sealing assembly." *Id.* at 3:16–18. The system includes an Ambient Sound Microphone (ASM) that is "located outside the occluded ear canal to monitor sound pressure levels near the entrance to the ear canal" and an Ear Canal Microphone (ECM) 32 that is located "within the occluded ear canal to facilitate monitoring of sound within the ear canal." *Id.* at 3:20–26. The signal generated by the ASM "allows for a binaural recording of the user's recent sound exposure for purposes such as automatic dictation and transmission to a binaural audio signal recording and/or monitoring system." *Id.* at 3:26–30. The signal generated by the ECM "may be recorded to analyze and predict the sound stimulus the user's ear drum is exposed to." *Id.* at 3:33–35. The AORS can also use as its data inputs the electronic signal generated by a cell phone. *Id.* at 5:55–58.

Figure 1A, reproduced below, illustrates "an embodiment of an electroacoustic assembly that the Always On (Headwear) Recording System (AORS) may function with." Ex. 1001, 7:9–11.

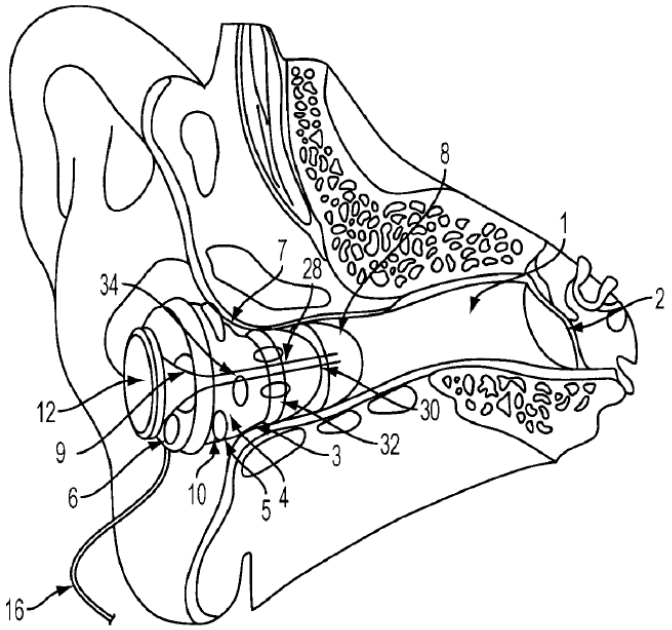


FIG. 1A

Figure 1A of the '839 patent shows an electroacoustic assembly that the Always On (Headwear) Recording System (AORS) may function with. Ex. 1001, Fig. 1A, 7:9–8:20.

As shown in Figure 1A, the system includes earphone body 10, which includes ECM 32, loudspeaker 28, and ASM 34. Ex. 1001, 7:12–14. ASM 34 "detects sound in the front chamber 18, which may be filled with air or another substance such as gel." *Id.* at 7:25–27. ECM 32 "may detect sound from the eardrum 2 side of the earpiece 8." *Id.* at 7:31–32. The system also includes communication circuitry 20, memories 22, 26 and processing unit 24. *Id.* at 7:14–17. Communication circuitry 20 communicates with various other devices, and loudspeaker/ear canal receiver 28 reproduces "sound in the eardrum side of the earpiece 8." *Id.* at 7:55–65. Earpiece 8 "forms a seal

in the ear canal 1 of a user, with the outside end (at diaphragm 12) substantially flush with the entrance 7 to the ear canal 1," resulting in a "completely in the ear" type of device. *Id.* at 7:17–22.

The '839 patent explains that "[t]he audio input data signals to the AORS are constantly recorded to a data storage system such as a circular buffer of non-volatile RAM mounted locally on the earphone assembly." Ex. 1001, 5:58–61. This can be used to allow "retrieval of a user's recent sound exposure (e.g. the last 10 minutes) for purposes such as determining a user's sound exposure preceding an accident" or to allow the user to listen again to a recent speech conversation. *Id.* at 5:61–66. "Recording of the monitored audio signal to a second audio data storage device can be initiated manually following a user-generated command, or automatically in response to a locally produce sound, such as a user-defined verbal activation message or a transient sound such as a gunshot." *Id.* at 5:66–6:4.

F. Illustrative Claim

Of challenged claims 1–4, claim 1 is independent. For purposes of the issues raised in this Decision, claim 1 is illustrative and is reproduced below.

> 1. [preamble] An Always-On Recording System (AORS) comprising:
>
> [a] a first monitoring assembly mounted in an earpiece, the earpiece configured to occlude and form an acoustic seal of an ear canal, the first monitoring assembly including an Ambient Sound Microphone (ASM) to monitor an ambient acoustic field at an entrance to the ear canal occluded by the earpiece, the ASM producing an ASM signal responsive to the ambient acoustic field;
>
> [b] a second monitoring assembly mounted in the earpiece and including an ear canal microphone (ECM) to monitor an acoustic field within the ear canal occluded by the ear

piece, the ECM producing an ECM signal responsive to the acoustic field within the ear canal;

[c] a data storage device configured to act as a circular buffer for continually storing at least one of the ECM signal or the ASM signal;

[d] a further data storage device coupled to the data storage device; and

[e] a record-activation system including software configured to activate the further data storage device to record a content of the data storage device.

Ex. 1001, 14:47–67 (bracketed paragraph identifiers added).

II. DISCUSSION

A. Claim Construction

A claim "shall be 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)." 37 C.F.R. § 42.100(b) (2021).

In the Petition, Petitioner proposes that no claim construction is necessary and "the claims should be given their plain and ordinary meaning." Pet. 17. Patent Owner proposes that the claims be given their "ordinary and customary meaning . . . as understood by a person of ordinary skill in the art at the time of the invention." PO Resp. 16.

We determine that it is not necessary to provide an express interpretation of any claim terms for purposes of this Decision. *See 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)).

B. Principles of Law

A claim is unpatentable under 35 U.S.C. § 103 if "the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious 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, objective evidence of non-obviousness.[2] *Graham v. John Deere Co. of Kan. City*, 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)). Whether a combination of prior art elements would have produced a predictable result weighs in the ultimate determination of obviousness. *Id.* at 416–417.

In an *inter partes* review, the petitioner must show with particularity why each challenged claim is unpatentable. *Harmonic Inc. v. Avid Tech., Inc.*, 815 F.3d 1356, 1363 (Fed. Cir. 2016); 37 C.F.R. § 42.104(b) (2020). The burden of persuasion never shifts to Patent Owner. *Dynamic Drinkware, LLC v. Nat'l Graphics, Inc.*, 800 F.3d 1375, 1378 (Fed. Cir. 2015).

We analyze the challenges presented in the Petition in accordance with the above-stated principles.

[2] Patent Owner has not presented objective evidence of non-obviousness.

C. Level of Ordinary Skill in the Art

Petitioner contends that a person of ordinary skill in the art at the time of the alleged invention would have had "a bachelor's degree in electrical engineering, computer science, or a similar field and two years of experience in the design of digital audio systems and associated signal processing such as voice or speech processing and/or acoustic pattern recognition." Pet. 16 (citing Ex. 1003 ¶ 19). Petitioner further states that "[m]ore education can supplement practical experience and vice versa." *Id*. Patent Owner "applies the level of ordinary skill in the art that is proposed by Petitioners." PO Resp. 16.

We adopt Petitioner's assessment of the level of ordinary skill in the art, which is supported by the '839 patent and the asserted prior art.

D. Ground 1A: Asserted Obviousness of Claim 1 Based on Le in view of Armstrong and further in view of Kvaløy

Petitioner contends that claim 1 would have been obvious over Le in view of Armstrong and further in view of Kvaløy. Pet. 25–38. Patent Owner disagrees, arguing that the proposed combination of Le, Armstrong, and Kvaløy would not have rendered claim 1 obvious. PO Resp. 16–34.

1. Overview of Le (Ex. 1006)

Le discloses a wearable computer system that records audio signals from the user's surroundings, such as the user's conversations with other people. Ex. 1006, code (57), ¶ 12. Figures 1A and 1C are reproduced below:

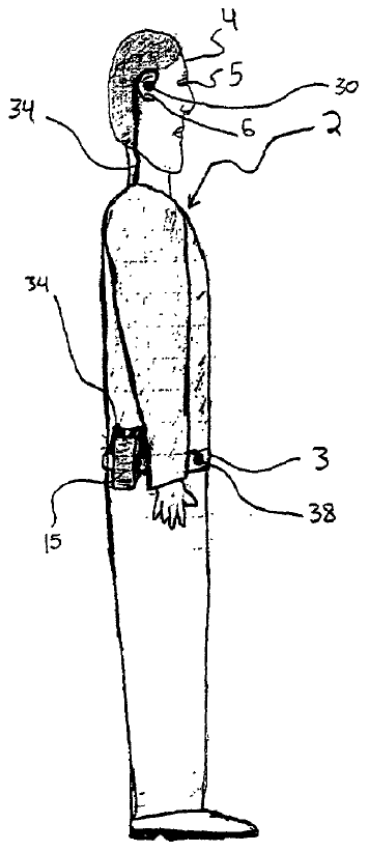


FIG. 1A

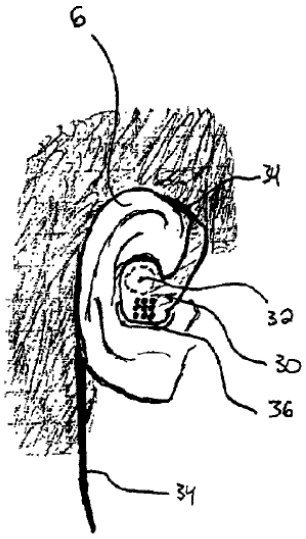


FIG. 1C

Figures 1A and 1C depict Le's wearable computer system. Ex. 1006, Figs. 1A, 1C, ¶¶ 15, 17.

Figure 1A depicts a profile view of user 2 wearing a hands-free, voice-operated computer system 10, and Figure 1C is a closer view of the portion of the system worn on the user's ear 6. Ex. 1006 ¶¶ 15, 17, 20, 22. The system includes computer unit 15 connected to personal microphone 36 and environmental microphone 38. *Id.* ¶¶ 20, 24. Computer unit 15 and environmental microphone 38 are both attached to the user's belt 3, and personal microphone 36 is housed in earpiece 30 on the user's ear 6. *Id.* ¶ 20.

Computer unit 15 includes "a continuously scrolling audio buffer to store audio information received by" microphone 38, and "continuously

records ambient audio, and saves it for some predetermined period of time, such as 30 seconds or one minute." Ex. 1006 ¶ 28. "This allows the user to store audio clips just before, or after, the user issues a predetermined voice command" to store the clips. *Id.* ¶¶ 28, 37. The buffer may be "a part of memory 18" within computer unit 15 (*id.* ¶ 28, Fig. 2), and the audio clips selected for more permanent storage may also be saved into memory 18 (*id.* ¶ 37). Computer unit 15 includes data port 28 to upload saved audio data to a remote computer (not shown). *Id.* at Fig. 2, ¶¶ 21, 30.

"In another implementation, a cellular telephone is used and worn on a belt clip or kept in the user's pocket" and "[t]his cellular telephone may be integrated with the wearable computer unit (which may be a PDA, for example) to provide communications between the user and a remote user, or a remote computer." Ex. 1006 ¶ 9; *see id.* ¶ 42 (contemplating "using the housing of a cellular phone to enclose the computer unit 15"), ¶¶ 41–42 (disclosing that computer unit 15 may use data port 28 to receive audio messages via the cellular telephone).

According to Le, computer system 10 "is more natural in appearance" than prior wearable computer systems, "and facilitates natural interactions with the system and the user's surroundings." Ex. 1006 ¶¶ 3, 5. Thus, the components of system 10 "blend in with the natural appearance of the user 2" to be "minimally obtrusive to the movements and actions of the user 2." *Id.* ¶ 31. For example, "having an earpiece in one's ear is becoming a normal appearance . . . with cellular telephones . . . to converse on the telephone in a hands-free manner." *Id.* ¶ 33.

2. Overview of Armstrong (Ex. 1014)

Armstrong is directed to a system "for transmitting audio via a serial data port in a hearing instrument." Ex. 1014, 1:19–21. In particular, Armstrong discloses "a serial data (SDA) port on a hearing instrument to pass audio data between the hearing instrument and an external device, such as a computer." *Id.* at 2:23–26. Armstrong explains that a "hearing instrument" may be "any personal listening device, such as a hearing aid, wireless cell phone earpiece, etc." *Id.* at 2:32–35.

Armstrong shows an "example hearing instrument having a serial data audio (SDA) port and an ear canal microphone" in Figure 1, reproduced below.

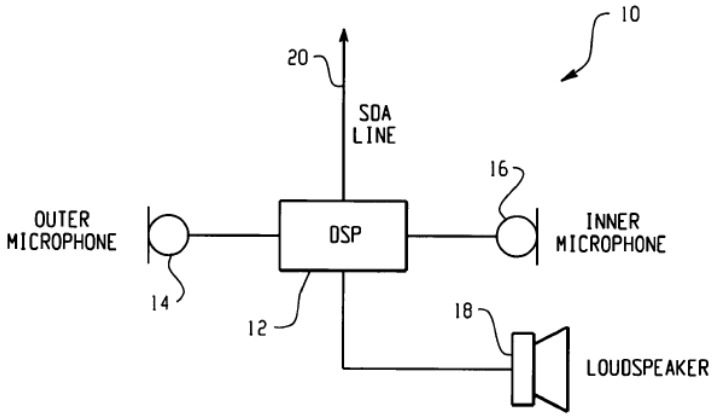


Fig. 1

Figure 1 of Armstrong shows an example hearing instrument having a serial data audio (SDA) port and an ear canal microphone.
Ex. 1014, Fig. 1, 2:7–9.

As shown in Armstrong's Figure 1, hearing instrument 10 includes outer microphone 14 for receiving audio signals from outside the ear canal, inner microphone 16 for receiving an audio signal from inside the ear canal, loudspeaker 18 for transmitting audio signals into the ear canal, digital signal processor (DSP) 12 for controlling the operation of hearing

instrument 10, and serial data port 20 for transmitting serial data, such as an audio signal, to and from DSP 12. Ex. 1014, 2:36–48.

In operation, audio data received by microphones 14 and 16 (or being delivered to loudspeaker 18) is routed into DSP12 where it can be formatted for transmission (wired or wirelessly) via SDA port 20. Ex. 1014, 2:54–57. For example, "audio data may be transmitted to an external device, such as a dedicated programming box, and then routed onto a PC where it can be auditioned by [an] audiologist via the PC's sound card and a set of speakers/headphones." *Id.* at 2:57–61. However, Armstrong explains, "audio can be routed out through the SDA line to many different types of external devices and the transmission protocol may vary." *Id.* at 2:64–67. For example, the SDA port may be used "for recreational purposes, such as streaming music or other recorded audio directly into the hearing instrument 32." *Id.* at 6:18–21.

A "more-detailed block diagram of an example system for transmitting audio via a serial data port (SDA) in a hearing instrument 32" is shown in Figure 2, reproduced below.

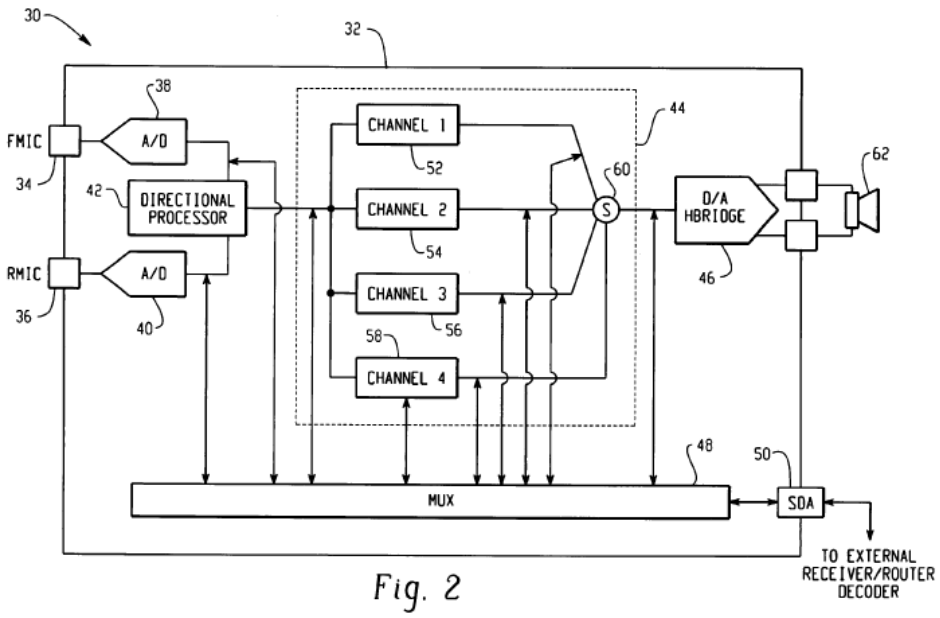


Fig. 2

Figure 2 of Armstrong shows a more detailed block diagram of an example system for transmitting audio from a serial data port in a hearing instrument. Ex. 1014, 4:10–12, Fig. 2.

As shown in Figure 2, hearing instrument 32 "includes front and rear microphones 34, 36 for receiving audio signals, a plurality of analog-to-digital converters 38, 40 for converting the received audio signals into digital audio signals, a directional processor 42 for generating a directionally-sensitive response from the audio signals received from the front and rear microphones 38, 40, and a sound processor 44 for processing the directional audio signal to compensate for hearing impairments." Ex. 1014, 4:12–20. Hearing instrument 32 also includes "digital-to-analog (D/A) converter 46 for converting the processed audio signal into an analog output that may be directed into a user's ear canal by a hearing instrument speaker 62." *Id.* at 4:25–29. Additionally, hearing instrument 32 includes "selection circuitry 48 (e.g., a multiplexer) and a serial data port 50 for transmitting audio signals or other data between the hearing instrument 32 and an external device." *Id.* at 4:29–33.

In operation, "selection circuitry 48 may be configured to receive audio signals from any one or more of a plurality of nodes within the hearing instrument, and selectively transmit one or more of the audio signals to an external device via the SDA 50." Ex. 1014, 4:34–38. "A control signal for configuring the selection circuitry 48 may be input to the multiplexer 48 from an external device via the SDA 50," or "by some other means, such as a switch or other input device on the hearing instrument." *Id.* at 4:47–52. In addition, selection circuitry 48 may "be configured to inject audio signals or other data" from an external device "into any one or more of a plurality of nodes within the hearing instrument 32" via SDA 50. *Id.* at 4:55–60.

3. Overview of Kvaløy (Ex. 1009)

Kvaløy is directed to "a voice detection and discrimination apparatus in a hearing protection arrangement." Ex. 1009, 1:16–18. The apparatus "is intended for use in noisy environments," such as those near heavy operating machinery, loud vehicle traffic, or crowds of people. *Id*. at 1:30–39. An embodiment of Kvaløy's apparatus included in an earplug is shown in Figure 1, reproduced below.

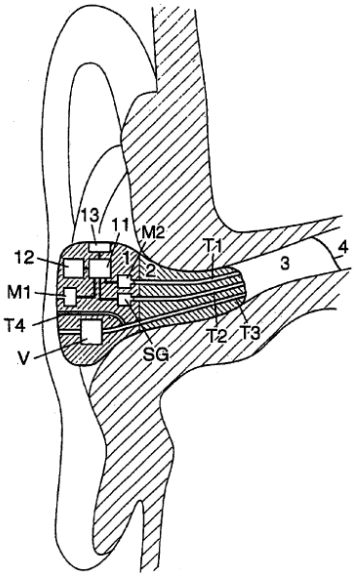


Fig. 1

Figure 1 shows an example of Kvaløy's voice detection and discrimination apparatus. Ex. 1009, Fig. 1, 3:38–39.

As shown in Figure 1, Kvaløy's voice detection and discrimination apparatus includes two electroacoustic transducer elements M1 and M2. Ex. 1009, 3:41–43. The sound inlet of M1 is connected to the outside of the earplug and picks up external sounds, while M2 is connected to the inner portion of the meatus 3 by means of an acoustic transmission channel T1. *Id.* at 3:52–57. The apparatus also includes sound generator SG that "is open into the inner portion of the meatus 3 by means of an acoustic transmission channel T2 between the sound generator SG and the inward facing portion of sealing section 2." *Id.* at 3:62–66. The apparatus also includes a "sealing part" that is "made of a resilient, slowly re-expanding shape retaining polymer foam like PVC, PUR, or other materials suitable for earplugs." *Id.* at 4:21–26.

Kvaløy further states that "[i]n many applications of an apparatus according to the invention, the surrounding pressure may vary during its

use," requiring "equalisation of pressure between the two sides of the earplug." Ex. 1009, 4:56–59. According to Kvaløy, this pressure equalization "is obtained by using a very thin duct T3, T4 or a valve that equalises static pressure differences, while retaining strong low frequency sound attenuation." *Id*. at 4:59–62.

4. Motivation to Combine Le, Armstrong, and Kvaløy

a) The Parties' Arguments

Relying on the testimony of Dr. Atlas, Petitioner argues that one of ordinary skill "would have been motivated to combine the teachings of Le, Armstrong, and Kvaløy, and would have had a reasonable expectation of success in doing so." Pet. 17 (citing Ex. 1003 ¶¶ 112–133). According to Petitioner, Le emphasizes the desire for the system to be unobtrusive and blend in with the user's appearance, and discloses that computer unit 15 can be implemented as a cellular telephone with wireless connections for microphones 36 and 38. *Id.* at 18 (citing Ex. 1006 ¶¶ 5, 9, 31, 33, 42). Petitioner also contends that Le is "concerned with properly recognizing voice commands that initiate recording in noisy environments." *Id.* (citing Ex. 1006 ¶¶ 23–24). In view of these disclosures, Petitioner argues, one of ordinary skill would have been motivated to look for ways to implement Le's system with a wireless connection to the microphones 36 and 38 and an ability to input audio commands in noisy environments, while making the system more unobtrusive. *Id.* (citing Ex. 1003 ¶ 118).

Petitioner argues that this motivation would have led one of ordinary skill to Armstrong and Kvaløy. Pet. 18 (citing Ex. 1003 ¶ 118). According to Petitioner, one of ordinary skill "would have recognized (1) that Armstrong's hearing instrument would have been compatible with and even

advanced Le's disclosed objectives and be the same as or superior to Le's earpiece; and (2) that adding Kvaløy's sealing part to Armstrong's hearing instrument would have improved both Armstrong and Le." *Id.* at 19 (citing Ex. 1003 ¶ 124).

As to the first point, Petitioner argues that one of ordinary skill "would have appreciated that Armstrong's hearing instrument is analogous to Le's earpiece, as the hearing instrument and Le's earpiece are configured to communicate with a remote device." Pet. 19 (citing Ex. 1003 ¶ 125). According to Petitioner, Armstrong "expressly discloses recording audio signals from the earpiece using a PC or other recording device." *Id.* (citing Ex. 1014, 5:52–64). Thus, Petitioner contends, one of ordinary skill "would have readily appreciated that Armstrong's wireless hearing instrument could be advantageously utilized with the recording function of Le's computer unit." *Id.* (citing Ex. 1003 ¶¶ 126–127). Additionally, according to Petitioner, "Armstrong is compatible with and even advances Le's objectives of providing a wireless earpiece with reduced visibility and obtrusiveness" because Armstrong's wireless earpiece would be less obtrusive than Le's wired earpiece. *Id.* (citing Ex. 1003 ¶ 128). Petitioner further contends that Armstrong's outer microphone "would provide the same or superior function as Le's belt-worn environmental microphone without the potential obtrusiveness of having to carry around a separate microphone and/or wear it on a belt." *Id.* at 20 (citing Ex. 1003 ¶ 129).

As to the second point, Petitioner argues that "implementing Kvaløy's seal with Armstrong's hearing instrument would have improved [an] audiologist's ability to accurately discern the characteristics of the sound being delivered to the ear canal." Pet. 20 (citing Ex. 1003 ¶¶ 130–131).

Petitioner also contends that "Kvaløy's seal would advance Le's objective to discern voice commands in noisy environments" and, in particular, using "Armstrong's inner microphone in a hearing instrument that employed Kvaløy's sealing section would provide an equivalent or superior voice signal compered to Le's personal microphone" for natural voice commands. *Id.* at 20–21 (citing Ex. 1003 ¶¶ 132).

Accordingly, Petitioner's combined Le-Armstrong-Kvaløy system would include "a hearing instrument as suggested by Armstrong with a sealing section as suggested by Kvaløy [that] would replace Le's earpiece 30 (including personal microphone 36 and speaker 32) and environmental microphone 38." Pet. 21 (citing Ex. 1003 ¶ 134). Petitioner argues that this combination "would have been predictable and would not have affected Le's, Armstrong's, or Kvaløy's design principles" for several reasons. *Id.*

First, relying on Dr. Atlas, Petitioner argues that "[w]ireless headsets capable of communication with mobile devices such as cellular phones were common in the 2007 timeframe," and one of ordinary skill "would have been able to adapt *Le*'s computer unit to wirelessly communicate with Armstrong's hearing instrument, as Le itself suggests." Pet. 21 (citing Ex. 1003 ¶¶ 135–136). "Similarly," Petitioner contends, "Kvaløy's sealing section 2 was a common feature of earpieces in the 2007 timeframe, so a person having ordinary skill in the art would have been readily able to implement Armstrong's hearing instrument with a sealing section." *Id.* at 22 (citing Ex. 1003 ¶¶ 137–143).

Second, Petitioner argues that one of ordinary skill "would have understood that the microphones of Armstrong's hearing instrument 32 would work to accomplish Le's design objective, i.e., to pick up voice

commands from the user and to pick up sounds from the user's environment, including the voices of people to whom the user is speaking." Pet. 22 (citing Ex. 1003 ¶ 144). "In particular," according to Petitioner, "Armstrong discloses that the hearing instrument 32 may be a 'hearing aid,'" and one of ordinary skill would have understood that a hearing aid would accomplish that design objective." *Id.* at 22–23 (citing Ex. 1003 ¶ 144).

Third, Petitioner argues that "Armstrong's hearing instrument is specifically designed to receive and transmit audio signals from either or both of the earpiece microphones to a remote device (e.g., Le's computer unit in the combination) for recording." Pet. 23 (citing Ex. 1014, 4:34–43). "In particular," Petitioner asserts, "Armstrong discloses selection circuitry 48, which is 'configured to receive audio signals from any one or more of a plurality of nodes within the hearing instrument,' including 'the outputs of the A/D converters 38, 40,' and to 'transmit one or more of the audio signals to an external device.'" *Id.* (citing Ex. 1014, 4:34–43). According to Petitioner, one of ordinary skill "would have understood that this would have permitted Armstrong's hearing instrument to transmit both the signal from the outer microphone and ear canal microphone to Le's computer unit." *Id.* (citing Ex. 1003 ¶ 145).

Patent Owner disagrees that it would have been obvious to combine Le, Armstrong, and Kvaløy as Petitioner proposes for several reasons. PO Resp. 16–34. First, Patent Owner argues that Le does not disclose or suggest an ear canal microphone, and that the environment measured by Le's personal microphone 36 "is very different than the environment measured by an ear canal microphone." *Id.* at 17 (citing Ex. 2006 ¶ 59). Additionally, according to Patent Owner, Le "does not disclose any circuitry

for handling echo, ringing, or feedback suppression," which occur "if an ear canal microphone and speaker are in close proximity." *Id.* Patent Owner also contends that Dr. Atlas "appear[ed] confused" at his deposition "on how to combine Le with a device using an ear canal microphone," and could not "identify even a single component" of the proposed combination. *Id.* at 17–23 (citing Ex. 2007, 11:14–23, 145:19–22, 148:15–149:17, 150:22–151:23, 153:10–157:22); *see also* PO Sur-reply 3.

Second, Patent Owner argues that "[o]ne of ordinary skill would not have achieved the proposed Le-Armstrong-Kvaløy combination with a reasonable likelihood of success." PO Resp. 23–34 (emphasis omitted). More specifically, Patent Owner asserts that one of ordinary skill would not have been able to modify Armstrong's hearing instrument into an in-the-ear earpiece because they would need to "strip Le of virtually all components if its earpiece 30 and environmental microphone 38 were both replaced by Armstrong's hearing instrument," leaving nothing left in Le but a "concept." *Id.* at 25 (citing Ex. 2006 ¶ 64). Patent Owner also contends that, due to limitations in the state of the art in hearing aid technology in 2007, Petitioner's proposed combination would have "require[ed] knowledge and skill beyond one of ordinary skill in the art." *Id.* at 26. To support this argument, Patent Owner relies on a 2007 article by Brent Edwards titled *The Future of Hearing Aid Technology*, found in the National Institute of Health's National Library of Medicine and reprinted by SAGE Journals (Exhibit 2008,[3] "the Edwards article") which, according to Patent Owner,

[3] Patent Owner erroneously cites to the article as Exhibit 2007 on page 26, but the context makes clear that the article is included as Exhibit 2008. *See* PO Resp. 26; Exs. 2007, 2008.

states that Bluetooth wireless solutions required more power than most hearing aids of that time could accommodate and that incorporating Bluetooth technology in a hearing aid would have been a major engineering challenge. *Id.* at 27 (citing Ex. 2008, 4, 5); *see also* PO Sur-reply 4–5.

Patent Owner also argues that the Edwards article "explains that the digital signal processors found in hearing aids during the 2007 timeframe were not capable of performing many algorithmic and processing tasks because of limitations of available power and memory." PO Resp. 28–29 (citing Ex. 2008, 5). These issues, according to Patent Owner, would have "dramatically limit[ed] the functions that could be performed by the Le-Armstrong-Kvaløy combination," such as speech recognition. *Id.* at 30–31. Patent Owner further contends that "neither Le nor Armstrong discloses gating circuitry to control when the microphones and speakers are active to avoid feedback effects." *Id.* at 31. Indeed, Patent Owner argues, "in 2007 the market was void of any consumer electronics earphone/earbud (in-ear canal) devices, including hearing aids, having these features and functions in the marketplace," and "it took 3–5 or more years for any such devices to be developed." *Id.* at 33 (citing Ex. 2006 ¶ 81).

Additionally, Patent Owner contends, "Armstrong discusses the occlusion effect, a common hearing aid issue which occurs when an ambient sound is being amplified and is corrupted with undesirable lower frequency resonant emphasis (accentuation) when the user speaks." PO Resp. 31 (citing Ex. 1014, 7:60–67). According to Patent Owner, "Armstrong addresses this problem by canceling the unwanted signal received by the rear microphone 1026 by feeding back the rear signal from A/D converter 1032B to summation circuit 1071," which then "subtracts the unwanted signal from

the processed composite signal to thereby compensate for the occlusion effect." *Id.* at 31–32 (citing Ex. 1014, 7:60–67). However, Patent Owner contends, "[i]f the rear microphone has been moved into the ear canal, as Petitioners propose, this action would result in no ECM signal to store in memory because the summation circuit 1071 would have removed the signal." *Id.* at 32. According to Patent Owner, Armstrong only stores the ECM signal when it is used by an audiologist to check the operation of the hearing aid, and the ECM signal "is not normally available during normal operation of the hearing aid" and is "not available for always on recording." *Id.* (citing Ex. 2006 ¶ 77; Ex. 1014, 3:1–8). Therefore, Patent Owner contends, "in any combination of Armstrong and Le, with the sealing portion of Kvaløy, the circuit of Armstrong would need to be redesigned to retain the ECM signal for the always on recording feature of claim 1." *Id.* (citing Ex. 2006 ¶ 78).

Finally, Patent Owner argues that Petitioner is not clear "whether in their combination only the inner microphone is used to pick up the user's voice commands." PO Resp. 34. According to Patent Owner, "[i]f the inner ear microphone is being used to pick up the user's voice, that voice signal will be repeated by the inner ear speaker, causing echoing and undesirable feedback," requiring circuitry "to parse the user's voice from the other sounds" which "is not disclosed in any of the references" and "would not have been present in 2007" as previously discussed. *Id.* (citing Ex. 2006 ¶ 85). On the other hand, Patent Owner contends, if the outer microphone is used to detect the user's voice, "then the problem of parsing the user's voice from other ambient sounds remains," and "determining whether the user or

someone in close proximity to the user is speaking would be a technical problem" not discussed in the prior art. *Id.* (citing Ex. 2006 ¶ 86).

Petitioner responds that Patent Owner's criticisms of Dr. Atlas's deposition testimony are unfounded because Patent Owner was essentially "conducting a memory test" of Dr. Atlas's recollections off the top of his head, and that the fact that Dr. Atlas had not "committed to memory the 543 pages of his declarations in three separate IPR proceedings about which he was being deposed concurrently does not undermine the credibility of his opinions in his declaration." Pet. Reply 3 (citing Ex. 2007, 140:22; Ex. 1047, 37). Petitioner also argues that many of the questions asked of Dr. Atlas at his deposition were unclear or very general, and his inability to guess at the desired answer or effectively summarize many paragraphs of his declaration "does not render his proposed combination undefined." *Id.* at 3–4 (citing PO Resp. 18).

Petitioner also argues that Patent Owner misperceives the standard for determining a reasonable expectation of success by requiring that Petitioner must "explicitly specify every detail of a physically combined, operative device," rather than looking to "the likelihood of success in combining references to meet ***the limitations of the claimed invention***." Pet. Reply 7. Petitioner asserts that the Edwards article is "not a reliable source of information" because "there is no evidence as to when it was written," it "does not purport to conduct a comprehensive literature or patent review," and "its discussion is focused on commercially available hearing aid technology." *Id.* at 8. Additionally, Petitioner contends that the author of the Edwards article "appears to have filed a patent application in July 2006 that takes for granted many of the alleged technical limitations discussed in"

the Edwards article, including a "completely-in-the-canal hearing aid" or "wireless earpiece" that supports Bluetooth. *Id.* (citing Ex. 1057, Cover, 1:22–28, 3:34–47, 3:56–60, 4:4–15, 6:39–52).

Next Petitioner responds that Patent Owner's contention that modifying Armstrong's hearing instrument into "an in-ear canal earpiece" would have been beyond the level of ordinary skill is flawed because "Petitioner[] d[oes] not argue that the proposed combination required placing all of Armstrong's circuitry into an 'in-ear canal earpiece' or Kvaløy's form factor," and "[t]he claims do not require any particular form factor." Pet. Reply 11 (citing Pet. 21, 24, 26; Ex. 1003 ¶¶ 134, 146, 156–157). Petitioner argues that one of ordinary skill "would have been familiar with earpieces, including hearing aids, that had a hybrid form-factor including an in-ear-canal component including a speaker and/or microphone(s) and a behind-the-ear component including additional processing and power capabilities." *Id.* at 12 (citing Ex. 1054 ¶¶ 13–24). Additionally, according to Petitioner, both Kvaløy and Victorian[4] disclose capabilities similar to Armstrong in an in-ear canal earpiece, are presumed enabling, and indicate that one of ordinary skill would have been able to implement Armstrong's circuitry in an in-ear canal earpiece. *Id.* at 14–16 (citing Ex. 1054 ¶¶ 19–24; Ex. 1009, 5:10–11, 5:66–6:18, 9:30–45, Fig. 2; Ex. 1007 ¶¶ 25, 26, 30, Figs. 3B, 3C). Petitioner further argues that "the '839 patent itself takes any technical limitations associated with a small form-factor for granted," explaining that the disclosed system can be implemented using wireless earbuds. *Id.* at 16 (citing Ex. 1001, 2:54–58, 3:1–6).

[4] EP 1 519 625 A2, published Mar. 30, 2005 (Ex. 1007, "Victorian").

As for Patent Owner's arguments based on Bluetooth, Petitioner responds that "the claims do not require Bluetooth" or wireless communication, or have "any limitations related to power consumption or transmission speed." Pet. Reply 17. Petitioner also argues that "Le expressly discloses using a wireless connection between the computer unit and the personal and environmental microphones without any suggestion that it would diminish Le's ability to record audio and recognize the user's speech commands." *Id.* (citing Ex. 1006 ¶ 42). Similarly, Petitioner asserts, "Armstrong discloses using the hearing instrument as a 'wireless cell phone earpiece'" implemented via an SDA port, and that "'audio data' including speech or streaming music could be fed into the device via the SDA port." *Id.* at 18 (citing Ex. 1014, 2:32–35, 2:54–57, 3:31–35, 6:12–21). Petitioner further contends that the '839 patent itself "takes the alleged technical limitations of wireless communication for granted" by describing the implementation of a "Bluetooth communications assembly" in an earpiece "using block diagrams and no implementation detail." *Id.* (citing Ex. 1001, 7:55–62).

With respect to Patent Owner's argument regarding the presence of echo, ringing, or feedback in the proposed combination, Petitioner responds that the absence of echo, ringing or feedback is not required by the claims. Pet. Reply 19–20 (citing PO Resp. 24, 31, 34). Even if it were required, Petitioner argues, the proposed combination "rel[ies] upon Armstrong's single ear embodiment denoted by hearing instrument 32," and "Armstrong's device is not limited to use as a hearing aid." *Id.* at 20 (citing Ex. 1014, 2:32–35, 5:65–6:11). Thus, according to Petitioner, when the ear canal speaker is off the user can hear environmental sounds through their

other ear, and in such a case there would be no risk of the feedback, echo, or ringing that Patent Owner complains of. *Id.* Additionally, Petitioner contends that the Edwards article describes hearing aid DSP algorithms that include "feedback cancellation," and that this was confirmed by Mr. Anagnos. *Id.* at 20–21 (citing Ex. 2008, 5; Ex. 1045, 36:10–15). Petitioner further asserts that "despite having the same earpiece microphone combination as Armstrong, the '839 patent does not even mention feedback/echo/ringing as a problem to solve." *Id.* at 22.

With respect to Patent Owner's argument regarding limitations in digital signal processors found in hearing aids, Petitioner responds that Patent Owner "does not explain what 'algorithmic and processing tasks' that are required by the claims would not have been feasible to implement." Pet. Reply 23. Petitioner argues that "the claimed invention has no limitations related to the required effectiveness of speech recognition" and, in any event, speech recognition could occur "within Le's computer unit." *Id.* (citing PO Resp. 30–31, 36–38; Ex. 2008, 5). "Moreover," Petitioner contends, the '839 patent "takes any alleged processing demands completely for granted" and "includes no implementation details for a new or inventive DSP capable of achieving this functionality." *Id.* (citing Ex. 1001, 5:46–6:3).

Finally, with respect to Patent Owner's argument about Armstrong's proposed solution for the "occlusion effect," Petitioner responds that "Armstrong discloses using the invention for 'non-diagnostic' purposes or for recreational or entertainment purposes," and that Armstrong's solution for the occlusion effect is "described with respect to the embodiment in Figs. 4A/B, which Petitioners do not rely upon." Pet. Reply 24 (citing Pet. 13

(citing Ex. 1014, 4:9, 6:18–22, 6:24)). Petitioner also contends that Patent Owner's argument "incorrectly assumes that Armstrong's selection circuitry is only configured to obtain a signal for recording from the output of summation circuit 1071 (described with respect to Fig. 4A/4B), when in fact Armstrong discloses receiving the signals for the signal output directly from the A/D converters 38/40." *Id.* at 25 (citing Pet. 23 (citing Ex. 1014, 4:34–43); Ex. 1003 ¶ 145). "Thus," according to Petitioner, "no new hardware or circuitry would be required." *Id.*

Patent Owner responds to Petitioner's arguments about the echo/feedback issue by arguing that both Le and Armstrong contemplate that the ear canal speaker (or Le's earpiece speaker 32) must occasionally be on because otherwise a speaker would not be necessary at all. PO Sur-reply 6–7 (citing Ex. 1006 ¶ 39; Ex. 1007 ¶ 30). Patent Owner also argues that without the ear canal speaker, "the user would not be able to properly hear ambient sound—at least not with one ear, or with either if the user were wearing two earpieces, which is the most likely situation." *Id.* Additionally, Patent Owner argues that the ear canal microphone must be on to record the user's conversation with another speaker which, according to Patent Owner, is Le's "inventive idea," and without which Le would be "inoperable." *Id.* at 7, 9–11 (emphasis omitted). Finally, Patent Owner argues that in the proposed combination the ASM and ECM are not on at the same time, as required by claim 1. *Id.* at 11–12 (citing Ex. 1001, 14:48–52, 14:55–57).

b) Analysis

Based on the full trial record, we find that Petitioner has sufficiently proven that one of ordinary skill would have been motivated to combine Le, Armstrong, and Kvaløy as Petitioner proposes, and would have had a

reasonable expectation of success in doing so. We agree with Petitioner and Dr. Atlas that Le expresses the desire for the system to blend in with the natural appearance of the user and be unobtrusive to the user and to people with whom the user interacts. Pet. 18 (citing Ex. 1006 ¶¶ 5 (the invention provides a wearable system "that is more natural in appearance and facilitates natural interactions with the system and the user's surroundings"), 31 ("[t]he user interface devices of the wearable computer system . . . blend in with the natural appearance of the user" and are "also minimally obtrusive to the movements and actions of the user"), 33 (describing "[a]dditional measures" that "may be taken to make the wearable computer system 10 even more unobtrusive for the user and people who interact with the user")). Ex. 1003 ¶¶ 113–115.

We also agree with Petitioner and Dr. Atlas that Le teaches implementing the computer unit 15 as a cellular telephone and using a wireless connection for microphones 36 and 38. Pet. 18 (citing Ex. 1006 ¶¶ 9 ("[i]n another implementation, a cellular telephone is used" in the wearable computer unit "to provide communications between the user and a remote user, or a remote computer"), 42 (personal microphone 36, earpiece speaker 32, and environmental microphone 38 "may be connected to the computer unit 15 using a conventional wireless connection," and the invention may "us[e] the housing of a cellular phone to enclose the computer unit 15"); Ex. 1003 ¶ 116. We further agree that Le is concerned with properly recognizing voice commands that initiate recording in noisy environments. Pet. 18 (citing Ex. 1006 ¶¶ 23–24); Ex. 1003 ¶ 117.

In light of these disclosures, we find that Petitioner has set forth sufficient evidence and reasoning to establish a motivation to modify Le's

system to use a hearing instrument like that disclosed in Armstrong and Kvaløy. This evidence includes the testimony of Dr. Atlas that one of ordinary skill would have appreciated that Armstrong's hearing instrument is analogous to Le's earpiece, and using an earpiece like that of Armstrong would have advanced Le's objective of providing a wireless earpiece with reduced visibility and obtrusiveness. Ex. 1003 ¶¶ 125, 128. We also credit Dr. Atlas's testimony that one of ordinary skill would have recognized that Armstrong's outer microphone would have provided the same or superior function as Le's belt-worn environmental microphone without its obtrusiveness. *Id.* ¶ 129. Additionally, we find credible Dr. Atlas's testimony that one of ordinary skill in the art would have understood that a sealing part as disclosed in Kvaløy would have improved Le's ability to discern voice commands in noisy environments and would also have improved Armstrong because it would ensure that the sound inside the ear canal was less polluted with noise from the external environment. *Id.* ¶¶ 130–132. Thus, Petitioner has sufficiently proven that combining Le, Armstrong, and Kvaløy as proposed would have amounted to no more than substitution of one known element (the Armstrong-Kvaløy hearing instrument) for another (Le's earpiece and environmental microphone) to obtain predictable results (Le's computer unit with a wireless earpiece and microphones). *Id.* ¶¶ 146–148.

We do not agree with Patent Owner's arguments that one of ordinary skill would not have been motivated to combine Le with Armstrong and Kvaløy, or had a reasonable expectation of success in doing so. *See* PO Resp. 16–34; PO Sur-reply 3–12. First, we disagree with Patent Owner's argument that Le fails to disclose or suggest an ear canal microphone, and

that the environment measured by Le's personal microphone 36 is very different than the environment measured by an ear canal microphone. *See* PO Resp. 17. In doing so, we credit Dr. Atlas's testimony that one of ordinary skill would have understood that Armstrong's inner microphone would have worked to accomplish Le's design objectives, namely to pick up voice commands from the user, and would also provide a superior voice signal because it is less susceptible to noise. Ex. 1003 ¶¶ 132, 144. The fact that Le individually does not disclose or suggest an ear canal microphone does not detract from Petitioner's argument and evidence showing that one of ordinary skill would have been motivated to modify Le to replace the personal microphone with an ear canal microphone to make the device less obtrusive and less susceptible to noise.

We also do not agree with Patent Owner's argument that the Le-Armstrong-Kvaløy combination would have required one of ordinary skill to strip Le down to a "concept" which would no longer be an apparatus. PO Resp. 25. Petitioner's combination relies on Le's computer unit which continuously stores, in a scrolling buffer, audio information from the user's surroundings and, when a user enters a voice command, stores a "thirty-second sound byte surrounding the event" from the environmental microphone in a memory. Pet. 21, 31–36. Petitioner also relies on Le's software instructions in a computer memory for recognizing spoken words, determining whether they constitute a predetermined voice command, and using voice commands to trigger storage of content that is in the continuously scrolling buffer to the memory. *Id.* at 36–37. Petitioner then replaces Le's environmental microphone and earpiece with Armstrong's ear level device and Kvaløy's sealing section. *Id.* at 21. Thus, Petitioner's

combination relies on structure from Le, Armstrong, and Kvaløy in its proposed combination.

Additionally, we do not agree with Patent Owner that making Petitioner's combination would have required knowledge and skill beyond one of ordinary skill in the art. *See* PO Resp. 26. Patent Owner relies on the Edwards article, but we agree with Petitioner that this article focuses primarily on commercially available hearing aid technology, and does not purport to review the state of the prior art or discuss the prior art references being asserted in this proceeding. *See* Pet. Reply 8; Ex. 2008. For example, the Edwards article discusses hearing aids "sold in the United States" and technologies that are "successful in the marketplace." Ex. 2008, 1.

As for the purported challenges of incorporating Bluetooth into the proposed combination, we agree with Petitioner that the claims do not require Bluetooth or wireless communication, or have any limitations related to power consumption or transmission speed. *See* Pet. Reply 17. Furthermore, Le expressly discloses using a wireless connection between the computer unit and the personal and environmental microphones, and Armstrong discloses implementing the hearing instrument as a "wireless cell phone earpiece" that can transmit speech and audio data. Ex. 1006 ¶ 42; Ex. 1014, 2:32–35, 2:54–57, 3:31–35, 6:12–21). Le and Armstrong are presumed to be enabling, and their disclosure of wireless communication undermines Patent Owner's argument that implementing wireless communication between an earpiece and a computer device or cell phone would have been beyond the level of ordinary skill in the art. *See In re Antor Media Corp.*, 689 F.3d 1282, 1288 (Fed. Cir. 2012) (prior art printed publications are presumptively enabled); *Apple Inc. v. Corephotonics, Ltd.*,

861 F. App'x 443, 450 (Fed. Cir. 2021). Moreover, the '839 patent itself describes the implementation of a "Bluetooth communications assembly" in an earpiece using only block diagrams with no implementation details, suggesting that the inventors did not believe that such implementation was beyond the level of ordinary skill in the art. Ex. 1001, 2:59–67, 5:61–6:20, 6:62–67, 10:61–11:11; *see Google LLC v. Cywee Grp.*, IPR2018-01258, Paper 90 at 38–39 (PTAB Jan 9, 2020) (Final Written Decision) (explaining that because the patent "does not explain how to implement its sensor within appropriate circuits or its mathematics within appropriate software in any detail, this acts as an admission that such details were within the knowledge of one of ordinary skill"); *In re Epstein*, 32 F.3d 1559, 1568 (Fed. Cir. 1994) ("[T]he Board's observation that appellant did not provide the type of detail in his specification that he now argues is necessary in prior art references supports the Board's finding that one skilled in the art would have known how to implement the features of the references.").

Similarly, we do not agree with Patent Owner's argument that limitations in digital signal processor technology would have prevented one of ordinary skill from making the proposed combination. *See* PO Resp. 28–29. Patent Owner focuses on speech recognition capability, but the claims have no limitations related to the required effectiveness of speech recognition, and speech recognition processing could occur within Le's computer unit in any event. Patent Owner's argument is also undermined by the fact that the '839 patent explains that the invention can include wireless "earbuds," but does not include any implementation details for circuitry capable of achieving the speech recognition or other processing capabilities that Patent Owner complains would be beyond the level of ordinary skill.

See Ex. 1001, 2:54–58, 5:46–6:3. Moreover, we agree with Petitioner and Dr. Atlas that the proposed combination does not require placing all of Armstrong's circuitry (including circuitry for implementing wireless communication and/or digital signal processing) into an in-ear-canal earpiece, and agree with and credit Dr. Atlas's testimony that one of ordinary skill would have been able to incorporate this circuitry into a different form factor such as a behind-the-ear component. *See* Pet. Reply 11; Ex. 1054 ¶¶ 13–18. We also credit Dr. Atlas's testimony that one of ordinary skill would have been able to implement the proposed combination in an in-ear canal form factor as well, as demonstrated by Victorian and Kvaløy. Ex. 1054 ¶¶ 19–23.

As for Patent Owner's argument that one of ordinary skill would not have been able to deal with problems of echo, ringing, or feedback in the proposed combination, we note that Petitioner's combination "rel[ies] on Armstrong's single ear embodiment denoted by hearing instrument 32." *See* Pet. Reply 20; Ex. 1014, 5:65–6:11 (describing a second hearing instrument 82, which Petitioner does not rely on). Thus the ear canal speaker need not always be on because the user could her the environment through their other ear, and there would be no risk of feedback, echo, or ringing. As for Patent Owner's argument that both Le and Armstrong contemplate that the speaker would at least occasionally be on (PO Sur-reply 6–7), we do not understand Petitioner to argue that the ear canal speaker would never be on, but merely that it need not always be on, and that it could be off in situations that might cause feedback, echo or ringing. We also disagree with Patent Owner's argument that without the ear canal speaker the user would not be able to properly hear ambient sound, because even with the speaker off the user

would be able to hear ambient sound through their other ear. *See id.* In the single-ear embodiment with the ear canal speaker off, the system would also be able to record the user's conversation with another speaker using the ear canal microphone and the ambient sound microphone. *See id.* at 7, 9–11. Moreover, Patent Owner's argument that claim 1 requires that the ASM and ECM must be on at the same time is not consistent with the language of claim 1, which includes no such limitation, and Patent Owner points to no intrinsic evidence that would require such a limitation. *See id.* at 11–12.

Even if one were to consider a system with earpieces in both ears in the combination, the record shows that feedback cancellation algorithms were available to one of ordinary skill. For example, we rely on and find credible Dr. Atlas's testimony that one of ordinary skill "would have been aware of the potential for feedback, echo, and ringing, and would have been aware of, and able to implement solutions to it," and his explanation of various solutions to this issue. Ex. 1054 ¶¶ 25–46 (emphasis omitted). The Edwards article also explains that "[m]ost hearing aids have a similar set of DSP algorithms that includes . . . feedback cancellation," and Dr. Anagnos testified that "in 2007, a person having ordinary skill in the art would have been familiar with DSP algorithms for feedback cancellation." Ex. 2008, 5; Ex. 1045, 36:10–15. Additionally, neither Armstrong nor the '839 patent describe echo, ringing, or feedback as a problem requiring a solution, further supporting the conclusion that dealing with feedback in hearing aids and in-ear systems was within the level of ordinary skill.

We also disagree with Patent Owner's argument that Armstrong's subtraction of the unwanted signal from the processed composite signal to compensate for the "occlusion effect" would have interfered with one of

ordinary skill's ability to make the proposed combination. *See* PO Resp. 31–32. Patent Owner's argument relies on Column 7, lines 60 through 67 and Column 8, lines 5 through 10 of Armstrong, which discusses the embodiment of Figure 4A and 4B. PO Resp. 31–32; Ex. 1014, 8:5–11 (explaining that the solution for the occlusion effect is "shown in FIG. 4"). Petitioner, however, does not rely on this solution in its proposed combination, and points out that Armstrong also discloses using its invention for non-diagnostic or recreation or entertainment purposes. Pet. Reply 24. We also agree with Petitioner that Armstrong discloses receiving the signals for the signal output directly from the A/D converters 38/40, and thus need not obtain the signal for recording from the output of summation circuit 1071 in Figures 4A/4B. *Id.* at 25; Ex. 1014, 4:34–43 ("the selection circuitry 48 may be configured to transmit audio signals received from the outputs of the A/D converters 38, 40," which receive audio signals from the front and rear microphones); Ex. 1003 ¶ 145 (explaining that Armstrong's selection circuitry 48 is used "to select the outputs of the A/D converters 38, 40, for transmission to a variety of external devices").

Finally, we turn to Patent Owner's argument that Dr. Atlas was unable to articulate the specifics of the proposed combination at his deposition. PO Resp. 17–23. The testimony cited by Patent Owner largely consists of Dr. Atlas referring to his declaration in response to questions rather than attempting to list and summarize them "off the top of my head." *See, e.g.*, Ex. 2007, 150:22–151:23. We do not find that this testimony is sufficient to undermine the evidence, including from Dr. Atlas's declarations, showing the specifics of Petitioner's proposed combination. Additionally, we agree with Petitioner that a patent challenger need not specify every detail of a

particular combination, particularly where those details are not claimed in the claims at issue.

For the reasons discussed above, and based on the full trial record, we find that Petitioner has sufficiently proven that one of ordinary skill would have been motivated to combine Le, Armstrong, and Kvaløy as Petitioner proposes.

5. Analysis of Independent Claim 1

a) 1[preamble]: "[a]n Always-On Recording System (AORS) comprising:"

Petitioner argues that, to the extent the preamble is limiting, Le discloses it. Pet. 25 (citing Ex. 1003 ¶¶ 149–153; Ex. 1006 ¶¶ 12, 28). For example, Petitioner asserts, Le discloses passively recording data of events that the user may recall later, and a computer unit including a "continuously scrolling audio buffer" to store ambient sound. *Id.* (citing Ex. 1006 ¶¶ 12, 28).

Other than its arguments concerning motivation to combine discussed in Section II.D.4 above, Patent Owner does not present arguments regarding the preamble. *See* PO Resp.

Based on the full trial record, we agree with Petitioner's arguments, and find that the preamble would have been obvious over the Le-Armstrong-Kvaløy combination.[5]

[5] Because we are persuaded that Petitioner has shown that Le teaches the subject matter recited in the preamble, we need not decide whether the preamble is limiting.

b) *1[a]: "a first monitoring assembly mounted in an earpiece, the earpiece configured to occlude and form an acoustic seal of an ear canal, the first monitoring assembly including an Ambient Sound Microphone (ASM) to monitor an ambient acoustic field at an entrance to the ear canal occluded by the earpiece, the ASM producing an ASM signal responsive to the ambient acoustic field"*

Petitioner argues that Le in combination with Armstrong and Kvaløy discloses or suggests this limitation. Pet. 26–27 (citing Ex. 1003 ¶¶ 154–171). Petitioner asserts that, in the combined Le-Armstrong-Kvaløy system, Armstrong's hearing instrument having a sealing section as taught by Kvaløy would replace Le's earpiece 30 (including personal microphone 36 and speaker 32) and environmental microphone 38. *Id.* at 26 (citing Ex. 1003 ¶ 156). According to Petitioner, Kvaløy discloses an ear terminal with a sealing section made of a resilient, slowly re-expanding shape retaining polymer foam like PVC, PUR or other materials suitable for earplugs. *Id.* (citing Ex. 1003 ¶ 157). Petitioner also argues that one of ordinary skill "would have understood that Armstrong's hearing instrument incorporating Kvaløy's sealing section would have achieved noise reduction in the range of 20-30 dB." *Id.* at 27 (citing Ex. 1003 ¶ 159). Therefore, according to Petitioner, one of ordinary skill would have understood "that the combined Le-Armstrong-Kvaløy system discloses or suggests a hearing instrument ('earpiece') with a sealing section made from, for example, a resilient, slowly re-expanding shape retaining polymer foam ('an earpiece configured to occlude and form an acoustic seal of an ear canal.')." *Id.* at 26–27 (citing Ex. 1003 ¶¶ 157–160).

Petitioner also argues that Armstrong discloses a hearing instrument with an "outer microphone" which receives audio signals from outside the ear canal and acts as an ambient sound microphone. Pet. 27–28 (citing

Ex. 1014, 2:7–9, 2:41–43; Ex. 1001, 1:60–61). Additionally, according to Petitioner, Armstrong teaches converting the received analog signals from the inner and outer microphones to digital audio signals using analog-to-digital converters. *Id.* at 28 (citing Ex. 1014, 4:12–20; Ex. 1003 ¶ 168). Petitioner further contends that, in the combined system, the earpiece would have a sealing section, as taught by Kvaløy, configured to occlude and form an acoustic seal of an ear canal. *Id.* (citing Ex. 1003 ¶ 169).

Accordingly, Petitioner argues, one of ordinary skill would have understood that Le-Armstrong-Kvaløy system

> discloses or suggests an earpiece including an outer microphone ("a first monitoring assembly mounted in an earpiece . . . the first monitoring assembly including an Ambient Sound Microphone ASM") for picking up sounds outside the ear canal ("to monitor ambient acoustic field at an entrance to the ear canal occluded by the earpiece") wherein the outer microphone produces a signal sent to an A/D converter ("the ASM producing an ASM signal responsive to the ambient acoustic field").

Pet. 27–29 (citing Ex. 1003 ¶¶ 162–171) (alteration in original).

Other than its arguments concerning motivation to combine discussed in Section II.D.4 above, Patent Owner does not present arguments regarding this limitation. *See* PO Resp.

Based on the full trial record, we agree with Petitioner's arguments, and find that this limitation would have been obvious over the Le-Armstrong-Kvaløy combination.

c) *1[b] a second monitoring assembly mounted in the earpiece and including an ear canal microphone (ECM) to monitor an acoustic field within the ear canal occluded by the earpiece, the ECM producing an ECM signal responsive to the acoustic field within the ear canal;*

Petitioner argues that Le in combination with Armstrong and Kvaløy discloses or suggests this limitation. Pet. 26–27 (citing Ex. 1003 ¶¶ 172–180). Petitioner asserts that "Armstrong discloses an earpiece with an 'inner microphone' that is also described as an 'ear canal microphone'" for "receiving audio signal from inside of the ear canal." *Id.* at 29 (citing Ex. 1014, 2:7–9, 2:43, Fig. 1). Petitioner also contends that Armstrong teaches converting the received audio signals from the inner and outer microphones to digital audio signals using analog-to-digital converters. *Id.* at 29–30 (citing Ex. 1014, 4:12–20; Ex. 1003 ¶¶ 176–177).

"Accordingly," Petitioner contends, one of ordinary skill

> would have understood that the Le-Armstrong-Kvaløy system discloses or suggests an inner- or ear canal-microphone for receiving audio signals from inside the ear canal ("a second monitoring assembly mounted in the earpiece and including an ear canal microphone (ECM)") for picking up the occluded sound within the ear canal ("to monitor an acoustic field within the ear canal occluded by the earpiece") wherein the inner- or ear canal-microphone produces a signal sent to an A/D converter ("the ECM producing an ECM signal responsive to the acoustic field within the ear canal").

Pet. 30 (citing Ex. 1003 ¶ 179).

Other than its arguments concerning motivation to combine discussed in Section II.D.4 above, Patent Owner does not present arguments regarding this limitation. *See* PO Resp.

Based on the full trial record, we agree with Petitioner's arguments, and find that this limitation would have been obvious over the Le-Armstrong-Kvaløy combination.

d) 1[c] a data storage device configured to act as a circular buffer for continually storing at least one of the ECM signal or the ASM signal;

Petitioner argues that Le in combination with Armstrong and Kvaløy discloses or suggests this feature. Pet. 31 (citing Ex. 1003 ¶¶ 181–205). Petitioner asserts that "Le discloses or suggests a memory 18 and continuously storing, in a scrolling buffer, audio information from the user's surroundings, including from environmental microphone 38." *Id.* (citing Ex. 1006 ¶¶ 10, 28, 37). According to Petitioner, one of ordinary skill would have understood this disclosure of a continuously scrolling buffer "to encompass a circular buffer because Le describes it as a single buffer that continuously stores audio data that is discarded, i.e., overwritten, after some predetermined period of time." *Id.* at 32 (citing Ex. 1003 ¶ 155). Petitioner also references its previous argument concerning motivation to replace Le's environmental microphone with Armstrong's outer microphone for recording into Le's buffer, and argues that one of ordinary skill would have understood that the combined system discloses or suggests a continuously scrolling buffer "for recording data from the outer microphone ('for continually storing the ASM signal.')." *Id.* at 35 (citing Ex. 1003 ¶¶ 203–204).

Other than its arguments concerning motivation to combine discussed in Section II.D.4 above, Patent Owner does not present arguments regarding this limitation. *See* PO Resp.

Based on the full trial record, we agree with Petitioner's arguments, and find that this limitation would have been obvious over the Le-Armstrong-Kvaløy combination.

e) 1[d] a further data storage device coupled to the data storage device; and

Petitioner argues that Le in combination with Armstrong and Kvaløy discloses or suggests this feature. Pet. 35 (citing Ex. 1003 ¶¶ 206–210). Petitioner asserts that "Le discloses that the computer unit 15 includes a memory 18 and that when a user enters a voice command, a 'thirty-second sound byte surrounding the event is input from the environmental microphone 38 and saved into the computer memory 18.'" *Id.* (citing Ex. 1006 ¶¶ 36–37). Petitioner also argues that one of ordinary skill would have understood Le to disclose or suggest implementing Le's scrolling buffer and memory 18 in separate memory devices. *Id.* (citing Ex. 1003 ¶ 208). According to Petitioner, one of ordinary skill "would have understood that when the scrolling buffer and permanent memory are implemented as separate memory devices, the two must be coupled to each other to continue to achieve Le's purpose of storing information in the buffer into the permanent memory." *Id.* at 36 (citing Ex. 1003 ¶ 209). "Thus," Petitioner contends, one of ordinary skill "would have understood the Le-Armstrong-Kvaløy system discloses or suggests a memory (a 'further data storage device') which saves or stores data from a separate scrolling buffer ('coupled to the data storage device')." *Id.* (citing Ex. 1003 ¶ 210).

Other than its arguments concerning motivation to combine discussed in Section II.D.4 above, Patent Owner does not present arguments regarding this limitation. *See* PO Resp.

Based on the full trial record, we agree with Petitioner's arguments, and find that this limitation would have been obvious over the Le-Armstrong-Kvaløy combination.

f) 1[e] a record-activation system including software configured to activate the further data storage device to record a content of the data storage device.

Petitioner argues that Le in combination with Armstrong and Kvaløy discloses or suggests this feature. Pet. 36 (citing Ex. 1003 ¶¶ 211–217). Petitioner asserts that Le's processor includes software for "determining whether the recognized spoken words constitute a predetermined natural voice command, and responding to the predetermined natural voice commands." *Id.* at 36–37 (citing Ex. 1006 ¶¶ 11, 36; Ex. 1003 ¶ 214). According to Petitioner, Le discloses that voice commands "are used to trigger storage of content that is in the continuously scrolling buffer to the memory 18." *Id.* at 37 (citing Ex. 1006 ¶¶ 27, 37). "Accordingly," Petitioner contends, one of ordinary skill "would have understood the Le-Armstrong-Kvaløy system discloses or suggests executing instructions to recognize speech commands such as 'start recording' ('a record-activation system including software') which are configured to store audio signals from the continuously scrolling buffer into a separate memory for later retrieval ('configured to activate the further data storage device to record a content of the data storage device')." *Id.* at 37–38 (citing Ex. 1003 ¶ 217).

Other than its arguments concerning motivation to combine discussed in Section II.D.4 above, Patent Owner does not present arguments regarding this limitation. *See* PO Resp.

Based on the full trial record, we agree with Petitioner's arguments, and find that this limitation would have been obvious over the Le-Armstrong-Kvaløy combination.

g) Summary for Claim 1

For the foregoing reasons, and based on the full trial record, Petitioner has proven by a preponderance of the evidence that claim 1 is unpatentable over the Le-Armstrong-Kvaløy combination.

E. Ground 1B: Asserted Obviousness of Claims 2–4 Based on Le in view of Armstrong and Kvaløy and further in view of Hall

Petitioner contends that claims 2–4 would have been obvious over Le in view of Armstrong and Kvaløy and further in view of Hall. Pet. 38–48. Patent Owner disagrees, arguing that Petitioner has failed to establish that the prior art teaches or suggests various elements of the claims. PO Resp. 35–39.

1. Overview of Hall (Ex. 1015)

Hall is directed to "a mobile telephone having the capability of continuously recording audio signals received and transmitted by the mobile telephone." Ex. 1015, 1:7–10. Hall explains that "[i]t is often necessary when using a mobile telephone to make notes and memos about the conversation," but "[u]sually, when using a mobile telephone, the user is not at his or her desk, and may often not have a pencil and notepad readily available to take notes about a conversation." *Id.* at 1:16–21. The mobile telephone has a memory with "a first-in-first-out (FIFO) queue," in which audio signals received by the telephone's receiver are digitized and "continuously written to the FIFO queue." *Id.* at 1:34–41; *see id*. at 3:5–9. A user can issue a "store" command, which will cause the phone's

microprocessor to transfer the contents of the FIFO buffer to a separate SRAM static buffer, where the audio content can be replayed. *Id.* at 3:52–63, 4:11–16.

2. Analysis of Dependent Claim 2

a) "[t]he system according to claim 1, where the system is further configured to receive an audio content signal, the system further comprising:"

Petitioner argues that Le in combination with Armstrong and Kvaløy discloses or suggests this feature. Pet. 38 (citing Ex. 1003 ¶¶ 218–221). Petitioner asserts that "Le discloses that the computer unit 15 receives and transmits audio content signals from a cellular telephone." *Id.* (citing Ex. 1006 ¶¶ 30, 41). According to Petitioner, one of ordinary skill "would have known that cellular phones send and receive audio signals to and from each other (e.g., the user's voice)." *Id.* (citing Ex. 1003 ¶ 219). Petitioner further asserts that Armstrong "discloses using the hearing instrument 32 as a 'wireless cell phone earpiece.'" *Id.* (citing Ex. 1014, 2:35; Ex 1003 ¶ 219). "Accordingly," Petitioner contends, one of ordinary skill "would have understood that the Le-Armstrong-Kvaløy system discloses or suggests that the components of the system described with respect to claim 1" above meet the limitation of "a cellular telephone for receiving an audio message from a co-worker's cellular telephone ('further configured to receive an audio content signal')." *Id.* at 39 (citing Ex. 1003 ¶ 221).

Other than its arguments concerning motivation to combine discussed in Section II.D.4 above, Patent Owner does not present arguments regarding this limitation. *See* PO Resp.

Based on the full trial record, we agree with Petitioner's arguments, and find that this limitation would have been obvious over the Le-Armstrong-Kvaløy-Hall combination.

b) "a signal processing circuit configured to process at least one of the audio content signal, the ECM signal or the ASM signal"

Petitioner argues that Le in combination with Armstrong and Kvaløy discloses or suggests this feature. Pet. 39 (citing Ex. 1003 ¶¶ 222–226). Petitioner asserts that

> Le discloses that the computer unit 15 includes a processor 16 that executes instructions to "perform a series of functions that include processing the digitized signals and recognizing spoken words therein, determining whether the recognized spoken words constitute a predetermined natural voice command, and responding to the predetermined natural voice commands from the user by prompting the processor to execute a predetermined function," including to record data from a scrolling buffer into memory for later retrieval.

Id. at 39–40 (citing Ex. 1006 ¶¶ 11, 27, Fig. 2). Additionally, Petitioner contends, one of ordinary skill would have understood that a processor would need to process signals that are stored in Le's scrolling buffer or in memory 18, and would also need to process signals that are sent to and received from a wireless earpiece. *Id.* at 40 (citing Ex. 1003 ¶ 224).

Thus, Petitioner asserts, in the combined Le-Armstrong-Kvaløy system, the processor 16 of computer unit 15 would process: (1) ambient audio signals ("ASM signal") from the earpiece's outer microphone to record it into the scrolling buffer, (2) the signal from the earpiece's inner-microphone for the purpose of recognizing voice commands, and (3) in the embodiment where computer unit 15 is a cellular telephone, any RF signals sent or received. Pet. 40 (citing Ex. 1003 ¶ 225).

Other than its arguments concerning motivation to combine discussed in Section II.D.4 above, Patent Owner does not present arguments regarding this limitation. *See* PO Resp.

Based on the full trial record, we agree with Petitioner's arguments, and find that this limitation would have been obvious over the Le-Armstrong-Kvaløy-Hall combination.

> c) *"a signal router and switching matrix to select which signals among the audio content signal, the ECM signal and the ASM signal are recorded into the data storage device."*

Petitioner argues that Le in combination with Armstrong, Kvaløy, and Hall discloses or suggests this feature. Pet. 42 (citing Ex. 1003 ¶¶ 227–230). Petitioner asserts that Hall discloses a mobile phone that can record an incoming phone call and continuously store a combined digital signal representing a received signal and a transmitted signal into a FIFO queue. *Id.* (citing Ex. 1015, 1:34–50, 3:5–9). According to Petitioner, Hall also allows a user to issue a "store" command which will cause the phone's microprocessor to transfer the contents of the FIFO buffer to a separate SRAM static buffer, where the audio content can be replayed. *Id.* (citing Ex. 1015, 3:52–63, 4:11–16).

Petitioner contends that one of ordinary skill would have recognized Hall's applicability to the Le-Armstrong-Kvaløy system because Hall's system of temporarily recording audio to a FIFO buffer and transferring the audio to an SRAM buffer when receiving a store command is similar to Le's system of storing audio data in a scrolling buffer and transferring it to memory 18 upon receipt of a voice command. Pet. 43 (citing Ex. 1003 ¶ 239). Additionally, Petitioner argues, because "the Le-Armstrong-Kvaløy system is designed to be wearable and mobile," the "same reasons why Hall

suggests recording phone calls—i.e., not being able to take contemporaneous handwritten notes—would apply to the Le-Armstrong-Kvaløy system." *Id.* (citing Ex. 1003 ¶ 240).

Petitioner asserts that one of ordinary skill "would have understood that in the Le-Armstrong-Kvaløy-Hall system, the user's speech for the phone call would be preferably picked up by Armstrong's ear canal microphone" because it is less susceptible to noise than Le's personal microphone 36 for voice commands. Pet. 43. Thus, according to Petitioner, "the combined Le-Armstrong-Kvaløy-Hall system discloses or suggests recording into Le's scrolling buffer an incoming cell phone call ('the audio content signal'), the user's speech signal for the phone call from the inner microphone ('the ECM signal'), and the signal from the outer microphone (the 'ASM signal')." *Id.* at 44 (citing Ex. 1003 ¶ 242).

Relying on Dr. Atlas, Petitioner argues that one of ordinary skill would have understood that Armstrong's selection circuitry 48 is analogous to the "signal router and switching matrix" disclosed in the '839 patent. Pet. 45 (citing Ex. 1003 ¶¶ 245–257). Petitioner asserts that one of ordinary skill "would have understood that the claimed 'signal router and switching matrix' corresponds to the 'input signal router and channel selector' shown in FIG. 3C and described at, for example, column 10, lines 9–30 of the '839 patent." *Id.* (citing Ex. 1003 ¶ 251). Petitioner further contends that "the input signal router and channel selector 'determines which signals are recorded with the AORS 152 using either manual 144 or automatic 146 configuration means.'" *Id.* at 45–46 (citing Ex. 1001, 10:28–30). Again relying on Dr. Atlas, Petitioner asserts that one of ordinary skill would have been generally familiar with such "signal routers" or "signal selectors"

because "they are commonly used in recording systems that have one or more potential signal source/inputs for a recording system," and effectively perform the same function as Armstrong's "selection circuitry 48." *Id.* at 46 (citing Ex. 1003 ¶¶ 252–255).

> "Accordingly," Petitioner argues, one of ordinary skill
>
> would have understood that the Le-Armstrong-Kvaløy-Hall system discloses or suggests selection circuitry which includes a "signal router and switching matrix" and which is configured to select one or more of ("to select which signals among") an incoming cell phone call ("the audio content signal"), the user's speech signal for the phone call from the inner microphone ("the ECM signal"), and the signal from the outer microphone (the "ASM signal") to be transmitted to Le's computer unit for recording into the buffer ("are recorded into the data storage device").

Pet. 46 (citing Ex. 1003 ¶ 256). Petitioner contends that one of ordinary skill "would have considered it obvious to combine the teachings of Le, Armstrong, Kvaløy, and Hall because he or she would have understood that the combination amounts to nothing more than applying a known technique (recording the audio signals representing a telephone conversation) to a known device (the Le-Armstrong-Kvaløy system implemented as a cellular phone with wireless earpiece) ready for improvement to yield predictable results (the Le-Armstrong-Kvaløy system being able to record telephone conversations in addition to ambient sound)." *Id.* at 46–47 (citing Ex. 1003 ¶ 257).

Patent Owner argues that Petitioner's arguments are incorrect because "[t]he claim requires the signal router and switching matrix to select one of the three types of signals to record," but "[t]hat choice is not presented in any of Le, Armstrong, Kvaløy, or Hall." PO Resp. 36 (citing Ex. 1001, 15:7–9; Ex. 2006 ¶ 90). Patent Owner acknowledges that Armstrong

teaches that a technician in a clinical setting can insert signals into the hearing aid for test purposes and record and save those signals and the hearing aid's response. *Id.* (citing Ex. 1014, 4:34–55, 5:52–64). However, Patent Owner contends, Armstrong "does not show, suggest, or teach a system that is configured to always record the ASM signal, the ECM signal, or both in a buffer." *Id.* Patent Owner also argues that Dr. Atlas's opinion that it would have been obvious to modify the circuitry of Le and Armstrong to provide this recording feature is "conclusory," and that "[t]here is no teaching in the prior art how to make such modifications or whether they would work as the claimed invention requires." *Id.* at 37 (citing Pet. 41; Ex. 2006 ¶ 91).

Petitioner responds that it need not show that one of the references discloses by itself the claimed "signal router and switching matrix," and that Petitioner's arguments are not conclusory. Pet. Reply 27. To the contrary, Petitioner argues that Patent Owner ignores the Petition's key points, namely that: (1) the advantages disclosed by Hall to record phone conversations would be applicable to the Le-Armstrong- Kvaløy system; (2) the user's speech for the phone call in the Le-Armstrong-Kvaløy system would be preferably picked up by Armstrong's ECM; (3) Armstrong's "selection circuitry 48" is a signal router; and (4) Armstrong discloses that selection circuitry 48 can selectively transmit an injected audio signal, the ear canal microphone signal, and the outer microphone signal to an external device, including a recording device." *Id.* at 27–28 (citing Pet. 43–44).

Patent Owner responds that "[t]he claim requires the signal router and switching matrix to select one of the three types of signals to record," but "that choice is not presented in any of Le, Armstrong, Kvaløy, or Hall." PO

Sur-reply 12 (citing Ex. 1001, 15:7–9). Patent Owner argues that Armstrong is different from the claimed invention because it "teaches that in a clinical setting a technician can insert signals into the hearing aid for test purposes," and "[t]hose signals and the hearing aid's response can be recorded for use in adjusting the hearing aid, and the recording can be saved for later reference purposes." *Id.* (citing Ex. 1014, 4:34–55, 5:52–64). Additionally, according to Patent Owner, Armstrong "does not teach that its system operates in always on recording mode while the hearing aid is being used continuously by a user." *Id.* at 13.

We agree with Petitioner that this limitation would have been obvious over the Le-Armstrong-Kvaløy-Hall combination. We agree with and find credible Dr. Atlas's testimony that one of ordinary skill would have found it obvious to combine Hall's telephone recording feature into the Le-Armstrong-Kvaløy combination. Ex. 1003 ¶¶ 231–244. We also credit Dr. Atlas's testimony that it would have been obvious for the Le-Armstrong-Kvaløy-Hall combination to include the claimed "signal router and switching matrix" to select which signals are recorded into the data storage device. *Id.* ¶¶ 245–257. We do not agree with Patent Owner's contention that this expert testimony is merely "conclusory." *See* PO Resp. 37.

We also do not agree with Patent Owner's argument that none of the references individually disclose a signal router and switching matrix to select one of the three types of signals to record. *See* PO Resp. 36; PO Sur-reply 12. Patent Owner relies on a combination of references to teach this limitation, and the fact that no one reference individually discloses the limitation does not undermine Petitioner's combination or the motivation to make it. We further disagree with Patent Owner's argument that Armstrong

is different from the claimed invention because Armstrong "does not show, suggest, or teach a system that is configured to ***always*** record the ASM signal, the ECM signal, or both in a buffer." *See* PO Resp. 36 (emphasis added). We do not see anything in claim 2 that would require that the signal router and switching matrix must ***always*** record the ASM signal, the ECM signal, or both in a buffer, and Patent Owner does not explain why the claims should be interpreted to include such a requirement.

d) Summary for Claim 2

For the foregoing reasons, and based on the full trial record, Petitioner has proven by a preponderance of the evidence that claim 2 is unpatentable over the Le-Armstrong-Kvaløy-Hall combination.

3. Analysis of Dependent Claim 3

a) "[t]he system according to claim 2, further comprising: a user AORS configuration system configured to control the signal router and switching matrix."

Petitioner argues that Le in combination with Armstrong, Kvaløy, and Hall discloses or suggests this feature. Pet. 47 (citing Ex. 1003 ¶¶ 258–262). Petitioner asserts that Armstrong "teaches inputting a control signal from an external device into the multiplexer for configuring the selection circuitry." *Id.* (citing Ex. 1014, 4:43–54). According to Petitioner, "Armstrong further teaches using a computer to 'program the selection circuitry 48' to 'monitor the output of the hearing instrument at select hearing instrument nodes.'" *Id.* (citing Ex. 1014, 5:34–39). "Accordingly," Patent Owner contends, one of ordinary skill "would have understood that the Le-Armstrong-Kvaløy-Hall system discloses or suggests providing a control signal from another device, such as a computer, to program the selection circuitry to, for example, select which signals are selected for recording ('a user AORS configuration system

configured to control the signal router and switching matrix.')." *Id.* (citing Ex. 1003 ¶ 262).

Other than its arguments concerning motivation to combine discussed in Section II.D.4 above, and its arguments concerning claim 2 in Section II.E.2, Patent Owner does not present arguments regarding claim 3. *See* PO Resp.

Based on the full trial record, we agree with Petitioner's arguments, and find that claim 3 would have been obvious over the Le-Armstrong-Kvaløy-Hall combination.

4. Analysis of Dependent Claim 4

a) "[t]he system according to claim 2 further comprising: signal processing system configured to at least one of multiplex output signals from the signal router and switching matrix or encode the output signals from the signal router and switching matrix to reduce a data rate."

Petitioner argues that Le in combination with Armstrong, Kvaløy, and Hall discloses or suggests this feature. Pet. 48 (citing Ex. 1003 ¶¶ 263–267). Petitioner asserts that Armstrong's selection circuitry includes a multiplexer that selects one or more audio signal inputs for transmission as serial output. *Id.* (citing Ex. 1014, 5:10, 4:43–54). Petitioner contends that one of ordinary skill "would have understood that the serial output is a multiplexed signal comprising the selected audio signal inputs from the selection circuitry." *Id.* (citing Ex. 1003 ¶ 266). "Accordingly," Petitioner argues, one of ordinary skill "would have understood that the Le-Armstrong-Kvaløy-Hall system discloses or suggests selection circuitry that includes a multiplexer for generating a serial data output of the one or more audio signals selected for recording ('signal processing system configured to at least one of multiplex

output signals from the signal router and switching matrix')." *Id.* (citing Ex. 1003 ¶ 267).

Patent Owner argues that Petitioner "does not address a key aspect of claim 4: 'to reduce a data rate' of the signals sent from the signal router and switching matrix to be recorded into the data storage device." PO Resp. 37–38. According to Patent Owner, Petitioner relies on use of a multiplexer, but "[m]ultiplexers are not intended to reduce data rates." *Id.* at 38. Rather, Patent Owner asserts, "[m]ultiplexers interleave multiple signals onto one carrier signal, but generally do not reduce the data rate of that carrier signal." *Id.* Patent Owner contends that "[t]he claimed data rate reduction is important because it allows more information to be recorded into the memory contained in the claimed invention, thus allowing the system to operate for longer periods of time before its memory is filled with data." *Id.* at 38–39 (citing Ex. 1001, 11:37–52; Ex. 2006 ¶ 95).

Petitioner responds that Patent Owner is misinterpreting claim 4. Petitioner argues that claim 4 is directed to a system used to reduce data rate by "encoding and/or ***multiplexing the encoded signals*** from the signal router and switching matrix," but claim 4 "does not refer to multiplexing the **encoded** signals from the signal router and switching matrix." Pet. Reply 29 (citing PO Resp. 38). Rather, according to Petitioner, claim 4 refers to multiplexing or encoding "output signals." *Id.* Additionally, Petitioner contends that the '839 patent uses permissive language in describing reducing a data rate of audio signals prior to storage in a circular buffer by explaining that, in the system shown in Figure 3B, the "selected audio signals ***may*** first be processed by a first audio encoder-1" which "***may*** reduce a data-rate," and thus the signal recorded in the circular buffer "***may***

therefore be an encoded signal representing many multiplexed audio channels." *Id.* (citing Ex. 1001, 9:48–54). According to Petitioner, "[t]he use of permissive language shows that the '839 patent encompasses an embodiment where multiple audio signals are multiplexed but not necessarily encoded or compressed." *Id.* Petitioner further argues that Patent Owner "would have the Board re-write the claim to require 'a signal processing system configured to at least one of' (1) ***multiplex*** output signals from the signal router and switching matrix ***to reduce a data rate*** or (2) encode the output signals from the signal router and switching matrix ***to reduce a data rate***," but this re-writing "does not even make sense given [Patent Owner's] admission that '[m]ultiplexers are not intended to reduce data rates.'" *Id.* at 30.

Patent Owner responds that the claim language is clear that the system must "either multiplex or encode signals from the signal router and switching matrix for the purposes of reducing the data rate of those signals." PO Sur-reply 14. And, according to Patent Owner, even if the specification uses permissive language to describe the data rate reduction, claim 4 does not. *Id.*

Based on the full trial record, we find that Petitioner has sufficiently shown that the proposed combination teaches claim 4. We agree with Petitioner that claim 4 does not require that the "multiplexing" must "reduce a data rate." First, the structure of the claim language supports this conclusion because the phrase "to reduce a data rate" follows the phrase "encode the output signals from the signal router and switching matrix," and not the phrase "multipex output signals from the signal router and switching matrix." This makes sense because "encoding the output signals" can

reduce the data rate of the encoded signal, but multiplexers are not intended to reduce data rates, as Patent Owner and Dr. Anagnos admit. *See* PO Resp. 38 ("Multiplexers are not intended to reduce data rates."); Ex. 2006 ¶ 95 ("Multiplexers are not intended to reduce data rates. Multiplexers interleave multiple signals onto one carrier signal, but generally do not reduce the data rate of that carrier signal."). Our conclusion is also supported by the '839 patent specification, which states that "[t]he selected audio signals may first be processed by a first audio encoder-1 92," which "may reduce the data-rate using lossy or loss-less audio signal encoding algorithms," indicating that the reduction of the data rate is performed by encoding the data signals with an encoder, not by multiplexing output signals. Ex. 1001, 9:48–51.

Turning to Patent Owner's arguments, we do not agree that Patent Owner's position is supported by the statements in the '839 patent specification describing an "optional audio signal multiplexing and lossy or lossless date-rate reduction system for processing the audio signals" and "an optional second audio signal multiplexing and lossy or lossless date-rate reduction system for processing the audio signals from the circular buffer in before transmission to a second audio signal data storage device." PO Resp. 38; Ex. 1001, 11:43–45, 11:55–58. These statements refer to a system for "multiplexing" ***and*** "data-rate reduction," indicating that the data rate reduction occurs separately from the multiplexing, which is consistent with the specification's earlier statement that "a first audio encoder-1" is used to reduce the data rate and Patent Owner's admission that multiplexers are not intended to reduce data rates. *See* PO Resp. 38; Ex. 2006 ¶ 95; Ex. 1001, 9:48–51.

Finally, we agree with Petitioner that Armstrong's selection circuitry includes a multiplexer that selects one or more audio signal inputs for transmission as serial output. *See* Pet. 48 (citing Ex. 1014, 5:10, 4:43–54). We also agree with Petitioner that one of ordinary skill would have understood that the Le-Armstrong-Kvaløy-Hall system discloses or suggests selection circuitry that includes a multiplexer for generating a serial data output of the one or more audio signals selected for recording, which meets the claim requirement of a "signal processing system configured to . . . multiplex output signals from the signal router and switching matrix." *Id.* (citing Ex. 1003 ¶ 267).

For the foregoing reasons, and based on the full trial record, Petitioner has proven by a preponderance of the evidence that claim 4 is unpatentable over the Le-Armstrong-Kvaløy-Hall combination.

III. CONCLUSION

For the reasons discussed above, Petitioner has proven, by a preponderance of the evidence, that the challenged claims are unpatentable, as summarized in the following table:[6]

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

Claim(s)	35 U.S.C. §	Reference(s)/Basis	Claims Shown Unpatentable	Claims Not Shown Unpatentable
1	103(a)	Le, Armstrong, Kvaløy	1	
2–4	103(a)	Le, Armstrong, Kvaløy, Hall	2–4	
Overall Outcome			1–4	

IV. ORDER

Accordingly, it is

ORDERED that claims 1–4 of the ’839 patent have been proven by a preponderance of the evidence to be unpatentable; and

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

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