

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

SAMSUNG ELECTRONICS CO., LTD., AND
SAMSUNG ELECTRONICS, AMERICA, INC.,
Petitioners

v.

STATON TECHIYA, LLC,
Patent Owner

Case IPR2022-00324
U.S. Patent No. 8,254,591

PATENT OWNER'S NOTICE OF APPEAL

Notice is hereby given, pursuant to 37 C.F.R. §§ 90.2(a) and 90.3, and 35 U.S.C. §§ 141 and 142, that Patent Owner Staton Techiya, LLC ("Patent Owner") appeals to the United States Court of Appeals for the Federal Circuit from the Final Written Decision of the Patent Trial and Appeal Board in IPR2022-00324 entered on July 10, 2023 (Paper No. 33) and from all underlying orders, decisions, rulings, and opinions.

In accordance with 37 C.F.R. § 90.2(a)(3)(ii), Patent Owner states that the issues on appeal include, but are not limited to, the Board's determination that Petitioners have proven, by a preponderance of the evidence, that claims 1, 2, 4-7, 9, and 11-16 of U.S. Patent No. 8,254,591 are unpatentable, and any related issue, finding, or determination; whether the Board's claim constructions are proper; whether the Board's conclusion regarding obviousness of the claims was sufficiently supported by substantial evidence; as well as all other issues decided adversely to Patent Owner in any orders, decisions, rulings, and opinions.

Patent Owner is filing one copy of this Notice of Appeal with the Director of the United States Patent and Trademark Office, and a copy of this Notice of Appeal is being filed electronically with the Board. In addition, a copy of this Notice of Appeal is being electronically filed with the United States Court of Appeals for the Federal Circuit, along with the required docketing fee.

Respectfully submitted,

Date: September 8, 2023

/Jacob A Snodgrass/

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CERTIFICATE OF FILING

I certify that the foregoing was filed electronically with the Board through P-TACTS, and a paper copy was filed by Priority Mail Express on September 8, 2023 with the Director of the United States Patent and Trademark Office, at the following address:

Director of the U.S. Patent and Trademark Office
c/o Office of the General Counsel
United States Patent and Trademark Office
P.O. Box 1450
Alexandria, Virginia 22313-1450

I further certify that a true and correct copy of the foregoing Notice of Appeal, along with the required filing fee, was filed electronically with the Court of Appeals for the Federal Circuit via CM/ECF on September 8, 2023.

Date: September 8, 2023

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CERTIFICATE OF SERVICE

I certify that the foregoing Patent Owner's Notice of Appeal was served on
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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.

IPR2022-00324
Patent 8,254,591 B2

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

CASS, *Administrative Patent Judge*.

JUDGMENT
Final Written Decision
Determining Some 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 1–7, 9, and 11–16 (the “challenged claims”) of U.S. Patent No. 8,254,591 B2 (Ex. 1001, “the ’591 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, 2, 4–7, 9, and 11–13 are unpatentable. Petitioner has not proven by a preponderance of the evidence that claim 3 is 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. 1005, “Le”);

Kvaløy, US 6,728,385 B2, issued Apr. 27, 2004 (Ex. 1006, “Kvaløy”);

Johnson, US 6,163,338, issued Dec. 19, 2000 (Ex. 1008, “Johnson”);

Fiedler, US 6,804,638 B2, issued Oct. 12, 2004 (Ex. 1009, “Fiedler”);

Mayer, US 2004/0042103 A1, published Mar. 4, 2004 (Ex. 1010, “Mayer”)

Rast, US 2001/0046304 A1, published Nov. 29, 2001 (Ex. 1011, “Rast”).

Paper 3 (“Pet.”) iv, 6. Petitioner submits declarations from Dr. Les Atlas, Ph.D. (Exs. 1002, 1041). Patent Owner submits declarations from Daniel P. Anagnos (Exs. 2001, 2006).

Petitioner challenges the patentability of claims 1–7, 9, and 11–16 of the ’591 patent based on the following grounds:

Claim(s) Challenged	35 U.S.C. §	Reference(s)/Basis
1, 2, 6, 7, 9	103(a) ¹	Le, Kvaløy
4–5	103(a)	Le, Kvaløy, Fiedler
3, 11–13	103(a)	Le, Kvaløy, Johnson
11–13	103(a)	Le, Kvaløy, Johnson, Rast
14–16	103(a)	Le, Kvaløy
14–16	103(a)	Le, Kvaløy, Mayer

Pet. i–iii, 7. Patent Owner filed a Preliminary Response. Paper 8. We instituted trial on all grounds of unpatentability. Paper 13 (“Inst. Dec.”), 63.

During the trial, Patent Owner filed a Response (Paper 20, “PO Resp.”), Petitioner filed a Reply (Paper 22, “Pet. Reply”), and Patent Owner filed a Sur-reply (Paper 23, “PO Sur-reply”).

An oral hearing was held on April 11, 2023, a transcript of which appears in the record. Paper 32 (“Tr.”).

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 ’591 patent. Therefore, we apply the pre-AIA version of 35 U.S.C. § 103.

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, 72. Patent Owner states that Staton Techiya, LLC is the real party in interest. Paper 31, 1.

D. Related Proceedings

Petitioner states that the '591 patent was asserted in *Staton Techiya, LLC v. Samsung Electronics Co., Ltd.*, 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.*, Case No. 2:22-cv-00053 (E.D. Tex.), filed February 14, 2022. Pet. 72; Paper 28, 1; Paper 31, 1.

E. The '591 Patent (Ex. 1001)

The '591 patent is directed to “the detecting and recording of acoustic events as measured by an earpiece.” Ex. 1001, 1:16–17. The Background of the '591 patent specification explains that, “[i]n industrial environments where noise is frequently present, workers can be subject to loud excessive noises over long periods of time” and, “[a]lthough earplugs help suppress the noise and mitigate the physiological and psychological effects of the noise on the workers, there are few accurate indications of the noise exposure to which the workers are subjected.” *Id.* at 1:28–34. Therefore, according to the '591 patent, a need exists “for assessing sound exposure levels in various environmental settings.” *Id.* at 1:35–36.

In order to address this perceived need, the '591 patent discloses “a method and device for audio recording” using an earpiece. Ex. 1001, 1:40–41. A pictorial diagram of an embodiment of the earpiece is provided in Figure 1, reproduced below.

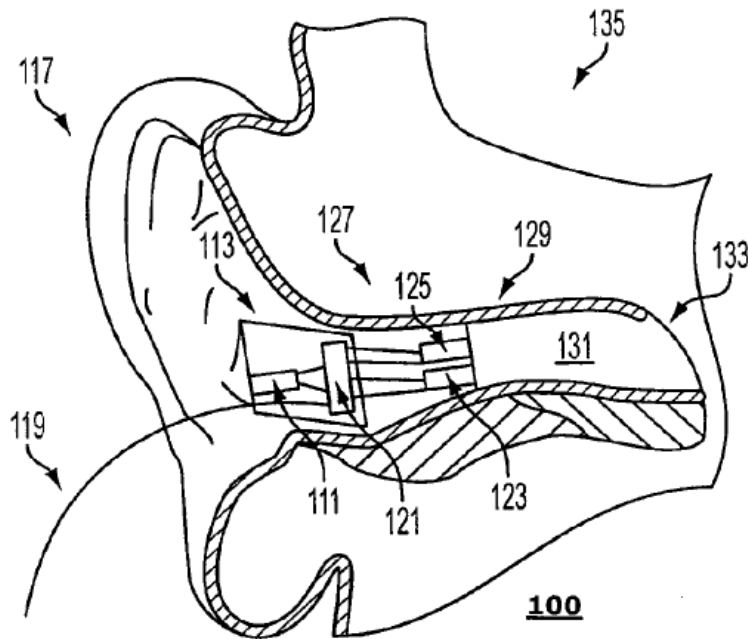


FIG. 1

Figure 1 of the '591 patent shows an embodiment of an earpiece of the invention. Ex. 1001, Fig. 1, 4:12–57.

As shown in Figure 1, earpiece 100 includes Ambient Sound Microphone (ASM) 111 to capture ambient sound, Ear Canal Receiver (ECR) 125 to deliver audio to ear canal 131, and Ear Canal Microphone (ECM) 123 to assess a sound exposure level within ear canal 131. Ex. 1001, 4:24–28. Earpiece 100 can partially or fully occlude ear canal 131 to provide various degrees of acoustic isolation. *Id.* at 4:28–30. The assembly is designed to be inserted into the user's ear canal 131 and form an acoustic seal with the walls 129 of the ear canal at a location 127 between the entrance 117 to the ear canal and ear drum 133. *Id.* at 4:30–34. Earpiece 100 also includes a processor 121 “that undertakes audio signal processing and provides a transceiver for audio via the wired or wireless communication path 119.” *Id.* at 4:53–57.

A block diagram of an embodiment of the earpiece is provided in Figure 2, reproduced below.

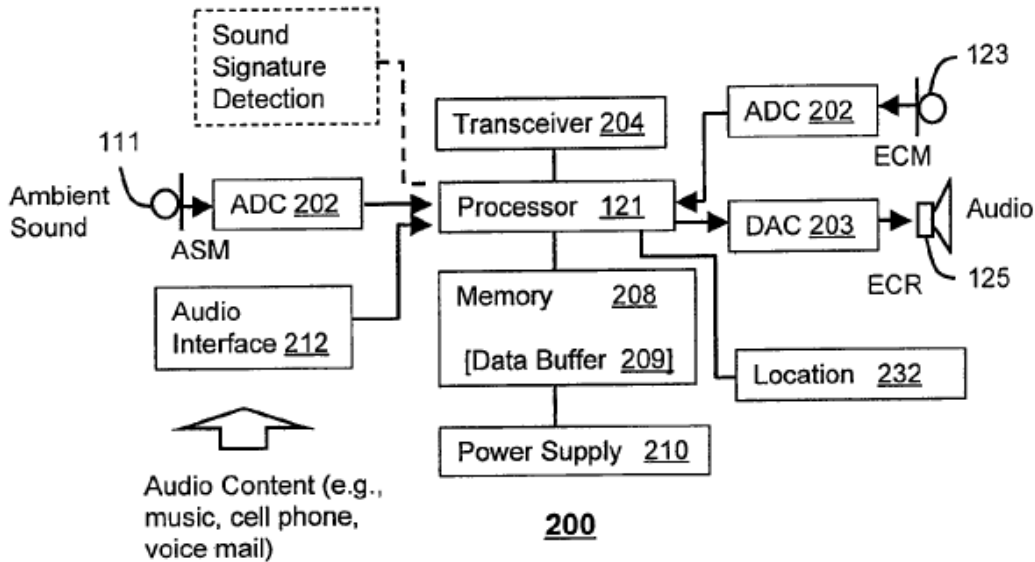


FIG. 2

Figure 2 shows a block diagram of the earpiece in accordance with an embodiment of the '591 patent. Ex. 1001, 3:28–29, Fig. 2.

As shown in Figure 2, the earpiece 100 includes Ambient Sound Microphone (ASM) 111, Ear Canal Receiver (ECR) 125, and Ear Canal Microphone (ECM) 123. Ex. 1001, 4:24–27. ASM 111 “capture[s] ambient sound,” ECR 125 “deliver[s] audio to an ear canal 131,” and ECM 123 “assess[es] a sound exposure level within the ear canal 131.” *Id.* The “assembly is designed to be inserted into the user’s ear canal 131” and also “to form an acoustic seal with the walls 129 of the ear canal.” *Id.* at 4:30–32. Also, “earpiece 100 can be an in the ear earpiece, behind the ear earpiece, receiver in the ear, open-fit device, or any other suitable earpiece type.” *Id.* at 4:18–20.

The earpiece also includes processor 121 that can receive and transmit signals to ASM 111, ECR 125, and ECM 123. Ex. 1001, 4:53–55. It also includes memory 208, which can “include a data buffer 209 to temporarily

capture the ambient sound and the internal sound as a history, and a storage memory to save from the data buffer the recent portion of history in a compressed data format responsive to a directive by the processor.” *Id.* at 5:6–11. Data buffer 209 “can be a circular buffer that temporarily stores audio sound at a current time point to a previous time point.” *Id.* at 5:11–15. The earpiece further includes audio interface 212, which “receive[s] audio content, for example from a media player or cell phone, and deliver[s] the audio content to the processor 121.” *Id.* at 5:18–21. In response to detecting events, processor 121 can “save the history in the data buffer 209 to the longer term storage memory 208.” *Id.* at 5:21–24. Processor 121 “by way of the ECM 123 can also actively monitor the internal sound exposure level inside the ear canal 131 and adjust the audio to within a safe and subjectively optimized listening level range.” *Id.* at 5:24–27.

F. Illustrative Claims

Of challenged claims 1–7, 9, and 11–16, claims 1, 11 and 14 are independent. For purposes of the issues raised at this stage of the proceeding, claim 1 is illustrative and is reproduced below.

1. [preamble] A headset, comprising:
 - [a][i] a left ear piece including: a left Ambient Sound Microphone (LASM) configured to capture first ambient sound, and
 - [a][ii] a left earpiece including: . . . a left Ear Canal Microphone (LECM) configured to capture first internal sound in a left ear canal;
 - [b] a right earpiece including: a right Ambient Sound Microphone (RASM) configured to capture second ambient sound, and a right Ear Canal Microphone (RECM) configured to capture second internal sound in a right ear canal;

[c] a memory configured to record at least one of the first ambient sound or the second ambient sound and at least one of the first internal sound or the second internal sound, and

[e][i] a processor operatively coupled to the left earpiece, the right earpiece and the memory,

[e][ii] the processor configured to save a recent portion of the at least one of the first ambient sound or the second ambient sound and the at least one of the first internal sound or the second internal sound responsive to an event.

Ex. 1001, 13:5–25 (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).

Petitioner argues that the “preambles of the challenged claims are non-limiting.” Pet. 16. In support, Petitioner first asserts that “the body of the independent claims 1, 11, and 14 do not rely on the preambles for antecedent basis.” *Id.* Petitioner also argues that the ’591 patent specification “confirms that the alleged invention is not defined by, for example, all of the recited components fitting within a structure conventionally known as a ‘headset’ or an ‘earpiece,’” and instead “explains that ‘[t]he earpiece 100 can further represent a single operational device or a family of devices configured in a master-slave arrangement, for example, a mobile device and an earpiece.” *Id.* (citing Ex. 1001, 5:52–57) (alteration in original). “In addition,” Petitioner contends, “the specification repeatedly asserts that the form factor for the alleged invention is not important.” *Id.* (citing Ex. 1001, 5:65–67 (“The method 250 can be implemented in a single

earpiece, a pair of earpieces, headphones, or other suitable headset audio delivery device.”), 8:19–21, 8:57–60).

Petitioner further argues that “the specification takes for granted that the various structures claimed can fit within an ‘earpiece’ or a ‘headset,’” so “the focus of the alleged invention is not, for example, on alleged technical improvements that drove the miniaturization making it possible to fit the processing circuitry and memory within an earpiece or headset.” Pet. 17. “Finally,” Petitioner argues, “during prosecution the examiner did not give the preambles patentable weight . . . and the applicant did not dispute this position in its response.” *Id.* (citing Ex. 1004, 69–72, 131).

Petitioner acknowledges that dependent claims 2, 3, 8, and 16 “rely on the preamble for antecedent basis,” but argues that this “is not dispositive” because “the dependent claims are merely referring to the structure of the positive limitations in the body of the claim as a whole.” Pet. 16 (citing *Catalina Mktg. Int’l, Inc. v. Coolsavings.com, Inc.*, 289 F.3d 801, 808 (Fed. Cir. 2002)).

Patent Owner does not specifically dispute Petitioner’s argument that the preambles of the challenged claims are non-limiting, but rather argues that no claim terms need construction and all claim terms should be construed in accordance with their ordinary and customary meaning. PO Resp. 17.

In general, “a preamble limits the invention if it recites essential structure or steps, or if it is necessary to give life, meaning, and vitality to the claim.” *Arctic Cat Inc. v. GEP Power Prod., Inc.*, 919 F.3d 1320, 1327 (Fed. Cir. 2019). On the other hand, “a preamble is not limiting where a patentee defines a structurally complete invention in the claim body and uses

the preamble only to state a purpose or intended use for the invention.” *Id.* at 1328 (internal quotations omitted). For example, in *Arctic Cat*, the Federal Circuit held that a preamble reciting a “personal recreation vehicle” was not limiting because it “merely identifies an intended use” and does not “impose[] any structural requirement on the claimed module beyond what is required by the bodies of the claims.” *Id.* Additionally, there was no “reliance on the preamble during prosecution to distinguish the claimed invention from the prior art.” *Id.*

Based on the record before us, we agree with Petitioner that the preambles of independent claims 1, 11, and 14 are non-limiting. The preamble of claim 1 recites a “headset,” but the “headset” is not referenced in the body of that claim, which recites a structurally complete invention. Similarly, the preambles of claims 11 and 14 recite an “earpiece,” but the body of those claims do not reference the “earpiece” and recite a structurally complete invention. Additionally, the Examiner determined during prosecution that the terms “a headset” and “earpiece” recited in precursors to the independent claims “ha[ve] not been given patentable weight” because “the claim following the preamble is a self-contained description of the structure not depending for completeness upon the introductory clause,” and the applicant did not dispute this determination. Ex. 1004, 69, 131. Thus, the preamble terms “headset” and “earpiece” are more akin to the intended use of a structurally complete invention recited in the body of the claim than an “essential element” of the claimed invention that should be given patentable weight.

However, we do not agree with Petitioner that the preambles of dependent claims 2, 3, and 16 are non-limiting. Each of these claims refers

to the preamble in the body of the claim. For example, claim 2, states that the “event” of claim 1 “is a touching of the *headset*,” claim 3 states that the processor “triggers the event responsive to detecting an abrupt movement of the *headset*, or a change in location of the *headset*.” Similarly, claim 16 states that the “event” of claim 15 “is a touching of the *earpiece*” or “an abrupt movement of the *earpiece*.” In *Arctic Cat*, the Federal Circuit distinguished the non-limiting structural language in the preamble from a situation where preamble language “suppl[ies] ‘antecedent basis’ for terms in the body,” and identified this factor as one of “[t]he rules we have articulated about what preamble language reciting structure *is* limiting.” *Arctic Cat*, 191 F.3d at 1329.

Other than the preambles, the parties do not propose constructions for any other claim terms. Pet. 17; PO Resp. 17. We determine that it is not necessary to provide an express interpretation of any other claim terms at this stage of the proceeding. *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.*, 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.

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. 15 (citing Ex. 1002 ¶¶ 18–20). Petitioner further states that a person of

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

ordinary skill in the art “could have also obtained similar knowledge and experience through other means.” *Id.* Patent Owner “applies the level of ordinary skill in the art that Petitioners propose.” PO Resp. 17.

We are persuaded by Petitioner’s undisputed assessment of the level of ordinary skill in the art, which is supported by the ’591 patent and the asserted prior art.

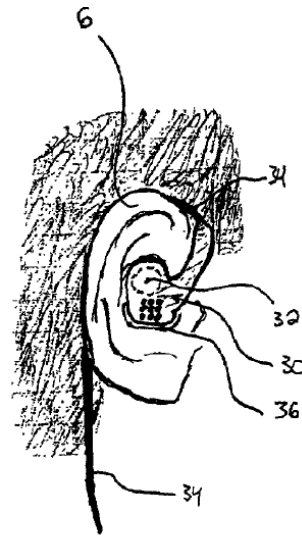
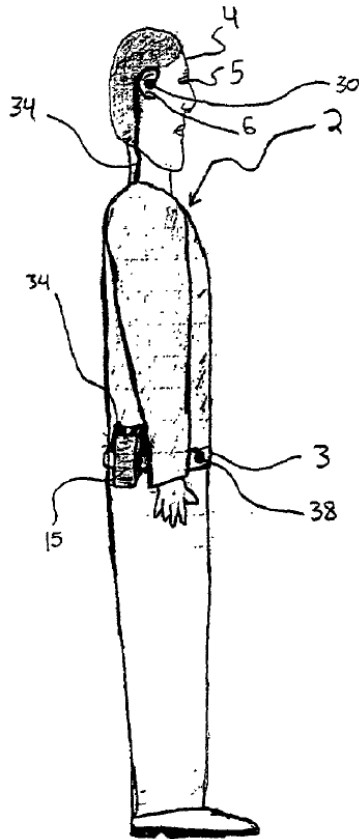
D. Ground 1³: Asserted Obviousness of Claims 1, 2, 6, 7, and 9 Based on Le in view of Kvaløy

Petitioner contends that claims 1, 2, 6, 7, and 9 would have been obvious over Le in view of Kvaløy. Pet. 24–37. Patent Owner disagrees, arguing that Petitioner has failed to establish that the claims would have been obvious. PO Resp. 18–35.

1. Overview of Le (Ex. 1005)

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. 1005, code (57), ¶ 12. Figures 1A and 1C are reproduced below:

³ Here, and elsewhere in the Decision, the identification of the grounds using designations such as “Ground 1” refers to the designation of the grounds as presented in the Petition.



Figures 1A and 1C are illustrations of the system and earpiece of Le. Ex. 1005 ¶¶ 15, 17, Figs. 1A, 1C.

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. 1005 ¶¶ 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. 1005 ¶ 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 (*see 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. 1005 ¶ 9; *see also id.* ¶ 42 (contemplating “using the housing of a cellular phone to enclose the computer unit 15”); *id.* ¶¶ 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. 1005 ¶¶ 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 *Kvaløy* (Ex. 1006)

Kvaløy is directed to “a voice detection and discrimination apparatus in a hearing protection arrangement.” Ex. 1006, 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.

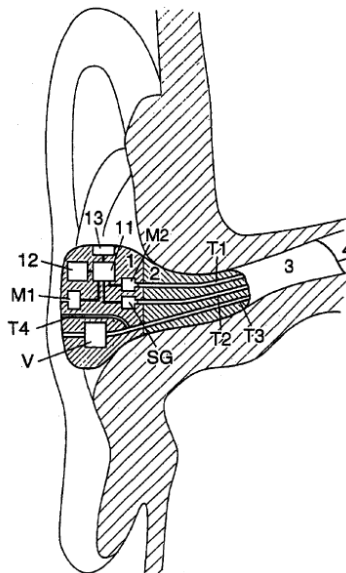


Fig. 1

Figure 1 shows an example of *Kvaløy*’s voice detection and discrimination apparatus. Ex. 1006, 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. 1006, 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. Additionally, the apparatus 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.

A block diagram of the main functional units of the electronic circuitry of Kvaløy’s apparatus is shown in Figure 2, reproduced below.

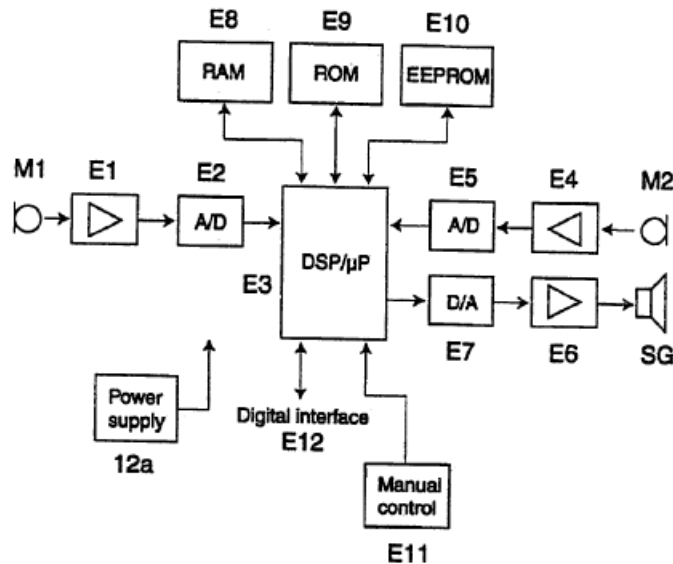


Fig. 2

Figure 2 shows a block diagram of the main functional units of the electronic circuitry of Kvaløy’s apparatus. Ex. 1006, Fig. 2, 5:1–3.

As shown in Figure 2, Kvaløy’s apparatus includes “signal processing unit E3,” “storage means which may be RAM (Random access memory) E8, ROM (read only memory) E9, or EEPROM (electrically erasable programmable read only memory) E10, or combinations of these.” Ex. 1006, 5:10–11, 5:50–57. The apparatus also includes “bi-directional digital interface E12,” which may use “[t]he Bluetooth standard” for

wireless communication and can allow the “two ear terminals 1,2” to be “used in a binaural mode.” *Id.* at 5:66–6:18. Signal processor E3 may generate an output signal for sound generator SG based on “signals received by the electronic circuitry 11 via the communication with other electrical units” or “signals detected by the electroacoustic transducer elements M1, M2.” *Id.* at 6:21–24. Signal processing unit E3 can also include “signal analysis means for detecting the presence of speech components, such as words, in the signal from the inner electroacoustic transducer element M2.” *Id.* at 9:29–36; *see id.* at 6:36–41.

3. *Motivation to Combine Le 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 and Kvaløy, and would have had a reasonable expectation of success in doing so.” Pet. 18 (citing Ex. 1002 ¶ 93). 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.* (citing Ex. 1005 ¶¶ 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. 1005 ¶¶ 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.* at 18–19 (citing Ex. 1002 ¶ 99).

Petitioner argues that this motivation would have led one of ordinary skill to Kvaløy. Pet. 19 (citing Ex. 1002 ¶ 99). According to Petitioner, one of ordinary skill “would have recognized that Kvaløy’s ear terminal was compatible with and even advanced Le’s disclosed objectives and be as good or superior to Le’s earpiece 30” for the following reasons:

1. Kvaløy’s ear terminal is analogous to Le’s earpiece 30 because both are configured to exchange audio signals with other devices. *Id.* at 20 (citing Ex. 1002 ¶ 103).
2. Kvaløy’s ear terminal would be less obtrusive and better blend in with the user’s natural appearance than Le’s wired earpiece 30. *Id.* (citing Ex. 1002 ¶ 104).
3. Kvaløy’s inner microphone M2 would provide an equivalent or superior voice signal to Le’s personal microphone 36 for Le’s natural voice commands to computer unit 15 because it is less susceptible to noise. *Id.* (citing Ex. 1002 ¶ 105).
4. Kvaløy’s outer microphone M1 for picking up ambient sound so that the user can speak with other people would be as effective as Le’s belt-worn environmental microphone 38 without the obtrusiveness of having to carry around a separate microphone or wear it on a belt. *Id.* at 20–21 (citing Ex. 1002 ¶ 106).
5. Le’s recording of ambient sound for later recall would have been an obvious use for Kvaløy’s ear terminal microphones. *Id.* at 21 (citing Ex. 1002 ¶ 107).

Accordingly, in Petitioner’s combined Le-Kvaløy system, “Kvaløy’s ear terminal would replace Le’s earpiece and Le’s environmental microphone such that Kvaløy’s outer microphone would replace Le’s environmental microphone, and Kvaløy’s inner microphone would be used to pick up the user’s speech instead of the personal microphone.” Pet. 21–22 (citing Ex. 1002 ¶ 109). Petitioner asserts that “wireless headsets for mobile devices were common in the 2007 timeframe,” and one of ordinary skill “would have been able to adapt Le’s computer unit 15 to wirelessly

communicate with Kvaløy's ear terminal, as Le itself suggests." *Id.* at 22 (citing Ex. 1002 ¶¶ 110–111).

Petitioner argues that its proposed combination “would have been predictable and would not have affected Le's or Kvaløy's design principles.” Pet. 22 (citing Ex. 1002 ¶¶ 112–115). For example, according to Petitioner, configuring Kvaløy's ear terminal circuit to continually pass the signal from the outer microphone (which replaces Le's environmental microphone in the combination) to Le's computer unit through the digital interface would have required only the exercise of ordinary skill. *Id.* (citing Ex. 1002 ¶ 112). Indeed, Petitioner asserts, Kvaløy already discloses that the digital interface is bi-directional and used for transmitting digitized audio signals to and from the ear terminal (citing Ex. 1006, 5:66–6:18), so configuring Kvaløy's ear terminal to pass the signals from the inner microphone to the remote device would not have required a significant redesign of Kvaløy's ear terminal. *Id.* (citing Ex. 1002 ¶¶ 113–114). Accordingly, Petitioner argues, the combination of Le and Kvaløy “would have amounted to no more than the substitution of one known element (Kvaløy's ear terminal) for another (Le's earpiece and environmental microphone) to obtain predictable results (Le's computer unit with a wireless earpiece and microphones).” *Id.* at 23 (citing Ex. 1002 ¶ 116).

Patent Owner responds that “[t]he proposed Le-Kvaloy combination comprises components that would not combine into an operative system without significant modifications that would have been beyond the level of skill of one of ordinary skill in the art,” including: “(1) configur[ing] Kvaløy's hearing instrument to communicate bi-directionally in real time with Le's computer unit using wireless communication techniques, and

(2) redesign[ing] the control circuitry of Kvaløy to control operation of the inner microphone and speaker so that the combination does not produce unacceptable ringing and feedback in the user’s ear canal.” PO Resp. 18–19 (citing Ex. 2006 ¶ 63). According to Patent Owner, one of ordinary skill “would not have been above to achieve these modifications without a reasonable expectation of success,” as evidenced by “[t]he absence of any consumer electronics earphones/earbuds, including hearing aids (which are more expensive and more technical[ly] complex than audio earphones), having those features and functions during that time frame.” *Id.* at 19 (citing Ex. 2006 ¶ 64).

More specifically, Patent Owner asserts that one of ordinary skill would have needed to “strip Le of virtually all components if its earpiece 30 and environmental microphone 38 were both replaced by Kvaløy’s hearing instrument,” leaving nothing left in Le but a “concept.” PO Resp. 19–20 (citing Ex. 2006 ¶ 65). 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[d] knowledge and skill beyond one of ordinary skill in the art.” *Id.* at 20. To support this argument, Patent Owner relies on a 2007 article by Brent Edwards titled *The Future of Hearing Aid Technology*⁴ which, according to Patent Owner, states that Bluetooth wireless solutions required more power than most hearing aids of that time could accommodate and that incorporating Bluetooth technology in

⁴ Brent Edwards, *The Future of Hearing Aid Technology*, National Institute of Health National Library of Medicine, reprinted by SAGE Journals (2007) (Ex. 2008, “Edwards” or “the Edwards article”).

a hearing aid would have been a major engineering challenge. *Id.* at 20–22 (citing Ex. 2008, 4, 5); *see also* PO Sur-reply 3–4.

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. 22–23 (citing Ex. 2008, 5); *see id.* at 23–26. Patent Owner asserts that the Edwards article’s “review of the state of the art in 2006 shows that the majority of hearing aids were behind-the-ear devices in order to accommodate the size of batteries and other components required to provide functionality,” and “[t]here is no mention of sealed, in-ear canal designs such as Kvaløy offering any improvements” over “behind-the-ear/open ear canal design.” *Id.* at 23–24 (citing Ex. 2008, 1; Ex. 2006 ¶ 72). These issues, according to Patent Owner, would have “dramatically limit[ed] the functions that could be performed by the Le-Kvaløy combination,” such as speech recognition. *Id.* at 25.

Indeed, Patent Owner argues, the problems identified in the Edwards article “were not solved sufficiently to allow commercial products until after 2010.” PO Resp. 26 (citing Ex. 2006 ¶ 78). Citing an article on the androidcentral.com website,⁵ Patent Owner argues that “the first wireless earbuds were not offered until 2014,” and “those early products were ‘plagued by connectivity issues, poor battery life, awkward fit, and generally poor sound quality.’” *Id.* at 26 (citing Ex. 2009, 2). Patent Owner also

⁵ Android Central, *The History of True Wireless Earbuds: Here’s What’s Changed Over the Last Six Years* (Sept. 17, 2021) (Ex. 2009, “Android Central” or “the Android Central article”).

asserts that Apple did not introduce the first version of its AirPods, which “were a commercial success and indicate[d] that the technical problems that existed in 2007 had been resolved” until 2015. *Id.* (citing Ex. 2009, 4).

Next, Patent Owner argues that “the blocking function of Kvaløy prohibits an operational feature of Le, namely the ability to recognize user voice commands while the speaker is playing content.” PO Resp. 27. More specifically, Patent Owner asserts, “[t]o avoid false voice activation detection, Kvaløy blocks any pickup from the ear canal microphone when the [ear canal speaker] SG plays an incoming communication signal.” *Id.* (citing Ex. 1006, 5:33–44). According to Patent Owner, “Kvaløy is not concerned about a user listening to audio content such as music or recordings,” but rather “is a hearing protector” that is “intended for use in noisy environments” where “some source of acoustic noise is predominate, making it difficult to hear or where damage to the hearing could be at risk.” *Id.* (citing Ex. 1006, 1:16–17, 1:30–33, 4:48, 8:24).

Patent Owner attempts to distinguish Le from Kvaløy, arguing that “the placement of the personal microphone 36 in the Le system was able to pick up user voice while simultaneously playing content through the speaker because the personal microphone was specifically not sampling the ear canal region into which the speaker was playing the audio content.” *Id.* at 28. According to Patent Owner, “Kvaløy’s blocking frustrates this feature” of Le “because Kvaløy recognizes any content played by the speaker as an incoming communication signal, such as ambient sound, a phone call, or music content from a connected source, and stops the ear canal microphone from recording the sound in the ear canal region when the speaker plays audio content.” *Id.* Thus, Patent Owner contends, “the Le-Kvaløy

combination's ability to use the internal microphone M2 to detect the user's voice for voice commands would be blocked whenever there is any audio content being played by the speaker," which would render inoperative Le's ability "to simultaneously listen to a record environmental sounds and issue user commands," as well as "create problems for any type of music playback or phone call." *Id.* (citing Ex. 2006 ¶ 81).

Patent Owner further argues that, "for Le's recording feature to work using Kvaløy's earpiece," the ear canal speaker "must always be on so that the user can hear sounds from his or her environment to decide what to record." PO Resp. 28. However, according to Patent Owner, "Petitioner[] propose[s] that the inner microphone is used to pick up the user's voice commands" which will cause the voice signal to "be repeated by the inner ear speaker causing echoing and undesirable feedback." *Id.* at 28–29. To address this problem, Patent Owner contends, "[c]ircuitry would be needed to parse the user's voice from the other sounds," but "[t]hat technology is not disclosed in any of the references" and "would not have been present in 2007." *Id.* at 29 (citing Ex. 2006 ¶ 82). Alternatively, according to Patent Owner, if Kvaløy's outer microphone M1 is used to detect the user's voice (in order to avoid feedback and echo), "then the problem of parsing the user's voice from other ambient sounds remains." *Id.* (citing Ex. 2006 ¶ 83).

Petitioner responds that Patent Owner misperceives the standard for determining a reasonable expectation of success by making arguments that "are not tied to the claims," rather than looking to "the likelihood of success in combining references to meet *the limitations of the claimed invention.*" Pet. Reply 10. Petitioner asserts that the Edwards and Android Central articles are "not reliable" because "there is no evidence as to when they were

written or whether the author of Android Central is a [person of ordinary skill in the art],” they “do not purport to conduct a comprehensive literature or patent review,” “their discussion focuses on commercially available technology,” and a person of ordinary skill’s “knowledge base is not limited to hearing aids or ‘true wireless’ earbuds.” *Id.* (citing Ex. 1036).

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 “binaural hearing assistance system” with a “completely-in-the-canal form factor and sophisticated signal processing and Bluetooth capabilities.” *Id.* at 11 (citing Ex. 1037, Cover, 1:22–28, 3:34–47, 3:56–60, 4:4–15, 6:39–52).

Next, Petitioner responds to Patent Owner’s contentions that one of ordinary skill would not have used Kvaløy’s “sealed, in-ear canal” form factor and that Le’s system “could not be implemented solely in an earpiece configuration,” by asserting that “Petitioner[] d[oes] not argue that the proposed combination required placing all of Le’s and Kvaløy’s circuitry and functionality into a sealed, in-ear canal form factor,” and “[t]he claims do not require any particular form factor.” Pet. Reply 11–12 (citing Pet. 21–22). 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. 1041 ¶¶ 7–18). Additionally, according to Petitioner, Kvaløy discloses that its circuitry may be housed either within an ear terminal (with the form factor shown in

Kvaløy’s Figure 1) or in “a unit separate from but connected to [the] ear terminal.” *Id.* (citing Ex. 1006, Fig. 1, 9:18–23). Petitioner argues that Kvaløy is “presumed enabling” and indicates that one of ordinary skill would have been able to implement Kvaløy’s circuitry in an in-ear canal form factor. *Id.* at 13–14 (citing Pet. 68–70; Ex. 1002 ¶ 350). Petitioner further contends that “the ’591 patent itself takes any technical limitations associated with a small form-factor for granted.” *Id.* at 16 (citing Ex. 1001, 4:18–20; 5:52–57).

As for Patent Owner’s arguments based on Bluetooth, Petitioner responds that “the claims do not require wireless communication or low power consumption.” Pet. Reply 14. 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 impair Le’s recording functionality.” *Id.* at 14–15 (citing Ex. 1005 ¶ 42). And, Petitioner asserts, “Kvaløy itself discloses implementing bi-directional communication ‘through a digital radio link’ of which Bluetooth is ‘one possible candidate,’” and “further discloses several forms of data being transmitted through the bi-directional interface, including ‘digitised audio signals.’” *Id.* at 15 (citing Ex. 1006, 5:66–6:5, 6:5–18). Petitioner further contends that the ’591 patent itself “takes the alleged technical limitations for granted” by describing the use of “Bluetooth earpieces” in the “Background” section, as well as disclosing an “earpiece 100” with a “transceiver 204” that supports Bluetooth in block diagrams and without implementation details.” *Id.* (citing Ex. 1001, 1:24–27, 3:28–29, 5:28–33, Figs. 1, 2).

With respect to Patent Owner’s argument regarding limitations of digital signal processors found in hearing aids in the 2007 time frame, Petitioner responds that Patent Owner “does not explain what processing tasks that are required by the claims would not have been feasible to implement.” Pet. Reply 22. 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 Pet. 29–32). “Moreover,” Petitioner contends, the ’591 patent “takes any alleged processing demands completely for granted” and “includes no implementation details for a new or inventive DSP required to implement the claims.” *Id.* at 23.

Turning to Kvaløy’s blocking function, Petitioner responds that Patent Owner mischaracterizes the blocking function by arguing that Kvaløy’s “system will break whenever an incoming communication signal is present in the same ear terminal used for voice detection.” Pet. Reply 16. Petitioner argues that “Kvaløy discloses an additional decision condition signal applied to the decision block 28 to ensure that the system continues to function properly to recognize user voice inputs even in the presence of an incoming communication signal,” not “to destroy the system’s ability to recognize user voice inputs whenever an incoming communication signal is present, as [Patent Owner] would irrationally have it.” *Id.* at 17. Petitioner points to Kvaløy’s disclosure that its blocking function is intended to “block the detection of the incoming communication signal *as if it were the user’s own voice*,” and argues that Kvaløy nowhere suggests that “the blocking function is designed to block the user from being able to provide user voice commands when an incoming communication signal is active.” *Id.* (citing

Ex. 1006, 5:35–42). According to Petitioner, its interpretation is consistent with Kvaløy’s disclosure as a whole because Figure 3 shows that “the decision block 28 is *downstream* from where the inner microphone M2 captures signals,” so one of ordinary skill “would not have understood Kvaløy to disclose that its blocking function renders the microphone circuitry in the ear terminal inoperative.” *Id.* at 17–18 (citing Ex. 1006, Fig. 3).

Petitioner also disagrees that Kvaløy’s user voice command detection is blocked “whenever there is any audio content being played by the speaker,” because “Kvaløy discloses that the mere presence of any active communication signal does not break Kvaløy’s ability to detect voice commands.” Pet. Reply 18. Specifically, Petitioner asserts, “Kvaløy states that the blocking function is for an ear terminal ‘used for voice activated control’” and the “additional decision condition signal” “*typically depends on* the incoming communication signal.” *Id.* (citing Ex. 1006, 5:33–38). “If Kvaløy meant to disclose a binary on/off decision that [Patent Owner contends],” Petitioner continues, “the ‘decision condition signal’ would not ‘typically depend’ on the incoming communication signal.” *Id.* Petitioner further contends that Kvaløy’s inner microphone signal “does not need to be completely free of any noise/feedback component from the speaker” because “the ‘processing unit E3’ includes ‘signal analysis means’ that ‘comprises means for *separating the voice signal from the total signal* detected by the inner electroacoustic transducer element.”” *Id.* at 18–19 (citing Ex. 1006, 9:37–43). “Thus,” according to Petitioner, “Kvaløy acknowledges the need and capability to discern the user’s voice command from the additional noise/feedback in the inner microphone.” *Id.* at 19.

Petitioner further argues that “techniques for addressing feedback in the signal from the inner microphone” would have been “well-known” to a person of ordinary skill in the art. Pet. Reply 19. “For example,” Petitioner asserts, “Kvaløy itself discloses that the blocking function would not be necessary if the audio content signal is played in the opposite ear terminal.” *Id.* (citing Ex. 1006, 5:45–49). Petitioner also argues that Kvaløy incorporates by reference U.S. 09/653,869 to Svean (the “’869App”), which “expressly discloses implementing ‘feedback cancellation’ when the ear terminal speaker is in the same ear as the inner microphone,” and “Mr. Anagnos testified that this was an alternative to Kvaløy’s blocking function.” *Id.* (citing Ex. 1007, 24:28–31; Ex. 1035, 29:1–6, 29:15–30:8). “And,” according to Petitioner, “other prior art also confirms that techniques for feedback cancellation were known.” *Id.* at 19–20 (citing Ex. 1041 ¶¶ 19–40). Additionally, Petitioner contends, “the ’591 patent does not even mention feedback/echo/ringing as a problem to solve,” which “is an admission that any required feedback reduction technology was known” to a person of ordinary skill. *Id.* at 20 (citing *Google LLC v. Cywee Grp.*, IPR2018-01258, Paper 90 at 38–39 (PTAB Jan. 9, 2020) (Final Written Decision) (“*Cywee*”).

Finally, Petitioner argues that “Le does not require listening for a voice command while simultaneously playing audio content.” Pet. Reply 20. Petitioner asserts that “Le discloses a single earpiece, and so the user could, at a minimum, hear ambient sound through the other ear.” *Id.* “And,” according to Petitioner, “Mr. Anagnos conceded that there would at least be some circumstances in which the user of Le’s system would not need the speaker to record conversations.” *Id.* (citing Ex. 1035, 48:17–49:8).

Petitioner further contends that Le does not disclose any embodiment “that requires the ability to record conversations while also outputting audio content (e.g., music).” *Id.*

Patent Owner responds that the Edwards and Android Central articles are relevant and instructive of the state of the art in 2007. PO Sur-reply 3–5. Patent Owner also argues that Petitioner was the one who proposed an in-ear canal design form factor for the combination, and that Bluetooth would have been the preferred method of wireless communication for the combination in 2007. *Id.* at 5–9.

Turning to the blocking function, Patent Owner responds that Petitioner’s position “rests on the faulty premise that Kvaløy’s decision block 28 ‘ensure[s] that the system continues to function properly to recognize user voice inputs even in the presence of an incoming communication signal,’” which assumes Kvaløy is capable of “sophisticated user voice recognition that distinguishes between an incoming communication signal (such as Le’s audio recording) and the user’s own voice.” PO Sur-reply 9 (citing Pet. Reply 17) (alteration in original). According to Patent Owner, Kvaløy teaches otherwise by disclosing that the “signal analysis means” in “processing unit E3” does not “apply to decision block 28,” which “makes a decision based on the fact that the signal strength difference (calculated in 27)” between microphones M1 and M2 is “independent of the sound character and sound level.” *Id.* at 10 (citing Ex. 1006, 8:13–17) (emphasis omitted). “Thus,” Patent Owner contends, “Kvaløy’s blocking function does not block the microphone signal itself because Kvaløy’s system cannot distinguish the user’s voice from another within the same microphone signal.” *Id.*

Patent Owner also argues that Kvaløy's "means for separating the voice signal from the total signal detected by the inner [microphone]" is "limited to the detection of 'speech components, such as words,' which may involve 'means for determining the duration, frequency content, and amplitude of the signal.'" PO Sur-reply 10 (citing Ex. 1006, 9:29–32, 9:39–43). "Unlike the '591 patent and Le," Patent Owner asserts, "Kvaløy is only concerned with the detection of a person—any person—speaking," and even if its methods "were applied to decision block 28," it "would still not have been capable of distinguishing the user's voice from another voice in the audio recording." *Id.* "Thus," according to Patent Owner, "Petitioner's interpretation of Kvaløy's blocking function is beyond Kvaløy's capabilities." *Id.*

"If on the other hand," Patent Owner argues, "Le is combined with Kvaløy's blocking function as Kvaløy intended, then Le's operations would be impaired" because "Le contemplates the ability to record conversations while outputting audio content." PO Sur-reply 11. Patent Owner asserts that "Le generally discloses a system that responds to the user's voice commands" and "discloses at least two 'further mode[s] of operation' examples where the user may receive real-time remote communication 'via the speaker 32 in the earpiece 30' such as 'an audio message,'" which are "additions to Le's core system receiving user's voice commands." *Id.* (citing Ex. 1005, code (57), ¶ 41).

Furthermore, Patent Owner argues, "Petitioner's alternative combination using 'a single earpiece [such that] the user could, at a minimum, hear ambient sound through the other ear'" is flawed because "claim 1 recit[es] two earpieces," a "left earpiece configured to capture

ambient sound and a right earpiece configured to capture internal sound, meaning both earpieces must be usable.” PO Sur-reply 11. A “combination where only one earpiece can be used at a time” would, according to Patent Owner, “rewrite claim 1 to require a left earpiece or a right earpiece instead.” *Id.* (citing Pet. Reply 21). Lastly, Patent Owner contends that Petitioner’s argument that the claims do not require a speaker contradicts the language of claim 14, which “not only recites an ‘Ear Canal Receiver’ (speaker) but specifies that the ‘Ear Canal Receiver’ is ‘configured to deliver audio content to the ear canal’ (actively outputting audio content).” *Id.* at 12 (citing Ex. 1001, 14:41–42).

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 and Kvaløy as Petitioner proposes, and would have had a reasonable expectation of success in doing so. In Petitioner’s proposed combination, “Kvaløy’s ear-level device would replace Le’s earpiece and Le’s environmental microphone such that Kvaløy’s outer microphone would be replace Le’s environmental microphone, and Kvaløy’s inner microphone would be used to pick up the user’s speech instead of the personal microphone.” Pet. 17; Ex. 1002 ¶ 109. Additionally, in the proposed combination, the terminal circuit is configured to continually pass the signal from the outer microphone to Le’s computer unit. Pet. 22; Ex. 1002 ¶ 112.

We agree with Petitioner that Le emphasizes the desirability of having its device blend in with the user’s natural appearance and be unintrusive for the user and people with whom the user interacts. *See* Pet. 18; Ex. 1005 ¶¶ 5 (“The invention provides a wearable computer 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 10, such as the earpiece 30 and the environmental microphone 38, blend in with the natural appearance of the user" and "[t]he wearable computer system 10 is 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 unintrusive for the user and people who interact with the user"); Ex. 1002 ¶¶ 94–96.

Le also teaches implementing the computer unit 15 as a cellular telephone and implementing a wireless connection for microphones 36 and 38. Ex. 1005 ¶¶ 9 ("In another implementation, a cellular telephone is used and worn on a belt clip or kept in the user's pocket," which "may be integrated with the wearable computer unit."), 42 (The personal microphone, earpiece speaker, and environmental microphone "may be connected to the computer unit 15 using a conventional wireless connection" and "the housing of a cellular phone" may "enclose the computer unit 15."); Ex. 1002 ¶ 97. Le is further concerned with properly recognizing user voice commands in noisy environments. Ex. 1005 ¶¶ 23 (describing an audio filter "associated with the personal microphone 36 to filter noise from the surroundings of the user while properly receiving predetermined voice commands from the user"), 24 (in a noisy environment, the personal microphone's audio filter "filters the environmental noise and properly inputs the user's voice commands"); Ex. 1002 ¶ 98.

We agree with and find credible Dr. Atlas's testimony that, in view of these disclosures, one of ordinary skill "would have been motivated to look for (1) ways to implement Le's microphones 36 and 38 with a wireless

connection; (2) ways to input audio commands or key phrases in noisy environments, and (3) ways to do both (1) and (2) while also advancing Le’s objective to make the wearable system blend in with the natural appearance of the user.” Ex. 1002 ¶ 99. We also credit Dr. Atlas’s testimony that one of ordinary skill would have recognized that Kvaløy’s ear terminal was compatible with and advanced Le’s disclosed objectives, and would have been “as good or superior to Le’s earpiece 30” in achieving those objectives. *Id.* ¶ 102; *see id.* ¶¶ 103–108. We further agree with Dr. Atlas that one of ordinary skill would have understood that “Kvaløy’s ear terminal is analogous to Le’s earpiece” because both “are configured to exchange audio signals with other devices,” and that “Kvaløy’s wireless ear terminal would be less obtrusive for the user and blend in with the user’s natural appearance better than Le’s wired earpiece 30.” *Id.* ¶¶ 103–104.

Additionally, we agree with and find credible Dr. Atlas’s testimony that one of ordinary skill would have understood that “Kvaløy’s ear terminal would provide a comparable or superior means of providing voice commands to computer unit 15” because the inner microphone “is less susceptible to noise” and therefore “would provide an equivalent or superior voice signal to Le’s personal microphone 36.” Ex. 1002 ¶ 105. Indeed, Kvaløy incorporates by reference the ’869App, which states that the signal from the inner microphone M2 is “of high quality and well suited for voice control and speech recognition.” Ex. 1007, 17:32–34; Ex. 1006, 1:6–12 (incorporating by reference the ’869App); Ex. 1002 ¶ 105. We further credit Dr. Atlas’s testimony that Kvaløy’s outer microphone “would be as effective as Le’s belt-worn environmental microphone 38” in picking up ambient sound without “the potential obtrusiveness of having to carry around a

separate microphone and/or wear it on a belt,” and therefore “would blend in more with the user’s natural appearance.” Ex. 1002 ¶ 106.

Furthermore, we find that one of ordinary skill would have had a reasonable expectation of success in achieving the proposed Le-Kvaløy combination. Our conclusion is supported by Dr. Atlas’s testimony that one of ordinary skill “would have been able to adapt Le’s computer unit 15 to wirelessly communicate with Kvaløy’s ear terminal, as Le itself suggests.” Ex. 1002 ¶ 110. We also credit Dr. Atlas’s testimony that one of ordinary skill would have been able to “pass the signal from the outer microphone [of Kvaløy] (which replaces Le’s environmental microphone in the combination) continually to Le’s computer unit through the digital interface.” *Id.* ¶ 112; *see also id.* ¶¶ 113–114. We further agree with 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 able to implement solutions to address this issue. Ex. 1041 ¶¶ 19–40.

We do not agree with Patent Owner’s arguments that one of ordinary skill would not have been motivated to combine Le and Kvaløy, and would not have had a reasonable expectation of success in making the combination. *See* PO Resp. 18–29; PO Sur-reply 1–12. First, we disagree with Patent Owner’s argument that the Le-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. 19–20. Petitioner’s combination relies on Le’s computer unit which continuously stores, in a scrolling buffer, an audio recording of a conversation and, when a user enters a voice command, stores audio content in the continuously scrolling buffer from before the voice command into a memory for later recall. Pet. 21–22, 26–32. Petitioner then

replaces Le’s environmental microphone and earpiece with Kvaløy’s ear terminal. *Id.* at 21–22. Thus, Petitioner’s combination relies on structure from both Le 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 in 2007. *See* PO Resp. 20. Patent Owner relies on the Edwards and Android Central articles, but we agree with Petitioner that these articles focus primarily on commercially available hearing aid technology, and do not purport to review the state of the prior art or discuss the prior art references being asserted in this proceeding. *See* Pet. Reply 10–11; Ex. 2008; Ex. 2009. For example, the Edwards article discusses hearing aids “sold in the United States” and technologies that are “successful in the marketplace.” Ex. 2008, 1. Similarly, the Android Central article discusses wireless earbuds that debuted in the market and the development of the wireless audio segment in the market. Ex. 2009, 1–2.

As for the purported challenges of incorporating Bluetooth into the proposed combination, we agree with Petitioner that the claims do not require wireless communication or low power consumption. *See* Pet. Reply 14. Furthermore, Le expressly discloses using a wireless connection between the computer unit and its microphones without any suggestion that it would impair recording functionality, and Kvaløy discloses implementing bi-directional communication “through a digital radio link” of which “[t]he Bluetooth standard” is “one possible candidate.” Ex. 1005 ¶ 42; Ex. 1006, 5:66–6:5. Le and Kvaløy 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) (“*Corephotonics*”). Indeed, the '591 patent itself describes the implementation of “Bluetooth™ earpieces” in the “Background” section of the Specification, and discloses an “earpiece 100” with a “transceiver 204 that can support any number of wireless access technologies including . . . Bluetooth™” 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, 1:24–27, 3:28–29, 5:28–33; *see Cywee*, Paper 90 at 38–39 (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.* 22–29. 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. Other than speech recognition, Patent Owner does not explain what processing tasks that are required by the claim would have been beyond the level of ordinary skill to implement. Patent Owner's argument is also undermined by the fact that the '591 patent includes no implementation details for a new or inventive DSP to implement the claimed devices. *See* Ex. 1001. Moreover, we agree with Petitioner and Dr. Atlas that the proposed combination does not require placing all of Le's and Kvaløy's circuitry (including circuitry for implementing wireless communication and/or digital signal processing) into a sealed, in-ear canal form factor, 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 11–12; Ex. 1041 ¶¶ 9–18.

Turning now to the Kvaløy's blocking function and the issue of feedback, echo, or ringing, we disagree with Patent Owner's argument that the proposed combination would not "operate properly" because "the blocking function of Kvaløy prohibits an operational feature of Le, namely the ability to recognize user voice commands while the speaker is playing content." PO Resp. 27. To the contrary, we find that Petitioner has made a sufficient showing that Kvaløy discloses using feedback cancellation to address the issue of feedback, echo, or ringing in the signal from the internal microphone, and that implementing a suitable method for doing so would have been within the ability of a person of ordinary skill in the art. Kvaløy incorporates by reference the '869App (Ex. 1006, 1:6–12), which discloses implementing "feedback cancellation" when the ear terminal speaker is in the same ear as the inner microphone, explaining that:

In a more acoustically demanding arrangement the loudspeaker SG, arranged in the same meatus 3 as the inner pickup microphone M2 is situated, may be used, thus demanding *feedback cancellation*.

Ex. 1007, 24:28–31.⁶

Additionally, Mr. Anagnos testified that the '869App discloses the use of feedback cancellation which allows the internal microphone and speaker to be on at the same time:

Q: Would you agree that Exhibit 1007, which is incorporated by reference into Kvaløy, discloses that the internal microphone and speaker may be both on at the same time, provided that feedback cancellation is implemented?

A: Yes.

Ex. 1035, 29:1–6. Mr. Anagnos further testified that the '869App's disclosure of feedback cancellation and Kvaløy's blocking function are “two different methods of solving the same problem,” and that “[i]f the feedback cancellation solution were properly designed and implemented, [it] should be possible” to “have the speaker on and also have the inner microphone on and obtain a signal that does not have the feedback from the speaker.” *Id.* at 29:15–30:8.

We also agree with and find credible Dr. Atlas's testimony that one of ordinary skill would have been aware of the potential for feedback, echo, and ringing in the Le-Kvaløy combination, and would have been able to implement solutions to this issue. Ex. 1041 ¶¶ 19–40. We credit Dr. Atlas's testimony that one of ordinary skill would have understood that the potential for feedback, echo, or ringing “is a fundamental concern in systems

⁶ The citations to Exhibit 1007 are to the page numbers added by Petitioner, which is consistent with the manner Petitioner uses in its papers.

involving a feedback loop where a microphone and a speaker are both in close proximity,” and “would have been familiar with any number of solutions to addressing this issue.” *Id.* ¶¶ 20, 21.

For example, Dr. Atlas points to the solution disclosed in U.S. Patent No. 6,671,379 to Nemirovsky⁷ (Ex. 1038, “Nemirovsky”), which discloses an “earset 18 inserted at least partially into the ear 100” that includes a microphone 20 and speaker 22 inserted in the ear canal and shielded from environmental noise. Ex. 1041 ¶¶ 28–31; Ex. 1038, 6:4–22, 7:8–12, Fig. 3. Dr. Atlas testifies that Nemirovsky “recognizes the feedback created by the microphone 20 and the speaker 22, and discloses ‘minimiz[ing] detection of sounds from the speaker’ and/or ‘minimiz[ing] the delivery of a feedback component to the communication device 14’ by, for example, using a potentiometer to ‘adjust the gain of the amplifier 24 as desired.’” Ex. 1041 ¶ 34 (quoting Ex. 1038, 7:64–8:12) (alteration in original). According to Dr. Atlas, Nemirovsky “also discloses cancelling the feedback component of the signal generated by microphone 20 using filters and inverting/non-inverting amplifiers.” *Id.* ¶ 36 (citing Ex. 1038, 8:13–9:15). Dr. Atlas further points to Nemirovsky’s disclosures that signals generated by the internal and external microphones can be used to distinguish between user produced speech and externally generated noise, and that the system “can be adapted to cancel externally generated noise from the detections of internal microphone 20” to produce “a relatively noise-free speech signal” that can

⁷ Dr. Atlas makes clear that he is “relying on Nemirovsky’s disclosures as evidence of a person having ordinary skill in the art’s knowledge and the state of the art,” and that “Nemirovsky is not part of the ground” asserted in the Petition. Ex. 1041 ¶ 28 n.5.

be transmitted to a communication network. *Id.* ¶ 38 (citing Ex. 1038, 9:19–10:26); Ex. 1038, 10:8–26.

We also find credible Dr. Atlas’s testimony that, based on these disclosures:

A person having ordinary skill in the art would have understood that Nemirovsky’s teachings relating to canceling the feedback component of the microphone signal and canceling the externally generated noise would have helped to ensure that the signal received from the ear canal microphone by a remote communication device contained the user’s speech without the feedback component from the ear canal speaker. A person having ordinary skill in the art would have understood to implement this technique or a similar one in the Le-Kvaløy combination to the extent the ear canal speaker needed to be on.

Ex. 1041 ¶ 39.

Additionally, we credit Dr. Atlas’s testimony that a 2005 European patent application to Victorian⁸ discloses a system that “identifies the feedback, echo, and ringing problem discussed by Patent Owner,” and discloses a VOX circuit that can “substantially attenuate[.]” the signal from an ear canal microphone when an ear canal speaker is reproducing audio from an external microphone or remote device in order to reduce echo and/or ringing. Ex. 1041 ¶ 22–27 (citing Ex. 1039 ¶¶ 31–38) (emphasis omitted). According to Dr. Atlas, “substantial attenuation” of the ear canal microphone signal “may cause some echo or ringing, but at a tolerable intensity” that “may be “below the threshold of hearing,” and thus “completely blocking the microphone signal would not have been necessary to reduce the feedback echo or ringing.” *Id.* ¶¶ 25–26. Thus, Dr. Atlas explains, one of ordinary skill would have understood that “a signal that was

⁸ EP 1 519 625 A2, published Mar. 30, 2005 (Ex. 1039, “Victorian”).

sufficiently attenuated to reduce the feedback, echo, or ringing to a tolerable level would not have rendered the signal completely inaudible to the user” and, if the signal was recorded, the gain “could be increased on playback if necessary.” *Id.* ¶ 27. Consequently, we agree with Dr. Atlas’s conclusion that, “based on my experience and knowledge relating to the feedback, echo, and ringing problem, and confirmed and supported by Victorian’s and Nemirovsky’s express teachings, a person having ordinary skill in the art would have understood how to address” the “feedback, echo, and ringing problems” resulting from “using an earpiece with an ear canal microphone and ear canal speaker as disclosed by Kvaløy.” *Id.* ¶ 40.

Furthermore, the ’591 patent does not mention problems with feedback, echo, or ringing in the disclosed system having an external microphone, ear canal microphone, and ear canal speaker, suggesting that the inventors did not believe that addressing such issues was beyond the level of ordinary skill in the art. *See* Ex. 1001; *Cywee*, Paper 90 at 38–39; *In re Epstein*, 32 F.3d at 1568.

We have considered Mr. Anagnos’s declaration, including his testimony that using Kvaløy’s inner ear microphone “to pick up the user’s voice” will cause that voice signal to be “repeated by the inner ear speaker causing echoing and undesirable feedback,” and that “[c]ircuitry would be needed to parse the user’s voice from the other sounds,” which would require “sophisticated processing in an ear canal device” which “is not disclosed in any of the references” and “would not have been present in 2007.” Ex. 2006 ¶¶ 79–84. Mr. Anagnos appears to rely on his earlier opinions concerning the limitations of digital signal processors in 2007 for his conclusion that the necessary “sophisticated processing” was not

available in 2007. *Id.* ¶ 82. However, as discussed above, we do not find Patent Owner’s or Mr. Anagnos’s opinions about the limitations of digital signal processors in 2007 to be persuasive. Moreover, although Mr. Anagnos states in cursory fashion that circuitry “to parse the user’s voice from other sounds” was necessary to detail with feedback, and would “not have been present in 2007” in an ear canal device, he does not explain in any detail the state of the art in feedback cancellation for hearing devices in 2007, or explain why existing technology at the time would not have enabled one of ordinary skill to implement suitable feedback cancellation techniques, as the ’869App suggests and Dr. Atlas discusses. *Id.* Indeed, Mr. Anagnos acknowledged at his deposition that feedback cancellation was disclosed in the ’869App (incorporated by reference in Kvaløy) and that if “properly designed and implemented,” it would be possible “to have the speaker on and also have the inner microphone on and obtain a signal that does not have the feedback from the speaker.” Ex. 1035, 29:1–6, 29:15–30:8. Weighing the testimony of Dr. Atlas and Mr. Anagnos, we find that Dr. Atlas’s testimony is more detailed and credible, and rely on it in reaching our conclusions here.

In addition to the above, we also agree with Petitioner that Kvaløy discloses that the blocking function would not be necessary if the audio content signal is played in the opposite ear terminal from the one used to receive voice from the user’s ear canal. *See* Pet. Reply 19. Specifically, Kvaløy discloses that

An incoming communication signal may, however, be introduced into an additional hearing protective terminal (1, 2) located in the ear accommodating the terminal used for voice activated control. In this case the aforementioned blocking function is strictly not required.

Ex. 1006, 5:45–49. We do not agree with Patent Owner’s argument that, if this embodiment of Kvaløy were relied upon, the combination would not teach left and right ear terminals configured to capture ambient and internal sounds, because no microphone would be needed in one of the terminals. PO Resp. 30–31; PO Sur-reply 11. To the contrary, we agree with Petitioner that “[c]laim 1 is an apparatus claim that does not require that the ‘left’ and ‘right’ earpieces are used at the same time.” Pet. Reply 21. We also credit the testimony of Dr. Atlas that, in the above embodiment, one of ordinary skill would have considered it obvious “to configure Kvaløy’s second ear terminal with the identical configuration of the first ear terminal” to “provide[] additional flexibility to the user,” knowing that “earpiece users sometimes liked to use a single earpiece, while at other times, users liked to use both earpieces.” Ex. 1002 ¶ 130. To allow this option, Dr. Atlas explains, one of ordinary skill “would have been motivated to provide the user the option of using the left or right earpiece with the same structural and functional capabilities.” *Id.*

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 and Kvaløy as Petitioner proposes.

4. *Analysis of Independent Claim 1*

a) *1[preamble]: “A headset, comprising:”*

Referring to its claim construction argument, Petitioner argues that the preamble of claim 1 is non-limiting. Pet. 24. As discussed above in Section II.A, we agree with Petitioner.

Petitioner also argues that, even if the preamble were to limit claim 1, one of ordinary skill would have considered it obvious to incorporate Le’s

features, as discussed in the limitations below, in Kvaløy's ear terminal. Pet. 68–70 (citing Ex. 1002 ¶¶ 348–355). According to Petitioner, one of ordinary skill would have been motivated to do so because: (1) there was a market demand to carry fewer components, and it would have been feasible in February 2007 to incorporate all of the claimed structural components in an ear terminal; (2) the ear terminals could be used with different cell phones regardless of the hardware and software components of the cell phone; (3) using memory on board the ear terminal would have reduced latency related to the recognition of voice commands; (4) the modification would reduce power consumption in communication with the remote device because it would not require the earpiece's transceiver to be used as frequently; and (5) Kvaløy's ear terminal already included a processor and memory and thus was suitable for incorporating the functionality associated with Le's processor and memory. *Id.* (citing Ex. 1002 ¶¶ 350–354).

Other than the arguments concerning motivation to combine Le and Kvaløy previously discussed in Section II.D.3 above, Patent Owner does not present separate arguments that the preamble would not have been obvious based on the Le-Kvaløy combination. *See* PO Resp. 18–35.

Based on the full trial record, we agree with Petitioner's arguments and find that even if the preamble were considered a claim limitation, it would have been obvious over the Le-Kvaløy combination.

b) 1[a][i]: “a left earpiece including: a left Ambient Sound Microphone (LASM) configured to capture first ambient sound;”

Petitioner argues that Le in combination with Kvaløy discloses or suggests this limitation. Pet. 24 (citing Ex. 1002 ¶¶ 119–121). For example, Petitioner asserts, “Kvaløy discloses an ear terminal with an outer microphone that ‘picks up ambient sound,’” and one of ordinary skill

“would have understood Kvaløy’s ear terminal is for the left or the right ear.” *Id.* (citing Ex. 1006, 5:3–4; Ex. 1002 ¶ 120). Accordingly, Petitioner contends, one of ordinary skill “would have understood the Le-Kvaløy system discloses or suggests an ear terminal, for example, for the left ear (‘a left earpiece’) including an outer microphone to pickup ambient sound (‘a left Ambient Sound Microphone (LASM) configured to capture first ambient sound’).” *Id.* (citing Ex. 1002 ¶ 121).

Other than its arguments discussed above in Section II.D.3 with respect to motivation to combine Le and Kvaløy, Patent Owner does not present argument directed to this limitation. PO Resp. 18–35.

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

c) 1[a][ii]: “a left Ear Canal Microphone (LECM) configured to capture first internal sound in a left ear canal;”

Petitioner argues that Le in combination with Kvaløy discloses or suggests this limitation. Pet. 24 (citing Ex. 1002 ¶¶ 122–126). For example, Petitioner asserts, “Kvaløy discloses an ear terminal with an inner microphone that ‘picks up the sound in the meatus 3,’” and one of ordinary skill “would have understood Kvaløy’s ear terminal is for the left or the right ear” and that “the sound in the meatus 3 is ‘internal sound.’” *Id.* (citing Ex. 1006, 5:12–13; Ex. 1002 ¶¶ 124–125). Accordingly, Petitioner contends, one of ordinary skill “would have understood the Le-Kvaløy system discloses or suggests an ear terminal, for example for the left ear (‘a left earpiece’) including an inner microphone to pickup sound in the meatus (‘a left Ear Canal Microphone (LECM) configured to capture first internal sound in a left ear canal’).” *Id.* at 25 (citing Ex. 1002 ¶ 126).

Other than its arguments discussed above in Section II.D.3 with respect to motivation to combine Le and Kvaløy, Patent Owner does not present argument directed to this limitation. PO Resp. 18–35.

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

d) 1[b]: “a right earpiece including: a right Ambient Sound Microphone (RASM) configured to capture second ambient sound and a right Ear Canal Microphone (RECM) configured to capture second internal sound in a right ear canal;”

Petitioner argues that Le in combination with Kvaløy discloses or suggests this limitation. Pet. 25 (citing Ex. 1002 ¶¶ 127–131). For example, Petitioner asserts, “Kvaløy discloses using ‘two ear terminals 1,2’ for a ‘binaural mode.’” *Id.* (citing Ex. 1006, 6:11–12). Petitioner also argues that the ’869App (incorporated by reference in Kvaløy) “further discloses using two ear terminals, both with two microphones, and that are ‘generally symmetrical’ and ‘otherwise identical for both ears.’” *Id.* (citing Ex. 1007, 25:2–6). Thus, according to Petitioner, one of ordinary skill “would have understood Kvaløy to disclose or suggest using a second ear terminal identical to the first ‘ear terminal 1,2’ in the opposite ear for a binaural mode of operation.” *Id.* (citing Ex. 1002 ¶ 130). “At a minimum,” Petitioner asserts, one of ordinary skill “would have considered it obvious to configure Kvaløy’s second ear terminal with the identical configuration of the first ear terminal because it would have provided additional flexibility to the user,” for example, by allowing the user to choose whether to use one or two earpieces or to choose which earpiece to use for which ear. *Id.* at 25–26 (citing Ex. 1002 ¶ 130).

Patent Owner argues that the Le-Kvaløy combination does not disclose left and right earpieces configured to capture ambient and internal sounds. PO Resp. 30–31; PO Sur-reply 11. Patent Owner asserts that “Le discloses a single microphone used to capture ambient sounds” and Kvaløy “teaches that the microphone and circuitry used for voice detection (an example of an operational functionality) are only located in one of the earpieces and not both.” PO Resp. 30 (citing Ex. 1005, Fig. 1B, ¶ 20; Ex. 1006, 5:44–49). According to Patent Owner, “Kvaløy proposes that design to avoid the necessity of blocking the output of the sound generator SG if the user is speaking.” *Id.* (citing Ex. 1006, 5:44–49). “In other words,” Patent Owner contends, “the second ear terminal receives incoming communications and does not use the microphone and circuitry used for voice activated control,” so “no blocking function is needed to prevent interference between incoming communications and detection of ambient and user speech.” *Id.* at 30–31 (citing Ex. 2006 ¶ 87). According to Patent Owner, if both ear terminals are identical (containing both a speaker and ear canal microphone), “[t]hat would result in the noise interference problems discussed above being presented in both terminals as well, and no corresponding solution is found in the prior art.” *Id.* at 40.

Petitioner responds that Mr. Anagnos “took a different position at his deposition” than the one advanced by Patent Owner, “admitting that Kvaløy discloses two ear terminals, both with two microphones and a speaker.” Pet. Reply 23 (citing Ex. 1035, 22:12–23:6). “To be sure,” Petitioner acknowledges, Patent Owner “argues that such a configuration would result in feedback/interference problems,” but “this argument should be rejected for the reasons explained above” with respect to motivation to combine. *Id.*

Based on the full trial record, we find that Petitioner has sufficiently proven that the Le-Kvaløy combination teaches this claim element. Kvaløy discloses using “two ear terminals 1,2” for a “binaural mode.” Ex. 1006, 6:11–12; *see* Ex. 1002 ¶ 128. The ’869App (incorporated by reference in Kvaløy) further discloses “one preferred embodiment of the invention” using “two active hearing protective communications earplugs,” where “[e]ach earplug may comprise a main section 1 containing two microphones, an outer microphone M1 and an inner microphone M2, and a sound generator SG,” such that “[t]he right and left earplugs are generally symmetrical, otherwise identical for both ears.” Ex. 1007, 24:35–25:6. We also find credible Dr. Atlas’s testimony that, in view of these disclosures, one of ordinary skill would have understood the Le-Kvaløy combination to teach two ear terminals each having outer and inner microphones. Ex. 1002 ¶¶ 130–131. For the reasons discussed above in Section II.D.3 above, we do not agree with Patent Owner’s argument that having two ear terminals each with an inner microphone, outer microphone, and speaker, would cause feedback, echo, or ringing problems that could not have been addressed by one of ordinary skill in the art.

Moreover, if we rely on Petitioner’s alternative combination in which external sound can be played in the speaker in one earpiece while the inner microphone in the other earpiece picks up the user’s voice (*see* Pet. Reply 19), we agree with and find credible Dr. Atlas’s testimony that in such an embodiment one of ordinary skill would have considered it obvious “to configure Kvaløy’s second ear terminal with the identical configuration of the first ear terminal” to “provide[] additional flexibility to the user,”

knowing that “earpiece users sometimes liked to use a single earpiece, while at other times, users liked to use both earpieces.” Ex. 1002 ¶ 130.

Consequently, we find that this limitation would have been obvious over the Le-Kvaløy combination.

- e) *1[c] a memory configured to record at least one of the first ambient sound or the second ambient sound and at least one of the first internal sound or the second internal sound, and*

Petitioner argues that Le in combination with Kvaløy discloses or suggests this limitation. Pet. 26 (citing Ex. 1002 ¶¶ 132–141). Petitioner asserts that “Le discloses or suggests a continuously scrolling audio buffer that is part of memory 18” as well as “storing a recording of [a] conversation,” and that “[t]he personal microphone 36 and the environmental microphone 38 may be used, in combination, to input audio signals to the computer unit 15.” *Id.* (citing Ex. 1005 ¶¶ 10, 24, 28, 35, 37) (alterations in original).

According to Petitioner, one of ordinary skill “would have understood the Le-Kvaløy system to disclose or suggest that the scrolling buffer records ambient sound and internal sound.” Pet. 27 (citing Ex. 1002 ¶¶ 137–139). Petitioner further asserts that one of ordinary skill would have implemented the combination such that the Kvaløy’s inner microphone would record the portion of the conversation containing the user’s speech and Kvaløy’s outer microphone would record the portion of the conversation from the person to whom the user was speaking. *Id.* at 27–28 (citing Ex. 1002 ¶ 137). Relying on Dr. Atlas, Petitioner contends that one of ordinary skill “would have considered it obvious to use the signal from the inner microphone for the user’s speech signal because it is less susceptible to noise and would therefore provide a clearer representation of the user’s voice.” *Id.* at 28

(citing Ex. 1002 ¶ 138). “Thus,” Petitioner contends, one of ordinary skill “would have understood the Le-Kvaløy system to disclose or suggest that when continuously storing an audio recording of a conversation in the scrolling buffer,” the system “records the signal from an outer microphone in the left and/or right ear *and* the signal from the inner microphone in the left and/or right ear.” *Id.* (citing Ex. 1002 ¶ 139).

Other than its arguments discussed above in Section II.D.3 with respect to motivation to combine Le and Kvaløy, Patent Owner does not present argument directed to this limitation. PO Resp. 18–35.

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

f) 1[e][i] a processor operatively coupled to the left earpiece, the right earpiece and the memory,

Petitioner argues that Le in combination with Kvaløy discloses or suggests this limitation. Pet. 29 (citing Ex. 1002 ¶¶ 142–156). Petitioner asserts that “Le discloses a processor 16 that is connected to an earpiece 30 and the scrolling buffer, which Le discloses is part of memory 18 (in one implementation).” *Id.* (citing Ex. 1005 ¶¶ 27–28, Fig. 2). According to Petitioner, one of ordinary skill “would have understood FIG. 2 to illustrate by arrows showing signal paths that the processor is operatively coupled to the memory (including the buffer) and the earpiece.” *Id.* (citing Ex. 1002 ¶¶ 146–148). Petitioner further argues that Le discloses that the computer unit 15 (which includes processor 16) sends audio signals to the speaker in the earpiece, and that the personal microphone in the earpiece sends signals to the computer unit 15. *Id.* (citing Ex. 1005 ¶¶ 7, 24, 27).

Other than its arguments discussed above in Section II.D.3 with respect to motivation to combine Le and Kvaløy, Patent Owner does not present argument directed to this limitation. PO Resp. 18–35.

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

- g) 1[e][ii] the processor configured to save a recent portion of the at least one of the first ambient sound or the second ambient sound and the at least one of the first internal sound or the second internal sound responsive to an event.*

Petitioner argues that Le in combination with Kvaløy discloses or suggests this limitation. Pet. 31 (citing Ex. 1002 ¶¶ 157–161). Petitioner references its argument directed to limitation 1[c] above that the proposed combination discloses or suggests “continuously storing, in a scrolling buffer, an audio recording of a conversation, including an audio signal from an outer microphone from the left and/or right earpiece and an audio signal from an inner microphone in the left and/or right earpiece.” *Id.* Petitioner argues that Le further discloses that user voice commands are used to trigger storage of audio content previously recorded in the continuously scrolling buffer into memory 18 for later recall. *Id.* (citing Ex. 1005 ¶¶ 10, 28, 37, 38).

Patent Owner argues that Petitioner is incorrect that the Le-Kvaløy system stores “an audio recording of a conversation” including an audio signal from an outer microphone and an inner microphone. PO Resp. 32. Patent Owner asserts that “Le discloses storing audio recordings from the environmental microphone 38 (now Kvaløy’s outer microphone), but not

from the personal microphone 36 (now Kvaløy's inner microphone)." *Id.* at 32–33 (citing Ex. 1005 ¶ 21; Ex. 2006 ¶ 93).

Petitioner responds that “[t]he Le-Kvaløy combination discloses storing an audio recording of a conversation and it would have been obvious to record the user’s speech with Kvaløy’s inner microphone, and to record the other person’s speech with Kvaløy’s outer microphone,” as explained with respect to limitation 1[c]. Pet. Reply 23–24 (citing Pet. 27–28, 31; Ex. 1002 ¶¶ 137–139, 157–161). Petitioner asserts that Patent Owner “does not address or dispute Petitioner’s argument in this regard,” but instead “attempts to show why Le paragraphs [0010], [0028], [0037], and [0038] do not alone disclose recording conversations with the inner and outer microphones.” *Id.* at 24 (citing PO Resp. 32–25). According to Petitioner, it “cited those paragraphs to show that the user’s voice command is used to trigger the recording,” and thus “Petitioner’s actual argument stands un rebutted.” *Id.*

We agree with Petitioner. As explained above with respect to limitation 1[c], Petitioner relies on Le for the disclosure of “storing a recording of [a] conversation,” and argues that it would have been obvious to implement the combined system such that Kvaløy’s inner microphone would record the portion of the conversation containing the user’s speech and Kvaløy’s outer microphone would record the portion of the conversation from the person to whom the user was speaking. *See* Pet. 27–28, 31; Pet. Reply 23–24; Ex. 1005 ¶¶ 10, 24, 28, 35, 37; Ex. 1002 ¶¶ 137–139; § II.D.4(e), *supra*. We also agree with and find credible Dr. Atlas’s testimony that one of ordinary skill “understood that Kvaløy’s inner microphone would provide a good signal to use for the portion of the

conversation attributable to the user’s speech because it would be less susceptible to noise, and thus provide a clearer representation of the user’s voice than the outer microphone.” Ex. 1002 ¶ 138 (citing Ex. 1007, 17:28–34). Thus, Dr. Atlas explains, one of ordinary skill “looking to implement the Le-Kvaløy system to achieve Le’s stated objective of recording an audio clip of a conversation would have been motivated to use the signal from the inner microphone to record the user’s voice and the signal from the outer microphone, which picks up external sounds/ambient sound, to record the voice of the person to whom the user was speaking.” *Id.* Patent Owner’s argument considers Le in isolation and does not specifically respond to the argument and evidence provided by Petitioner.

Consequently, we find that this limitation would have been obvious over the Le-Kvaløy combination.

h) 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-Kvaløy combination.

5. Analysis of Dependent Claim 2

- a) 2: “[t]he headset of claim 1, wherein the event is a touching of the headset, a recognizing of a voice command, a starting or ending of a phone call, or a scheduled time.”*

Petitioner argues that Le in combination with Kvaløy discloses or suggests this limitation for the same reasons as discussed previously for limitation 1[e][ii]. Pet. 32 (citing Ex. 1002 ¶ 162).

Patent Owner does not provide separate argument for claim 2, and instead relies on its argument for claim 1. PO Resp. 35.

Based on the full trial record, we agree with Petitioner’s arguments, and find that Petitioner has proven by a preponderance of the evidence that claim 2 would have been obvious over the combination of Le and Kvaløy.

6. *Analysis of Dependent Claim 6*

- a) 6: “[t]he headset of claim 1, wherein the processor saves a last two minutes of the recent portion, and audibly presents the last two minutes responsive to a user request, wherein the recent portion is at least one [sic] a conversation, a voice mail, or an audio recording.”

Petitioner argues that Le “discloses a ‘set up procedure’ that allows the user to select the period of time for the voice clip, for example, 10 seconds, 20 seconds, one minute, etc.” Pet. 33 (citing Ex. 1005 ¶ 38). Petitioner asserts that one of ordinary skill “would have understood Le to disclose or suggest that the size of the scrolling buffer and the duration of the audio clip are customizable design choices including two minutes if desired.” *Id.* (citing Ex. 1002 ¶ 165). According to Petitioner, one of ordinary skill “would have understood that the size of the buffer and duration of the saved clip will depend on the circumstances, and that selecting a buffer large enough to record a two minute duration would have been trivial to do, and would have had no critical or unexpected benefits.” *Id.*

Petitioner argues that Le also discloses “recalling saved audio information from the wearable computer system, including where ‘voice commands may prompt the replay of audible information to the speaker 32 in the earpiece 30.’” Pet. 34 (citing Ex. 1005 ¶ 21). “Accordingly,” Petitioner asserts, one of ordinary skill “would have understood that the Le-Kvaløy system discloses or suggests that the processor may recall a previously stored audio clip for replay (‘audibly presents the last two

minutes responsive to a user request.’).” *Id.* (citing Ex. 1002 ¶ 170). “For example,” according to Petitioner, “Le discloses that the saved audio clip may be of a conversation.” *Id.* (citing Ex. 1005 ¶ 35). “Accordingly,” Petitioner contends, one of ordinary skill “would have understood the Le-Kvaløy system to disclose or suggest storing an audio clip of a conversation (‘wherein the recent portion is at least one a conversation, . . . or an audio recording.’).” *Id.* at 34–35 (citing Ex. 1002 ¶ 173).

Patent Owner does not provide separate argument for claim 6, and instead relies on its argument for claim 1. PO Resp. 35.

Based on the full trial record, we agree with Petitioner’s arguments, and find that Petitioner has proven by a preponderance of the evidence that claim 6 would have been obvious over the combination of Le and Kvaløy.

7. Analysis of Dependent Claim 7

a) 7: “[t]he headset of claim 1, wherein at least one of the first internal sound or the second internal sound is an ambient sound, speech, or audio content.”

Petitioner argues that, as discussed with respect to claim limitation 1[c], one of ordinary skill “would have understood the Le-Kvaløy system to disclose or suggest continuously storing in a scrolling buffer an audio recording of a conversation, including audio data from an outer microphone and audio data from an inner microphone,” and that “the inner microphone would have been used to pick up the user’s speech for purposes of recording the conversation.” Pet. 35 (citing Ex. 1002 ¶¶ 175–176). “Thus,” Petitioner contends, one of ordinary skill “would have understood that the Le-Kvaløy system discloses or suggests recording and saving the user’s speech as picked up by the inner microphone (‘wherein at least one of the first internal

sound or the second internal sound is . . . speech, or audio content.’)” *Id.* (citing Ex. 1002 ¶ 177) (alteration in original).

Patent Owner does not provide separate argument for claim 7, and instead relies on its argument for claim 1. PO Resp. 35.

Based on the full trial record, we agree with Petitioner’s arguments, and find that Petitioner has proven by a preponderance of the evidence that claim 7 would have been obvious over the combination of Le and Kvaløy.

8. *Dependent Claim 9*

- a) *“The headset of claim 1, wherein the processor binaurally records the first ambient sound, the second ambient sound, the first internal sound and the second internal sound from the left earpiece and the right earpiece, respectively.”*

Petitioner argues that Le in combination with Kvaløy discloses or suggests this claim. Pet. 35 (citing Ex. 1002 ¶¶ 178–191). Petitioner asserts that “Kvaløy discloses that its invention is applicable to ‘recording equipment,’ . . . and further discloses using two ear terminals for ‘binaural mode’ . . . and exchanging audio signals to and from other devices.” *Id.* at 35–36 (citing Ex. 1006, 1:28, 6:11–14). According to Petitioner, one of ordinary skill “would have understood Kvaløy to disclose or suggest using earpieces in a binaural mode when exchanging data with recording equipment,” and further understood Kvaløy to disclose or suggest “binaurally recording audio signals from the inner and outer microphones of the ear terminals.” *Id.* at 36 (citing Ex. 1002 ¶ 181).

At a minimum, Petitioner asserts, one of ordinary skill “would have been motivated to modify the Le-Kvaløy system to binaurally record audio signals from the inner and outer microphones of the ear terminals” in order

to achieve the advantages of binaural recording, such as “better realism on playback.” Pet. 36 (citing Ex. 1002 ¶¶ 182–187).

Patent Owner does not provide separate argument for claim 9, and instead relies on its argument for claim 1. PO Resp. 35.

Based on the full trial record, we agree with Petitioner’s arguments, and find that Petitioner has proven by a preponderance of the evidence that claim 9 would have been obvious over the combination of Le and Kvaløy.

E. Ground 2: Asserted Obviousness of Claims 4 and 5 Based on Le in view of Kvaløy and Fiedler

Petitioner contends that claims 4 and 5 would have been obvious over Le in view of Kvaløy and Fiedler. Pet. 37–43. Patent Owner disagrees. PO Resp. 36–41.

1. Overview of Fiedler (Ex. 1009)

Fiedler is directed to “event-activated recording.” Ex. 1009, code (57). Fiedler states that its system “enables users effectively to record words that have already been spoken, or events that have already taken place, prior to the time that a user decides to record them.” *Id.* at 2:35–44. According to Fiedler, this is achieved by “recording events on a finite extent of recording medium in a continuous logical loop” and “playing back and/or permanently preserving (capturing) portions of the recorded data as selected by the user.” *Id.* at 2:38–44. Fiedler further discloses that “[c]ompression algorithms may be employed concurrently with recording the sound . . . and/or on captured data in permanent storage, in order to maximize both the capture interval and the total recording time capacity of the device.” *Id.* at 7:42–46, 7:47–51.

2. *Analysis of Dependent Claim 4*

a) 4[a]: “[t]he headset of claim 1, wherein the memory comprises: a data buffer to temporarily capture the at least one of the first ambient sound or the second ambient sound and the at least one of the first internal sound or the second internal sound; and”

[b]: “a storage memory to save from the data buffer the recent portion of the at least one of the first ambient sound or the second ambient sound and the at least one of the first internal sound or the second internal sound in a compressed data format responsive to a directive by the processor.”

Petitioner argues that Le in combination with Kvaløy discloses or suggests the limitations of claim 4. Pet. 37–40. Petitioner asserts that, as described above with respect to limitation 1[c], the Le-Kvaløy combination discloses or suggests storing an audio recording of a conversation in a scrolling buffer, including audio signals from an outer microphone from the left and/or right earpiece and an audio signal from an inner microphone in the left and/or right earpiece. *Id.* According to Petitioner, Le also “discloses discarding the recorded audio after a period of time ‘if the user has not issued a predetermined command to store the information for later retrieval.’” *Id.* (citing Ex. 1005 ¶ 28).

Petitioner also argues that one of ordinary skill “would have been motivated to further modify the Le-Kvaløy system to apply Fiedler’s teachings related to the use of compression algorithms and would have had a reasonable expectation of success in doing so.” Pet. 39 (citing Ex. 1002 ¶¶ 203–207). Petitioner asserts that “Fiedler discloses that compression algorithms are used ‘to maximize both the capture interval and the total recording time capacity of the device,’” and one of ordinary skill “would have recognized Fiedler’s compression algorithms could be used in the same

way in the Le-Kvaløy system to compress audio signals received prior to storing those signals in Le's memory." *Id.* (citing Ex. 1009, 7:42–46; Ex. 1002 ¶ 204).

Patent Owner argues that “Le only stores data from the environmental microphone 38 to storage memory while storing the personal microphone data to [a] temporary buffer to detect and analyze the user’s voice.” PO Resp. 39 (citing Ex. 2006 ¶ 108). Thus, Patent Owner asserts, “Le stores only one signal from one microphone to storage memory.” *Id.* (citing Ex. 2006 ¶ 109). According to Patent Owner, “Kvaløy stores data only in a buffer to analyze the user’s voice, or to compare the ASM and ECM signals for voice detection,” and “does not disclose capturing audio data in memory-type storage for long-term retention.” *Id.* (citing Ex. 2006 ¶ 110). And, Patent Owner contends, “Fiedler stores one audio source’s data in acquisition buffers and then possibly in storage memory,” and thus, at most, “stores only one microphone’s data to storage memory.” *Id.* at 40 (citing Ex. 2006 ¶ 111). Accordingly, Patent Owner argues, “[e]ven if all the references could be combined, the combination would at most disclose or suggest one microphone’s data be stored in storage memory.” *Id.*

Patent Owner also argues that the proposed Le-Kvaløy-Fiedler combination “is not sufficiently defined” because Petitioner “propose[s] modifying the combination to store audio recordings from two inner microphones and two outer microphones,” but “fail[s] to explain what the resulting specific prior art combination would be that would result in this outcome.” PO Resp. 36. For example, Patent Owner asserts, “Petitioner[] fail[s] to describe whether all four microphones contribute to a single audio recording, or whether each microphone generates a single audio recording so

that the system memory contains four recordings of the same event,” and how to process these signals in either case. *Id.* at 37. Patent Owner also contends that “Fiedler too contemplates a single source input at any time,” and fails to “disclose how to process and combine multiple audio recordings.” *Id.* (citing Ex. 1009, 4:11–20).

Petitioner responds that it “described the base Le-Kvaløy combination in detail in the Petition, including why it would have been obvious to record the user’s speech with Kvaløy’s inner microphone, and to record the other person with Kvaløy’s outer microphone.” Pet. Reply 24 (citing Pet. 21–23, 26–28, 31; Ex. 1002 ¶¶ 109–117, 132–141, 157–161). Petitioner argues that it “also described how Kvaløy’s left and right ear terminal would meet the ‘left earpiece’ and ‘right earpiece’ limitations of claim 1.” *Id.* at 24–25 (citing Pet. 24–26; Ex. 1002 ¶¶ 119–131). Petitioner further contends that Patent Owner’s vagueness argument “amounts to nothing more than implementation details, such as whether all four microphones contribute to a single audio recording (which is not claimed),” and that it “need not spell out every detail of a physically combined, operative device.” *Id.* at 25 (citing PO Resp. 37; *Apple, Inc. v. GUI Glob. Prods., Ltd., D/B/A GWEE*, IPR2021-00470, Paper 38 (PTAB Aug. 11, 2022) (“*GUI Glob.*”). Additionally, according to Petitioner, “[t]he ’591 patent describes the binaural recording feature using block diagrams and black box circuitry,” and Patent Owner does not “dispute that binaural recording was well-known by February 2007.” *Id.* at 25 (Ex. 1001, 8:44–51, Fig. 4; Pet. 36; Ex. 1002 ¶¶ 183–187).

We agree with Petitioner. As explained above with respect to limitations 1[c] and 1[e][ii], Petitioner relies on Le for the disclosure of

“storing a recording of [a] conversation” in “a continuously scrolling audio buffer that is part of memory 18,” and that “[t]he personal microphone 36 and the environmental microphone 38 may be used, in combination, to input audio signals to the computer unit 15.” Pet. 26 (citing Ex. 1005 ¶¶ 10, 24, 28, 35, 37) (alterations in original). As also explained above for limitations 1[c] and 1[e][ii], we agree with Petitioner that it would have been obvious to implement the combined system such that Kvaløy’s inner microphone would record the portion of the conversation containing the user’s speech and Kvaløy’s outer microphone would record the portion of the conversation from the person to whom the user was speaking. *See id.* at 27–28, 31; Pet. Reply 23–24; Ex. 1005 ¶¶ 10, 24, 28, 35, 37; Ex. 1002 ¶¶ 137–139; § II.D.4(e), *supra*. Patent Owner’s argument that Le discloses storing only the signal from the environmental microphone to storage memory and Kvaløy does not disclose capturing audio data in storage for long-term retention improperly considers the references in isolation and does not specifically and fully respond to the argument and evidence provided by Petitioner, including the explanation and reasoning provided by Dr. Atlas.

We also find that Petitioner and Dr. Atlas have sufficiently defined the proposed combination given the scope of the claims, which do not describe the manner in which the microphone signals are processed and stored. *See* Pet. 18–32, 37–40; Ex. 1002 ¶¶ 93–161, 192–207; *GUI Glob.*, Paper 38 at 42 (rejecting argument that Petition was “hopelessly vague” because it did not discuss implementation details, as those “would not have been necessary for a [person of ordinary skill in the art] to have a reason for and to understand how to” combine the prior art references). Additionally, the ’591 patent does not supply the kind of specificity about how multiple

microphone signals are processed and stored that Patent Owner demands from the proposed combination, indicating that implementing such details would have been within the level of ordinary skill. *See* Ex. 1001; *Cywee*, Paper 90 at 38–39; *In re Epstein*, 32 F.3d at 1568.

Accordingly, based on the full trial record, we find that Petitioner has proven by a preponderance of the evidence that claim 4 would have been obvious in view of Le, Kvaløy, and Fiedler.

3. *Analysis of Dependent Claim 5*

- a) 5: *“The headset of claim 4, wherein the data buffer is a circular buffer that temporarily stores the at least one of the first ambient sound or the second ambient sound and the at least one of the first internal sound or the second internal sound at a current time point to a previous time point.”*

Petitioner argues that “Le discloses a ‘continuously scrolling audio buffer’ that ‘continuously records ambient audio, and saves it for some predetermined period of time, such as 30 seconds or one minute.’” Pet. 40. Petitioner asserts that one of ordinary skill “would have understood Le’s 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 41 (citing Ex. 1002 ¶ 213). “In addition,” according to Petitioner, one of ordinary skill “would have understood Le’s disclosure that the continuously scrolling buffer retains audio information ‘for some predetermined period of time, such as 30 seconds or one minute’” to mean that “the data is stored from a current time backwards for a predetermined period of time, such as 30 seconds or one minute.” *Id.* at 42 (citing Ex. 1002 ¶¶ 220–221).

Patent Owner argues that, as previously discussed for claim 1[e][ii], Le discloses capturing and storing ambient audio via the environmental microphone 38, but does not disclose capturing and storing user voice commands or internal sounds from via the personal microphone 36 in a scrolling buffer. PO Resp. 40 (citing Ex. 1005 ¶¶ 10, 28, 38, claims 23, 29; Ex. 2006 ¶ 115). As a result, Patent Owner contends, the proposed combination “fails to show (1) the data buffer is a circular buffer, and (2) that both ambient sound and internal sound are stored in a circular buffer.” *Id.* (citing Ex. 2006 ¶ 116).

Based on the full trial record, we agree with Petitioner’s arguments, and find that claim 5 would have been obvious over the Le-Kvaløy-Fiedler combination. Patent Owner’s arguments for claim 5 retread arguments made for claims 1[c], 1[e][ii], and 4, and we disagree with them for the reasons discussed above in the sections addressing those claim limitations. *See supra* §§ II.D.4(e), II.D.4(g), II.E.3.

Consequently we find that Petitioner has proven by a preponderance of the evidence that claim 5 would have been obvious over the combination of Le, Kvaløy, and Fiedler.

F. Ground 3A: Asserted Obviousness of Claims 3 and 11–13 Based on Le in view of Kvaløy and Johnson

Petitioner contends that claims 3 and 11–13 would have been obvious over Le in view of Kvaløy and Johnson. Pet. 35–43. Patent Owner disagrees. PO Resp. 35–43.

1. Overview of Johnson (Ex. 1008)

Johnson relates to the “capture and recording of unpredictable realtime events.” Ex. 1008, 1:10–11. More specifically, Johnson describes

a “device that record[s] actual sound or video footage of the few seconds just before and/or after an unexpected event, such as a collision.” *Id.* at 2:9–13. The “recording device may be advantageously triggered by the event itself, and create an audio recording of some desired window of time surrounding the event.” *Id.* at 2:37–39. Johnson explains that, in a preferred embodiment, “accelerometers are used in the apparatus which is installed in a motor vehicle such that a collision involving the vehicle is the triggering event.” *Id.* at 3:25–27. “The output of the accelerometer” is “input into [a] comparator and when it exceeds the value of the adjustable voltage source, a digital trigger is sent to the microprocessor to indicate a collision.” *Id.* at 6:29–33. The device “uses a small circular buffer or memory,” and “once an accident is detected by the accelerometer, multiple frames of data immediately before and immediately after the accident are recorded.” *Id.* at 6:42–46.

2. *Analysis of Dependent Claim 3*

- a) *“The headset of claim 1, wherein the processor triggers the event responsive to detecting an abrupt movement of the headset, or a change in location of the headset.”*

Petitioner argues that Le in combination with Kvaløy and Johnson discloses or suggests this limitation. Pet. 43 (citing Ex. 1002 ¶¶ 223–239). Petitioner asserts that one of ordinary skill would have understood that Johnson’s teachings are applicable to Le because both “disclose or suggest storing audio data detected by a microphone in a circular buffer until a triggering event occurs, at which time the contents of the buffer from before the event are saved for later recall.” *Id.* at 44 (citing Ex. 1008, 2:9–12, 2:33–47, 8:23–29; Ex. 1005 ¶¶ 10, 28, 37–38).

According to Petitioner, one of ordinary skill “would have understood that Johnson’s teachings would improve Le’s system” because “there are times, such as in emergencies like a car accident[,], that a user of the Le-Kvaløy system would predictably encounter, when the user may not have the ability to trigger the recording by voice command (e.g., because they are unconscious).” Pet. 44 (citing Ex. 1002 ¶ 234). Thus, Petitioner asserts, it would have been obvious “to have a mechanism to automatically record audio clips based on, for example, abrupt motion indicative of a car accident.” *Id.* at 44–45 (citing Ex. 1002 ¶ 234). Petitioner also contends that one of ordinary skill would have been motivated to implement Johnson’s teachings “such that the triggering event was an abrupt movement of *the headset*” because “the user’s headset would experience the same or similar shock or abrupt movement that a vehicle would in the event of an accident.” *Id.* at 45 (citing Ex. 1002 ¶ 235).

Patent Owner argues that “Johnson discloses a camera with an accelerometer for installation in a vehicle” which “provides acceleration measurements on the order of vehicle collisions.” PO Resp. 42 (citing Ex. 1008, 3:25–27, 6:18–21, Figs. 1, 2). Patent Owner asserts that Petitioner “fail[s] to explain how an accelerometer used in a vehicle would be properly configured to detect an abrupt movement or a change in location of a headset.” *Id.*; see PO Sur-reply at 14–15. “Indeed,” according to Patent Owner, “the accelerations used for a headset, such as for an abrupt movement (e.g., tapping the earpiece) are lower than in a vehicle collision,” and the “force measurements would be below the threshold of the Johnson system” because “[f]orces on a car in the event of an accident would be much higher than forces associated with headset movement.” PO Resp. 42–

43 (citing Ex. 2006 ¶¶ 119, 122). Moreover, Patent Owner argues, “detection of movement of a headset typically requires use of a 3-axis or three independent accelerometers (X, Y and Z axes) with low noise and high dynamic range.” *Id.* at 44 (citing Ex. 2006 ¶ 124). Thus, Patent Owner contends, “Johnson does not teach or suggest measuring and processing the small complex accelerations associated with headset movements during normal operation.” *Id.* at 43 (citing Ex. 2006 ¶ 122).

Petitioner responds that does not argue “that the combination required implementing a ‘vehicle-based accelerometer’ into a headset,” but rather that one of ordinary skill “would have readily understood how to implement Johnson’s *teachings* relating to collision detection using an inertial sensor such as an accelerometer in a headset.” Pet. Reply 26 (citing Pet. 45; Ex. 1002 ¶¶ 236, 237). According to Petitioner, Dr. Atlas “confirmed at deposition that such sensors could be constructed ‘very small’ for use in a headset,” and that this was not disputed by Mr. Anagnos. *Id.* at 26–27 (citing Ex. 2007, 222:15–223:23). Petitioner further contends that “abrupt movements” are not limited to “tapping the earpiece,” and include movements resulting from a car accident, which “tracks how the ’591 patent describes using abrupt movement detection to provide a black box recorder in an accident.” *Id.* at 27 (citing Ex. 1035, 35:16–20, 37:10–16; Ex. 1001, 7:16–23). Additionally, Petitioner argues that the claim does not require a “low noise and high dynamic range” accelerometer, and that the ’591 patent discusses the feature recited in claim 3 “in block diagrams and functional terms without implementation detail.” *Id.* at 27–28 (citing Ex. 1001, 10:46–55; Fig. 8).

We find that Petitioner has not sufficiently proven that it would have been obvious to combine the Le-Kvaløy headset with Johnson’s motor vehicle-based accelerometer. Johnson explains that its preferred embodiment uses accelerometers “installed in a motor vehicle such that a collision involving the vehicle” is “the triggering event.” Ex. 1008, 3:25–27. Johnson describes its vehicle-based accelerometer for detecting collisions as follows:

In the embodiment of Figure 1 an accelerometer 16 is connected to the threshold detection circuitry 21 ***in order to determine when sufficient force has occurred to indicate a collision.*** An accelerometer is an electromechanical device that outputs a signal which corresponds to the level of shock or force that is exerted on it. . . . The output of the accelerometer is also input into a comparator and when it exceeds the value of the adjustable voltage source, ***a digital trigger is sent to the microprocessor to indicate a collision.***

Id. at 6:18–33 (emphasis added).

Johnson’s accelerometer embodiment has a significantly different design and purpose than Le and Kvaløy—Johnson discloses an accelerometer installed in a motor vehicle to detect collisions, while Le-Kvaløy concern an earpiece used to receive audio, communicate with another person, and record information in response to voice commands or key phrases. In view of their different design and purpose, Petitioner has not provided a sufficient basis for why one of ordinary skill would have looked to Johnson’s vehicle accelerometer for detecting collisions when designing a headset like the one of Le-Kvaløy, or why such a person would have been motivated to incorporate Johnson’s vehicle accelerometer, or a device like it, into the Le-Kvaløy headset.

We also find credible the testimony of Mr. Anagnos explaining the significant differences that would exist between the Johnson vehicle accelerometer for detecting collisions and the use of an accelerometer in a communications headset. Ex. 2006 ¶¶ 117–131. Specifically, we credit Mr. Anagnos’s testimony that the accelerations involved in an abrupt movement of a headset “are much lower than in a vehicle collision,” and that a vehicle accelerometer, like that of Johnson, “would have great difficulty distinguishing between target events and normal, everyday head movement or music content.” *Id.* ¶¶ 119–120, 122. We also credit Mr. Anagnos’s testimony that “the difference between normal operating conditions and ‘abrupt movements’ is much less for a headset than the huge differences inherent between a vehicle collision and normal conditions within the vehicle,” and that “detection of a movement of a headset typically requires use of a 3-axis or three independent accelerometers (X, Y and Z axes) with low noise and high dynamic range.” *Id.* ¶¶ 120, 124. Thus, we agree with Mr. Anagnos that the vehicle accelerometer and a headset accelerometer “are so radically different in their static and dynamic conditions,” that one of ordinary skill “would understand the necessity of designing each system separately from the ground up” and “would not be motivated to combine Johnson with Le and/or Kvaløy.” *Id.* ¶ 125; *see id.* ¶ 121.

We have considered the testimony of Dr. Atlas that one of ordinary skill would have been motivated to combine Johnson’s accelerometer with the headset/earpieces of Le-Kvaløy, but do not find it persuasive. Ex. 1002 ¶¶ 223–239. First, we are not persuaded by Dr. Atlas’s testimony that Johnson and Le “disclose or suggest similar systems” because they both store audio data from a microphone in a circular buffer and save the contents

of the buffer when a triggering event occurs. *Id.* ¶ 233. Although the use of triggering and a circular buffer are similar between the systems, Johnson's accelerometer has a significantly different environment and purpose because it is installed in a motor vehicle (rather than a headset) and used for detecting collisions (rather than communicating with others, listening to content, and recording sounds in response to voice commands or key phrases).

Specifically, Dr. Atlas testifies as follows:

A person having ordinary skill in the art would have understood that Johnson's teachings would improve Le's system because there are times, such as in emergencies like a car accident that a user of the Le-Kvaløy system would predictably encounter, when the user may not have the ability to trigger the recording by voice command (for example, because the user lost consciousness or otherwise is not thinking about recording audio in the heat of the moment). Thus, a person hav[ing] ordinary skill in the art would have recognized that it would be advantageous to have a mechanism to automatically record audio clips based on, for example, abrupt motion indicative of a car accident. . . .

[A] person having ordinary skill in the art . . . would have understood that the same benefits described by Johnson would be realized by implementing Johnson's teachings in the headset because, for example, a person having ordinary skill in the art would have understood that the user's headset would experience the same or similar shock or abrupt movement that a vehicle would in the event of an accident.

Ex. 1002 ¶¶ 234, 235.

As Mr. Anagnos testifies in the portions cited previously, however, the kind of movements and shocks experienced by a headset are very different than those that would be experienced by an accelerometer installed in a motor vehicle, and adapting Johnson's motor vehicle based

accelerometer for use in a headset would have required a significant redesign. *See* Ex. 2006 ¶¶ 119–125. Although Dr. Atlas contends that such a redesign would have been “predictable,” he does not provide any detail on what it would entail or how one of ordinary skill would go about it. Ex. 1002 ¶¶ 223–239. Dr. Atlas relies on a patent to Boesen⁹ as “disclos[ing] an earpiece with an accelerometer to detect movement of the headset,” but Boesen is not part of the ground. *Id.* ¶ 236. In any event, Boesen discloses an accelerometer (in the form of an “inertial sensor”) for a different purpose than Johnson, namely for “wak[ing] a user up who is wearing the earpiece who, while driving, begins to nod off” by “detect[ing] a positional change.” Ex. 1019, 1:45–62; *see id.* at 2:44–49. Specifically, Boesen’s accelerometer “distinguish[es] between the movement of a user[’]s head when the user is falling asleep,” which may involve oscillation and side-to-side movements, with “the movement of a user[’]s head when the user is consciously controlling the movement of their head.” *Id.* at 2:44–49. Dr. Atlas does not explain how Boesen’s accelerometer for detecting when a user has fallen asleep would motivate one of ordinary skill to adapt Johnson’s motor vehicle accelerometer for detecting collisions for use in a headset, or provide guidance on how such a redesign can be performed. *See* Ex. 1002 ¶¶ 233–236.

Dr. Atlas also argues that the predictability of “implementing an accelerometer to detect abrupt motion of the headset” is “underscored by the fact that the ’591 patent describes no technical challenges that were overcome to implement an accelerometer within the headset, nor does it describe any unexpected benefits attributable from implementing an

⁹ US 7,209,569 B2 to Boesen (Ex. 1019, “Boesen”).

accelerometer within the headset that were not already disclosed or suggested by Johnson.” Ex. 1002 ¶ 237. Even if one of ordinary skill would have had the ability to implement an accelerometer in a headset with proper direction, the ’591 patent itself legally cannot provide the motivation required to adapt Johnson’s headset for the different use and environment that would be required in the Le-Kvaløy system. Relying on the ’591 patent for this purpose would be impermissible hindsight.

Consequently, we find that Petitioner has failed to prove by a preponderance of the evidence that claim 3 would have been obvious over the Le-Kvaløy-Johnson combination.

3. Analysis of Independent Claim 11

Independent claim 11 recites as follows:

- 11. [preamble] An earpiece, comprising:
 - [a] an Ambient Sound Microphone (ASM) configured to capture ambient sound;
 - [b] an Ear Canal Microphone (ECM) configured to capture internal sound in an ear canal;
 - [c] a memory; and
 - [d][i] a processor operatively coupled to the ASM, the ECM and the memory,
 - [d][ii] where the processor is configured to save a portion of at least one of the captured ambient sound and the captured internal sound in response to an event,
 - [d][iii] wherein the event is a detected sound signature within the ambient sound.

Ex. 1001, 14:16–27 (bracketed paragraph identifiers added).

For independent claim 11, Petitioner largely relies on the arguments it made for claim 1, with the exception of the requirement in limitation 11[d][iii] that the “event” in response to which the processor saves a portion

of at least one of the captured ambient sound and the captured internal sound “is a detected sound signature within the ambient sound.” Pet. 46–52.

Petitioner argues that one of ordinary skill “would have considered it obvious to further modify the Le-Kvaløy system to trigger storage of audio clips based on sound signatures within the ambient sound in view of Johnson.” Pet. 50 (citing Ex. 1002 ¶¶ 258–266). Petitioner asserts that Johnson teaches that events that are difficult to record in real time include, for example, “a robbery or other crime event, a sudden comment or statement of someone nearby, a gunshot, an explosion, low flying aircraft, an excessively loud automobile, and so forth.” *Id.* (citing Ex. 1008, 1:22–28). Petitioner contends that one of ordinary skill would have understood Johnson to teach recording in response to one of these types of events, and that these events all involve “specific sound signatures within the ambient environment.” *Id.* at 50–51 (citing Ex. 1002 ¶ 262). According to Petitioner, one of ordinary skill would have been motivated to combine Johnson’s teaching that it would be advantageous to trigger recording based on the event itself, and that this would be particularly advantage in situations where the user may not have the ability to issue a voice command. *Id.* at 51–52 (citing Ex. 1002 ¶ 264).

Patent Owner relies on its arguments for claims 1 and 3 for claim 11. PO Resp. 48. Patent Owner contends that one of ordinary skill “would not have been motivated to combine Le and Kvaløy because they are designed to serve different purposes and the specific disclosures of circuitry and operation are inconsistent between the two references,” and “[t]he addition of Johnson does not resolve the problems found in the proposed Le-Kvaløy combination.” *Id.*

We find that Petitioner has sufficiently proven that claim 11 would have been obvious over the proposed combination. For the preamble and limitations 11[a]–11[d][ii], we rely on the analysis provided above with respect to claim 1. *See* § II.D.4, *supra*.

With respect to limitation 11[d][iii], we agree with Petitioner that it would have been obvious based on the proposed combination for the event to be “a detected sound signature within the ambient sound.” Le discloses that voice commands may be used to trigger storage of audio content that was recorded in the continuously scrolling buffer before the voice command into a memory for later recall. *See* Ex. 1005 ¶¶ 10 (“In various implementations, the audio information stored for later retrieval may have been received just prior to receipt of the voice command, . . . , or during a period of time occurring both before and after receipt of the voice command.”); 37 (“The previously described audio buffer may be employed to store a clip audio data before the natural voice command is spoken, so the sound clip may include some audio data of the words spoken before the natural voice command was actually spoken. . . . In other contexts, it may be desirable to record . . . a combination of audio information received before and after the voice command is issued.”); 28 (“This allows the user to store audio clips just before . . . the user issues a predetermined voice command, as will be described in more detail later.”); 38 (“In addition, during this set-up procedure, the user may be prompted for additional information, such as the timing of the voice clip in relation to the issuance of the voice command the voice clip will be taken (for example, before the voice command . . . or a combination of both before and after the voice command).”).

Johnson discloses “capture and recording of unpredictable realtime events,” such as “a robbery or other crime event, a sudden comment or statement of someone nearby, a gunshot, an explosion, low flying aircraft, an excessively noisy automobile, and so forth.” Ex. 1008, 1:10–11, 1:22–28. Johnson explains that “[t]here are also many times when it would be desirable to have sudden or unexpected aural events or information recorded for immediate replay,” such as “a paging announcement, names, telephone numbers, instructions, verbal agreements or other messages.” *Id.* at 2:22–32. We find credible Dr. Atlas’s testimony that “[a] person having ordinary skill in the art would understand that each of the examples of sounds identified by Johnson are specific sound signatures within the ambient environment.” Ex. 1002 ¶ 262.

We also credit Dr. Atlas’s testimony that one of ordinary skill “would have been motivated to combine Johnson’s teachings” concerning using specific sounds or words as a recording trigger with Le-Kvaløy because they “would have understood that there are circumstances that a user of the Le-Kvaløy system would predictably encounter in which the user would want to record unexpected aural or other events in the environment but would not have the ability to trigger the recording by voice command,” such as “when the user is incapacitated during a car accident or engaged in an adversarial encounter with another person (such as a robbery or gunfight).” Ex. 1002 ¶ 263. Dr. Atlas explains that one of ordinary skill “would have thus recognized that it would be advantageous to have a mechanism to automatically record audio clips based on, for example, the sound of a collision or specific utterances made by other people in the user’s vicinity, when a user would predictably be unable to provide a voice command.” *Id.*

Thus, although we do not find that Petitioner has sufficiently proven that it would have been obvious to combine Johnson’s vehicle-based accelerometer with the Le-Kvaløy headpiece for purposes of claim 3, we do find that Petitioner has sufficiently proven that it would have been obvious to combine Johnson’s teachings on using specific sounds and words to trigger recording for purposes of claim 11, because Johnson’s disclosures of using specific sounds and words to trigger recording is similar to and would complement Le-Kvaløy’s ability to use voice commands to trigger recording, and implementing such a feature would have been within the level of ordinary skill. *See* Ex. 1002 ¶¶ 262–266.

Consequently, we find that Petitioner has proven by a preponderance of the evidence that claim 11 would have been obvious over the combination of Le, Kvaløy, and Johnson.

4. *Analysis of Dependent Claim 12*

- a) *“The earpiece of claim 11, wherein the processor monitors the ambient sound for a Sound Pressure Level (SPL) change event, and in response to detecting the SPL, change event commits saves [sic] a portion of the ambient sound to the memory.”*

Petitioner argues that Le in combination with Kvaløy and Johnson discloses or suggests claim 12. Pet. 52 (citing Ex. 1002 ¶¶ 267–272). Petitioner asserts that “Johnson teaches triggering recording in response to a ‘sudden loud noise,’” and one of ordinary skill “would have understood that Johnson’s description of a ‘sudden loud noise’ corresponds to a sudden, relatively high sound pressure level (SPL) as received by a microphone.” *Id.* at 53 (citing Ex. 1008, 3:28–30, 10:32; Ex. 1002 ¶ 270). According to Petitioner, one of ordinary skill would also “have understood that to detect a ‘sudden loud noise,’ the system would necessarily need to compare the

sound pressure level at a point in time to a prior point in time or a threshold level so as to detect a change in SPL.” *Id.* (citing Ex. 1002 ¶ 270). Thus, Petitioner argues, one of ordinary skill “would have understood Johnson to disclose or suggest that a sudden loud noise, i.e., a change in SPL as detected by a microphone, triggers saving of an audio clip.” *Id.*

Patent Owner argues that “the Le-Kvaløy system would only record environmental sounds using a triggering event generated by the inner microphone,” but claim 12 requires “the triggering event to originate from the ambient sound.” PO Resp. 49 (citing Ex. 2006 ¶ 140). Patent Owner asserts that “[t]he Le-Kvaløy combination has no mechanism to trigger recording of ambient sound signals using the ambient sound as a triggering mechanism,” because the voice commands for triggering are picked up by Kvaløy’s “inner microphone M2” which “is sealed inside the ear canal.” *Id.* According to Patent Owner, “Petitioner[] do[es] not explain how a microphone sealed inside the ear canal of the user could be used to trigger recording of an external event.” *Id.* And, Patent Owner contends, “[a]dding Johnson’s detection of a ‘sudden loud noise’ would not remedy this deficiency and is ‘vague.’” *Id.* at 45–46, 49. Finally, Patent Owner argues that “detection of a ‘sudden loud noise’ typically requires advanced spectral processing to determine whether the amplitude of a specific frequency content or range matches a known profile,” and “[t]he Le-Kvaløy system discloses no capability for spectral processing.” *Id.* at 45–46.

Petitioner responds that the Petition was clear that “in the proposed Le-Kvaløy-Johnson combination, the outer microphone of Kvaløy would be used to capture ambient sound.” Pet. Reply 29 (citing Pet. 18–23, 24, 46). Petitioner also argues that Mr. “Anagnos’s argument that sudden loud noise

detection “typically requires advanced spectral processing to determine whether the amplitude of a specific frequency content or range matches a known profile” is “*ipse dixit*,” and that Johnson’s disclosure of such detection “is presumed enabling.” *Id.* at 30–31. Additionally, Petitioner contends that the claim merely requires a “Sound Pressure Level (SPL) change event,” and is not limited to detecting any particular sound or type of noise. *Id.* at 31.

We find that Petitioner has sufficiently proven that the Le-Kvaløy-Johnson combination teaches this limitation. As explained above with respect to claim 11, we find that the combination teaches using a detected sound signature as the event that triggers the saving of a captured sound. *See* § II.F.3, *supra*. Johnson discloses that “a sudden loud noise indicative of a collision involving a vehicle” may be “the triggering event,” and Johnson’s claim 16 states that an “event detection mechanism is configured to detect . . . a loud noise.” Ex. 1008, 3:28–30, claim 6; *see* Ex. 1002 ¶ 268. We agree with and find credible Dr. Atlas’s testimony that one of ordinary skill “would have understood that Johnson’s description of a ‘sudden loud noise’ corresponds to a sudden, relatively high sound pressure level (SPL) as received by a microphone,” and “would have understood that microphones measure sound pressure, not ‘loudness’ directly.” Ex. 1002 ¶¶ 269–270.

We disagree with Patent Owner’s argument that the Le-Kvaløy combination uses the inner microphone to pick up triggering events and thus has no mechanism for using triggering events originating from the ambient environment. *See* PO Resp. 49. In Petitioner’s proposed combination, Kvaløy’s outer microphone captures ambient sound, and therefore would be used to capture ambient sounds used as a triggering event. Pet. 21–22, 49–

54; Pet. Reply 29. We also disagree with Patent Owner’s argument that what constitutes a “sudden loud noise” is undefined. Petitioner identifies numerous disclosures in Johnson that describe using different types of noises as triggering events, including a “sudden loud noise” from an accident or gunshot, for example. Pet. 50 (citing Ex. 1008, 1:22–28), 53 (citing Ex. 1008, 3:28–30, 10:32). Finally, Johnson’s disclosure of using various types of sudden loud noises as triggering events is presumed enabling. *In re Antor Media*, 689 F.3d at 1288 (prior art printed publications are presumptively enabled); *Corephotonics*, 861 F. App’x at 450. Neither Patent Owner nor Mr. Anagnos explains what “advanced spectral processing” would be needed to detect a “sudden loud noise” as a triggering event, or why that processing would be beyond the level of ordinary skill. See PO Resp. 46; Ex. 2006 ¶ 131.

Consequently, we find that Petitioner has proven by a preponderance of the evidence that claim 12 would have been obvious over Le, Kvaløy, and Johnson.

5. *Analysis of Dependent Claim 13*

Claim 13 is dependent on claim 11 and further recites that “the portion saved is at least one of a conversation, a voice mail, or an audio recording.” Ex. 1001, 14:33–35.

Petitioner argues that, as discussed above, one of ordinary skill “would have understood the Le-Kvaløy-Johnson system to disclose or suggest a processor configured to save an audio recording of a conversation in response to a sound in the environment such as detecting a sudden comment or statement of someone nearby, a gunshot, an explosion, a name, or a telephone number.” Pet. 54 (citing Ex. 1002 ¶ 274). “Accordingly,”

Petitioner contends, one of ordinary skill “would have understood that the Le-Kvaløy-Johnson system discloses or suggests saving a portion of an audio recording of a conversation (‘wherein the portion saved is at least one of a conversation . . . or an audio recording.’)” *Id.* (citing Ex. 1002 ¶ 275) (alteration in original).

Patent Owner does not provide separate argument for claim 13, and instead relies on its argument for claim 11. PO Resp. 41–49.

Based on the full trial record, we agree with Petitioner’s arguments, and find that Petitioner has proven by a preponderance of the evidence that claim 13 would have been obvious over the combination of Le, Kvaløy, and Johnson.

G. Ground 3B: Asserted Obviousness of Claims 11–13 Based on Le in view of Kvaløy, Johnson, and Rast

Petitioner alternatively contends that claims 11–13 would have been obvious over Le in view of Kvaløy, Johnson, and Rast. Pet. 54–56. Petitioner argues that, “[t]o the extent [Patent Owner] argues that Johnson does not disclose or suggest ‘wherein the event is a detected sound signature within the ambient sound,’ this limitation would nevertheless have been obvious in view of the combination of Le-Kvaløy-Johnson and Rast.” *Id.* at 54–55 (citing Ex. 1002 ¶¶ 283–291).

Petitioner argues that “Rast discloses correlating sounds picked up by microphones in a headset with sound signatures for important ambient sounds,” such as “alarms, screams, horns, screeching brakes, phones ringing, spoken phrases (i.e. ‘Hey!’, ‘Hello,’ ‘Wearer's Name,’ ‘Help’).” Pet. 55 (citing Ex. 1011 ¶¶ 16, 21). According to Petitioner, Rast also discloses that “[i]f the external sound correlates with the programmed sound,” then “the mode of operation of the headphone is changed,” e.g., to pass through

ambient sound to the user. *Id.* (citing Ex. 1011 ¶¶ 12, 51). Petitioner argues that one of ordinary skill “would have recognized that Rast’s teachings related to sound signature detection could be used to implement Johnson’s teachings,” and “would have considered the combination obvious because it amounted to no more than the use of a known technique (Rast’s sound signature detection technique) to improve similar devices (the Le-Kvaløy-Johnson system which detect specific sounds) in the same way (to detect specific sounds using Rast’s sound signature detection technique).” *Id.* (citing Ex. 1002 ¶ 290).

Patent Owner argues that “Rast is incongruent with the proposed Le-Kvaløy-Johnson combination” because, as discussed with respect to Ground 3A, “the triggering event in the proposed Le-Kvaløy-Johnson combination must be detected by the inner microphone M2, not the external microphone M1, of Kvaløy.” PO Resp. 50. According to Patent Owner, Rast “only discloses an external microphone, and does not teach or suggest how to use an internal microphone which is sealed into the user’s ear canal to detect a triggering event.” *Id.* (citing Ex. 1011, Fig. 1, ¶ 49). “Thus,” Patent Owner contends, “the proposed Le-Kvaløy-Johnson combination would fail to analyze Rast’s sound signal for a triggering event.” *Id.* (citing Ex. 2006 ¶ 143).

We agree with Petitioner that Rast provides additional support for using sound signatures to detect particular sounds, such as “alarms, screams, horns, screeching brakes, phones ringing, [and] spoken phrases.” Ex. 1011 ¶¶ 16, 21. We also agree with and credit Dr. Atlas’s testimony that one of ordinary skill would have been motivated to combine Rast’s use of sound signatures with the detection of sounds for triggering events in the Le-

Kvaløy-Johnson combination. Ex. 1002 ¶¶ 290–291. As discussed previously with respect to claim 12, we also disagree with Patent Owner’s argument that the Le-Kvaløy combination uses the inner microphone rather than the ambient microphone to pick up triggering events, because Petitioner makes clear that its proposed combination uses Kvaløy’s outer microphone to capture ambient sound, and thus would use ambient sound captured using the outer microphone as the trigger. See § II.F.4, *supra*; Pet. 21–22, 49–54; Pet. Reply 29.

Consequently, we find that Petitioner has proven by a preponderance of the evidence that claims 11–13 would have been obvious based on the combination of Le, Kvaløy, Johnson, and Rast.

H. Ground 4A/4B: Asserted Obviousness of Claims 14–16 Based on Le in view of Kvaløy and Mayer (4A) or Le in view of Kvaløy (4B)

1. Analysis of Independent Claim 14

Independent claim 14 recites as follows:

11. [preamble] An earpiece, comprising:
 - [a] an Ambient Sound Microphone (ASM) configured to capture ambient sound;
 - [b] an Ear Canal Microphone (ECM) configured to capture internal sound in an ear canal;
 - [c] an Ear Canal Receiver (ECR) configured to deliver audio content to the ear canal;
 - [d] a memory; and
 - [e][i] a processor operatively coupled to the ASM, the ECM, the ECR, and the memory,
 - [e][ii] where the processor is configured to save a portion of at least one of the captured ambient sound and the captured internal sound in response to an event.

Ex. 1001, 14:35–48 (bracketed paragraph identifiers added). The arguments presented with respect to claim 14 in these grounds are similar to the arguments presented for Grounds 1 and 3 with a couple of exceptions, which will be discussed further below.

First, in Ground 4A, Petitioner adds Mayer to the Le-Kvaløy combination in the event that the Board does not “construe[] limitation 14[e][ii] disjunctively (i.e., so that it merely requires a process store one of the captured ambient sound, the captured internal sound, *or* the delivered audio content in response to an event).” Pet. 64. In the event of such an interpretation, Petitioner relies on Mayer to store both phone conversations and sounds in the environment. *Id.* at 60–62. Patent Owner does not appear to take a position on whether limitation 14[e][ii] should be construed disjunctively. *See* PO Resp. 50–53.

Limitation 14[e][ii] recites that “the processor is configured to save a portion of *at least one* of the captured ambient sound, the captured internal sound, and the delivered audio content in response to an event.” Because the claim language uses the phrase “at least one,” we interpret this language disjunctively to require that the processor need only be configured to save one of the recited items, i.e., the captured ambient sound, the captured internal sound, or the delivered audio content in response to an event. As a result, we determine that Petitioner has made a sufficient showing that limitation 14[e][ii] is met by showing that the Le-Kvaløy combination teaches recording audio from either the inner microphone or the outer microphone. Pet. 64–65. Therefore, we need not rely on the teachings of Mayer in order to find that this limitation is satisfied. *See Boston Scientific Scimed, Inc. v. Cook Gp. Inc.*, 809 F. App’x 984, 990 (Fed. Cir. 2020) (“We

agree that the Board need not address issues that are not necessary to the resolution of the proceeding.”).

Second, Petitioner argues that the Le-Kvaløy combination teaches limitation 14[c], which recites “an Ear Canal Receiver (ECR) configured to deliver audio content to the ear canal.” Pet. 57–58. For this limitation, Petitioner points to Kvaløy’s disclosure “that the ear terminal includes a sound generator SG that outputs to the user’s ear an ‘incoming communication signal.’” *Id.* at 57 (citing Ex. 1006, 3:41–43, 5:25–32, 6:19–31). According to Petitioner, one of ordinary skill “would have understood that Kvaløy’s disclosure of an ‘incoming communication signal’ encompasses an incoming communication signal from a cellular phone at least because Kvaløy discloses that its invention is applicable to ‘communication systems like radio transceivers, intercom systems, recording equipment, etc.’),” and “a cell phone is a ‘communication system’ with a ‘radio transceiver.’” *Id.* (citing Ex. 1006, 1:26–29).

Patent Owner argues that Kvaløy’s embodiment that uses “sound generator SG” requires “a blocking mechanism to address interference.” PO Resp. 51. According to Patent Owner, this blocking mechanism will operate “[w]hen the incoming communication signal is introduced in the same terminal as is used for voice activated control,” and “will prohibit or block the detection of the incoming communication signal as if it were the users own voice, during the periods of time when the incoming communication signal is active.” *Id.* (citing Ex. 1006, 5:33–36, 5:38–42). Patent Owner argues that Petitioner is silent “on whether the Le-Kvaløy combination would implement Kvaløy’s blocking function.” *Id.* “If the blocking function is not used,” Patent Owner asserts, “the combination would have no

way to distinguish between sounds generated by the sound generator SG on the one hand and the user's voice on the other hand," which "leads to the problems discussed" with respect to claim 1. *Id.* "If the blocking function of Kvaløy is used in the combination," according to Patent Owner, "the ear canal microphone would be blocked, resulting in the combination not operating properly to detect and react to a user's voice input." *Id.* at 52.

Based on the full trial record, we agree with Petitioner's arguments. As discussed previously with respect to Ground 1, we find that Petitioner has sufficiently proven that one of ordinary skill would have understood how to deal with any issues of feedback, echo, or ringing using feedback cancellation techniques that were known in the art, and would have been able to distinguish between user produced speech and externally generated noise. *See* § II.D.3, *supra*. Alternatively, this issue could have been addressed by using identical left and right earpieces with an internal speaker and microphone, but introducing sound via the sound generator in a different ear than the one used to pick up the user's voice via the ear canal microphone. *Id.*

Consequently, Petitioner has proven by a preponderance of the evidence that claim 14 would have been obvious based on the combination of Le and Kvaløy.

2. *Analysis of Dependent Claim 15*

- a) 15: "[t]he earpiece of claim 14, wherein the processor continually records a history of at least one of the captured ambient sound, captured internal sound, and the delivered audio content in the memory."

Petitioner argues that, as discussed with respect to claim limitations 1[c] and 1[e][ii], one of ordinary skill "would have understood that the Le-

Kvaløy system discloses or suggests a processor that triggers storage of an audio recording of a conversation in the scrolling buffer into a separate memory for later recall,” where “the audio recording includes a signal from the outer microphone (containing the speech of person to whom the user is speaking) and a signal from the inner microphone (containing the speech of the user) in response to receipt of a voice command.” Pet. 66. Petitioner also asserts that *Le* in combination with Kvaløy meets this limitation even if, for example, [Patent Owner] contends that the *Le*-Kvaløy system **does not** disclose or suggest that the audio recording of a conversation includes **both** a signal from the outer microphone (containing the speech of person to whom the user is speaking) **and** a signal from the inner microphone (containing the speech of the user) in response to receipt of a voice command.” *Id.* at 66–67 (citing Ex. 1002 ¶¶ 342–343). “For example,” according to Petitioner, “if [Patent Owner] argues that the *Le*-Kvaløy system only discloses or suggests using one of the inner or outer microphones for recording conversations, the *Le*-Kvaløy system would still disclose this limitation under a disjunctive construction.” *Id.* at 67.

“Accordingly,” Petitioner argues, one of ordinary skill would have “understood the *Le*-Kvaløy system to disclose or suggest [a] processor (‘the processor’) configured to continuously record audio of a conversation (‘continually records a history of at least one of’),” where “the audio recording includes an audio signal from an outer microphone (‘the captured ambient sound’), and/or an audio signal from an inner microphone containing the user’s speech (‘the captured internal sound’) into a continuously scrolling buffer (‘in the memory’).” Pet. 67 (citing Ex. 1002 ¶ 344).

Patent Owner does not provide separate argument for claim 15, and instead relies on its argument for claim 15. PO Resp. 50–54.

Based on the full trial record, we agree with Petitioner’s arguments, and find that Petitioner has proven by a preponderance of the evidence that claim 15 would have been obvious over the combination of Le and Kvaløy.

3. *Analysis of Dependent Claim 16*

a) 16: “[t]he earpiece of claim 14, wherein the event is a touching of the earpiece, a recognizing of a voice command, a starting or ending of a phone call, an abrupt movement of the earpiece, or a scheduled time.”

Petitioner argues that, as discussed for claim limitations 1[c] and 1[e][ii], one of ordinary skill “would have understood that the Le-Kvaløy system discloses or suggests a processor that triggers storage of an audio recording of a conversation in the scrolling buffer into memory 18 for later recall,” where “the audio recording includes a signal from the outer microphone (containing the speech of [a] person to whom the user is speaking) and a signal from the inner microphone (containing the speech of the user) in response to receipt of a voice command.” Pet. 67 (citing Ex. 1002 ¶ 346). “Accordingly,” Petitioner asserts, one of ordinary skill “would have also understood the Le-Kvaløy system to disclose or suggest storing the audio recording in response to a voice command (‘wherein the event is a . . . [] recognizing of a voice command.’).” *Id.* at 68 (citing Ex. 1002 ¶ 347) (first alteration in original).

Patent Owner does not provide separate argument for claim 16, and instead relies on its argument for claim 14. PO Resp. 50–54.

Based on the full trial record, we agree with Petitioner’s arguments, and find that Petitioner has proven by a preponderance of the evidence that claim 16 would have been obvious over the combination of Le and Kvaløy.

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:¹⁰

Claim(s)	35 U.S.C. §	Reference(s)/Basis	Claims Shown Unpatentable	Claims Not Shown Unpatentable
1, 2, 6, 7, 9	103(a)	Le, Kvaløy	1, 2, 6, 7, 9	
4–5	103(a)	Le, Kvaløy, Fiedler	4–5	
3, 11–13	103(a)	Le, Kvaløy, Johnson	11–13	3
11–13	103(a)	Le, Kvaløy, Johnson, Rast	11–13	
14–16	103(a)	Le, Kvaløy	14–16	
14–16	103(a)	Le, Kvaløy, Mayer ¹¹		
Overall Outcome			1, 2, 4–7, 9, 11–16	3

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

¹¹ As explained above, because we find that claims 14–16 are unpatentable based on Le and Kvaløy, we decline to address those claims in this ground.

IV. ORDER

Accordingly, it is

ORDERED that claims 1, 2, 4–7, 9, and 11–16 of the '591 patent have been proven by a preponderance of the evidence to be unpatentable; and

FURTHER ORDERED that claim 3 of the '591 patent has not 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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