

**IN THE UNITED STATES DISTRICT COURT  
FOR THE NORTHERN DISTRICT OF ILLINOIS  
EASTERN DIVISION**

Shenzhen Shokz Co., Ltd.,

*Plaintiff,*

v.

Shenzhen Wenming Technology Co., Ltd.,  
guizhoushengxinhongshengshangmaoyouxiang  
ongsi, Shenzhen Youbo Technology Co., Ltd.,  
Shanghai Kushi Information Technology Co.,  
Ltd., Suzhou Mojawa Intelligent Electronic Co.,  
Ltd., MRNEIO LLC

*Defendants.*

Case No. 1:24-cv-06717

**JURY TRIAL DEMANDED**

**DEFENDANT SUZHOU MOJAWA INTELLIGENT ELECTRONIC CO., LTD.'S  
OPENING CLAIM CONSTRUCTION BRIEF**

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## **I. INTRODUCTION<sup>1</sup>**

Plaintiff Shenzhen Shokz Co., Ltd. (“Shokz”) asserts claims from both U.S. Patent Nos. 11,310,582 (“the ’582 Patent”) and 11,197,084 (“the ’084 Patent”) against Suzhou Mojawa Intelligent Electronic Co., Ltd. (“Mojawa”). Mojawa identifies four claim terms across both asserted patents that require construction. Mojawa’s proposed constructions are consistent with the intrinsic records of both asserted patents, as well as the law, and will provide clarity to the Court and the jury. In contrast, Shokz disagrees that any claim terms require construction, simply proposing the “plain and ordinary meaning” for each term while failing to elaborate what that meaning is. Shokz’s proposal fails to provide necessary guidance as to the meaning of each term and only serves to prevent any boundaries to the claims themselves. This strategy is certain to result in additional ambiguity in the claims themselves, especially for Claim 15 of the ’582 Patent which includes an indefinite claim term. For the foregoing reasons, Mojawa respectfully requests the Court adopt the constructions it puts forth to remove ambiguity and to apply proper bounds to the asserted claims.

## **II. TECHNOLOGY BACKGROUND**

### **A. Overview of the ’582 Patent and the ’084 Patent**

The ’582 patent, titled “Loudspeaker apparatus,” issued on April 19, 2022. The ’084 patent, also titled “Loudspeaker apparatus,” issued on December 7, 2021. Both patents are directed to a loudspeaker apparatus, specifically, bone conduction speakers or headphones that

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<sup>1</sup> Suzhou Mojawa Intelligent Electronic Co., Ltd.’s (“Mojawa’s”) opening claim construction brief was due for filing August 28, 2025. Dkt. 50. An ECF outage in the Illinois Northern District on August 28 prohibited Mojawa from e-filing, despite multiple attempts through the evening. Mojawa was instructed by the Northern District of Illinois clerk’s office to e-file when ECF service resumed on August 29. Mojawa timely served Plaintiff Shenzhen Shokz Co., Ltd. (“Shokz”) and MRNEIO LLC on August 28 its opening claim construction brief, the joint appendix, and Mojawa’s appendix in support of its opening claim construction brief.

include an ear hook, a protective sleeve, core housing, and circuit housing for a control circuit or battery. *See, e.g.*, '582 Pat. at JA0037, Abstract,<sup>2</sup> JA0056-57, 8:35-9:19, JA0070, Claim 1, JA0040, Fig. 2; '084 Pat. at JA0001, Abstract, JA0020-21, 8:44-9:28, JA0034, Claim 1, JA0004, Fig. 2.

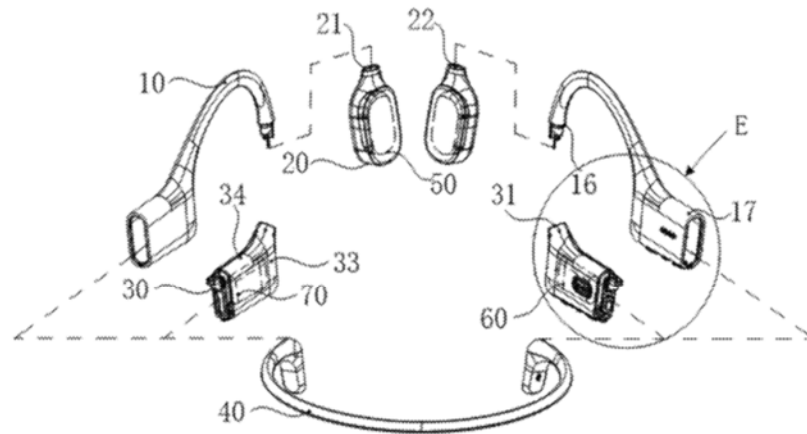


FIG. 2

'582 Pat. at JA0040, Fig. 2; '084 Pat. at JA0004, Fig. 2. The bone conduction speakers create sound by transmitting vibration to a housing panel in contact with a user. The vibration travels to the user's inner ear where the vibrations are converted into neural signals. '582 Pat. at JA0037, Abstract, JA0056-57, 8:35-9:19, JA0062, 20:22-56, JA0070, Claim 1; '084 Pat. at JA0001, Abstract, JA0020-21, 8:44-9:28, JA0027, 22:15-57, JA0034, Claim 1.

### III. PERSON OF ORDINARY SKILL IN THE ART

A person of ordinary skill in the art at the time of the '582 and '084 Patents would have had a Bachelors' degree in electrical or computer engineering or a comparable field of study,

<sup>2</sup> Citations to "JA" are to the parties' Joint Claim Construction Appendix, filed herewith. Citations to "MA" are to Mojawa's Appendix in Support of its Opening Claim Construction Brief, also filed herewith.

plus approximately two to three years of professional experience with acoustic technology. Additional graduate education could substitute for professional experience, and significant experience in the field could substitute for formal education. Ex. A, Declaration of Dr. Chris Kyriakakis Regarding Claim Construction (“Kyriakakis Decl.”) at ¶¶ 34-35.

#### IV. LEGAL STANDARD

Claim construction is an issue of law. *Markman v. Westview Instruments, Inc.*, 52 F.3d 967, 979 (Fed Cir. 1995) (en banc). “Words of a claim are generally given their ordinary and customary meaning, which is the meaning a term would have to a person of ordinary skill in the art after reviewing the intrinsic record at the time of the invention.” *O2 Micro Int’l Ltd. v. Beyond Innovation Tech. Co.*, 521 F.3d 1351, 1360 (Fed. Cir. 2008). The specification is “the single best guide to the meaning of a disputed term” and is usually dispositive. *Phillips v. AWH Corp.*, 415 F.3d 1303, 1315 (Fed. Cir. 2005) (en banc). Thus, claim terms should be construed in light of the specification “with a view to ascertaining the invention.” *United States v. Adams*, 383 U.S. 39, 49 (1966). “The correct inquiry” for purposes of claim construction “is not whether the specification proscribes or precludes some broad reading of the claim term.” *In re Smith Int’l, Inc.*, 871 F.3d 1375, 1382-83 (Fed. Cir. 2017). Rather, the correct construction must “correspond[] with . . . how the inventor describes his invention in the specification, *i.e.*, an interpretation that is consistent with the specification.” *Id.* at 1383 (internal citations and quotations omitted).

Pursuant to 35 U.S.C. § 112, patent claims must “particularly point[] out and distinctly claim[] the subject matter” regarded as the invention. 35 U.S.C. § 112 ¶ 2. The patent’s claims must “inform those skilled in the art about the scope of the invention with reasonable certainty,” in light of the specification and prosecution history. *Nautilus, Inc. v. Biosig Instruments, Inc.*, 572 U.S. 898, 910 (2014). This standard requires that a patent must “be precise enough to afford

clear notice of what is claimed, thereby apprising the public of what is still open to them.” *Id.* at 909 (internal citations and quotations omitted). That is, “[t]he claims, when read in light of the specification and the prosecution history, must provide objective boundaries for those of skill in the art.” *Interval Licensing LLC v. AOL, Inc.*, 766 F.3d 1364, 1371 (Fed. Cir. 2014). Claims that fail to do so are indefinite under § 112 and are invalid. *See Nautilus*, 572 U.S. at 902.

## V. DISPUTED CLAIM TERMS

### A. “wherein the first leaked sound wave and the second leaked sound wave are superimposed on each other, which reduces an amplitude of the first leaked sound wave” (’582 Patent, Claim 15)

| Mojawa’s Construction | Shokz’s Construction                       |
|-----------------------|--------------------------------------------|
| Indefinite            | Plain and ordinary meaning; not indefinite |

Claim 15 of the ’582 patent is indefinite as nonsensical or impossible for two reasons. First, it requires a “first leaked sound wave” and “second leaked sound wave” be “superimposed on each other,” which would cause the first leaked sound wave to cease to exist. Kyriakakis Decl. at ¶¶ 45-46. Therefore, it is impossible for the amplitude of the “first leaked sound wave” to be “reduced” as required by the claim. *Id.* Second, the claim element is scientifically impossible because it claims the reduction of the amplitude of a sound wave while depending on Claim 1’s requirement of amplifying sound waves. Kyriakakis Decl. at ¶ 47. The two conditions are opposite and cannot coexist at the same time. Kyriakakis Decl. at ¶¶ 47-67. If a claim term is nonsensical or can be read to require an impossibility, it is indefinite. *Synchronoss Techs., Inc. v. Dropbox, Inc.*, 987 F.3d 1358, 1366-67 (Fed. Cir. 2021); *Satius Holding, Inc. v. Samsung Elecs. Co.*, No. CV 18-850-CJB, 2024 WL 5090284, at \*5-\*11 (D. Del. Dec. 12, 2024) (“the claim term here is indefinite because one of its permutations is a scientific impossibility”) (collecting cases regarding nonsensical or impossible claims); *Koki Holdings Co. v. Kyocera Senco Indus.*

*Tools, Inc.*, No. CV 18-313-CFC, 2021 WL 1092579, at \*1 (D. Del. Mar. 22, 2021). The impossibilities of this term are irreconcilable and would be understood as such by a POSITA, rendering this claim term indefinite.

**1. Claim 15 is indefinite because when the first leaked sound wave and the second leaked sound wave are superimposed, the first leaked sound wave ceases to exist and cannot have an amplitude reduction**

Claim 15 requires the “first leaked sound wave and the second leaked sound wave are superimposed on each other,” while simultaneously claiming “reduc[ing] an amplitude of the first leaked sound wave.” A POSITA would understand that when first and second waves are superimposed on each other, the first and second waves cease and become a singular, resultant sound wave. Kyriakakis Decl. at ¶ 46. Accordingly, one could not separate out the “first leaked sound wave” for measurement from the combined sound wave. *Id.* (citing MA0015-16, Raymond A. Serway & John W. Jewett, Jr., *Physics for Scientists and Engineers with Modern Physics* 535-36 (9th ed. 2014) (two superimposed sound waves at 60-degree phase difference create a single resultant wave)). Claim 15 is indefinite for at least this reason alone because it is nonsensical or requires an impossibility, *i.e.*, the first leaked sound wave amplitude cannot be reduced or measured when superimposition of the waves creates a new combined wave. *Synchronoss Techs., Inc.*, 987 F.3d at 1366-67; *Satius Holding, Inc.*, 2024 WL 5090284, at \*5-\*11; *Koki Holdings Co.*, 2021 WL 1092579, at \*1.

**2. Claim 15 is also indefinite because superimposed nearly in-phase waves increase amplitude, and a first leaked sound wave’s amplitude would be increased in the resultant superimposed wave**

Dependent Claim 15 of the ’582 Patent is also indefinite because it inherently conflicts with independent Claim 1, from which it depends. Claim 1 claims the amplification of nearly in-phase vibrations of the housing panel and housing back panel, whereas Claim 15 depends from Claim 1 and simultaneously requires a reduction of the amplitude of a leaked sound wave of the

housing panel by the same rigid bone conduction speaker. Because amplified nearly in-phase vibrations increase amplitude, a person of ordinary skill would find it nonsensical or impossible for the core housing to both amplify and decrease sound simultaneously. Kyriakakis Decl. at ¶ 47. The specification does not explain how this can be so.

The '582 Patent specification does nothing to resolve this facial conflict in the claim language. The '582 Patent specification does not define its claimed “leaked sound waves.” In the context of the embodiment relevant to Claim 15, the specification only discusses sound leakage in general terms, including parroting the claim language. '582 Pat. at JA0062, 20:29-41. The patent is conclusory as to how the speaker would behave regarding the subject matter of Claim 15. The '582 Patent specification mentions the “first leaked sound wave” and “second leaked sound wave,” but provides no detail as to how amplitude is increased and reduced. '582 Pat. at JA0054, 3:4-9, JA0062, 20:29-41.

As explained by expert Chris Kyriakakis in his declaration, a POSITA would understand generally that bone conduction earphones may leak sound waves into the outside air depending on their construction and force of their vibration. Kyriakakis Decl. at ¶ 49. Despite a POSITA not being able to conceptualize or measure the “first leaked sound wave” once it is superimposed on the “second leaked sound wave” as discussed above, a POSITA reading the claim term “reduces an amplitude of the first leaked sound wave” would expect **destructive** interference to be the cause of a reduction in amplitude of a sound wave—*i.e.*, the two combined sound waves would be out of phase, including when meeting nearly crest-to-trough. *Id.* (citing MA0049-52, John D. Cutnell & Kenneth W. Johnson, *Physics* 508-11 (8th ed. 2009); MA0058-72, F. Alton Everest & Ken C. Pohlmann, *Master Handbook of Acoustics* 135-49 (5th ed. 2009)). A POSITA would further expect the bone conduction earphones to be designed in such a way as to achieve

this result. Kyriakakis Decl. at ¶ 49. But that is the exact opposite of what the disputed claims require, as explained below.

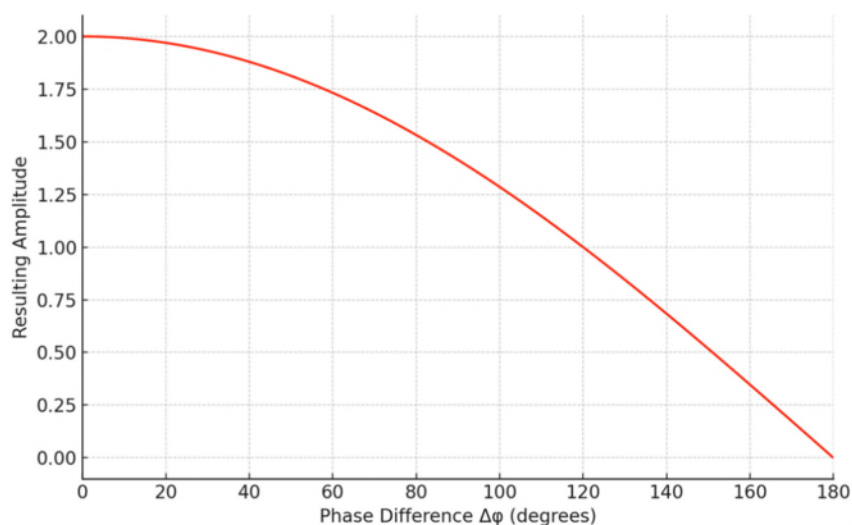
The '582 Patent does not explain how the leaked sound waves—generated by the housing panels vibrating nearly in-phase—would result in a **reduction** of amplitude of the first leaked sound wave, rather than an **increase** in amplitude of the first leaked sound wave. Claim 1 requires the vibrations of the housing panel and housing back panel to be nearly in-phase '582 Pat. at JA0070, Claim 1 (“an absolute value of a difference between the first phase and the second phase is less than 60 degrees”); Kyriakakis Decl. at ¶ 50. But Claim 15 requires that when the housing panel’s leaked sound wave and the housing back panel’s leaked sound wave are “superimposed on each other,” the amplitude of the first leaked sound wave is “**reduce[d]**.” '582 Pat. at JA0071, Claim 15 (emphasis added).

A person of ordinary skill in the art would understand superimposed, in-phase sound waves would necessarily result in an **increase** in amplitude of the resultant sound wave, not a reduction. Kyriakakis Decl. at ¶ 51 (citing MA0049-52, Cutnell & Johnson, *supra*, at 508-11; MA0058-72, Everest & Pohlmann, *supra*, 135-49). This is the concept of **constructive** interference. For example, as explained by Mr. Kyriakakis, in *Master Handbook of Acoustics*, Fig. 10-2 depicts adding sine waves, and the closer to in-phase the waves are, the higher the added amplitude. Kyriakakis Decl. at ¶ 51 (citing MA0060-61, Everest & Pohlmann, *supra*, at 137-38). As another example, the *Physics* textbook explains the basics of constructive interference that any POSITA would understand. Kyriakakis Decl. at ¶ 51 (citing MA0049-50, Cutnell & Johnson, *supra*, at 508-09). When two sound waves meet crest-to-crest and trough-to-trough, they exhibit constructive interference and an amplified sound. Kyriakakis Decl. at ¶ 51

(citing MA0049-50, Cutnell & Johnson, *supra*, at 508-09). The '582 Patent cannot avoid this law of physics, and a POSITA would understand this. Kyriakakis Decl. at ¶ 51.

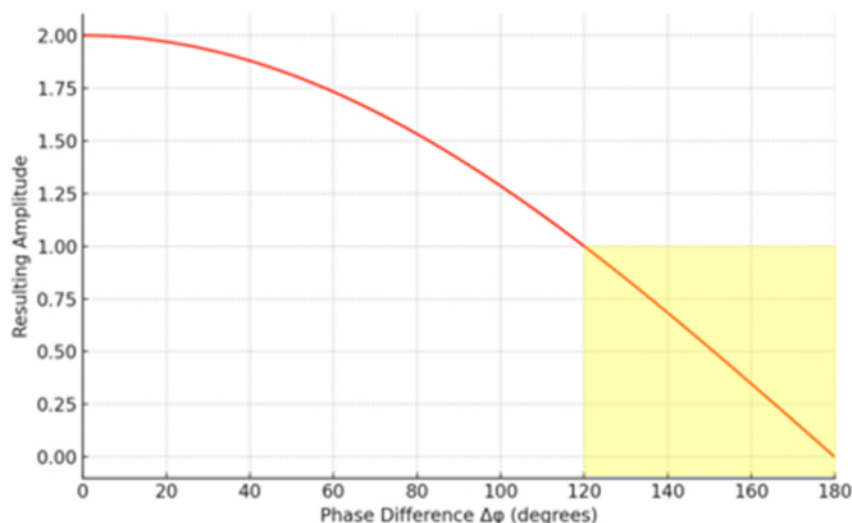
This is understood in reference to mathematical equations, as explained in detail by the Kyriakakis declaration. Kyriakakis Decl. at ¶¶ 52-60 (citing MA0015-16, Serway & Jewett, *supra*, at 535-36). At a 60-degree phase difference (*see* Claim 1's requirement "an absolute value of a difference between the first phase and the second phase is less than 60 degrees"), vibrations cause leakage reinforcement of  $\sqrt{3} = 1.73$ , or a 73% increase and not a reduction as Claim 15 suggests. Kyriakakis Decl. at ¶ 60.

The graph below, reproduced from the Kyriakakis declaration, shows how the combined amplitude of two sound waves changes as phase difference increases from 0° to 180°. Kyriakakis Decl. at ¶ 61. At the out-of-phase condition (180°), the sound waves fully cancel each other out ("reduce" amplitude), but at all other phase differences, including those at 60 degrees and less than 60 degrees, the combined amplitude of the sound waves is increased. Kyriakakis Decl. at ¶ 61.



Indeed, as shown in the graph below annotated in yellow from the Kyriakakis declaration, the phase difference of the sound waves would need to be greater than 120 degrees in order for the

resulting amplitude to be below 1.00, *i.e.*, in order for the claimed amplitude reduction of the “first leaked sound wave” as suggested by Claim 15 to occur. This directly contradicts Claim 1’s “less than 60 degrees” phase difference requirement. Kyriakakis Decl. at ¶ 62.



In Shokz’s final validity contentions, it posits “a POSITA would not identify any contradiction that would cause doubt as to the inventors’ possession of claim 15’s subject matter,” because “[a]s a POSITA would readily recognize, the housing panel compresses the surrounding air when it moves toward the facial skin, while the housing back panel suctions the air.” MA0149-50, Shokz’s Final Validity Contentions to Mojawa, cover pleading at 77-78. “Likewise, when the housing panel moves away from the facial skin, it suctions the surrounding air while the housing back panel compresses the surrounding air.” MA0150, *id.* at 78. “Therefore, if the vibration amplitude and phase of the housing panel and the housing back panel remain the same, their forces on the surrounding air will be opposite, thus reducing air movement, reducing sound leakage, and ‘reduc[ing] an amplitude of the first leaked sound wave.’” MA00150, *id.* But a POSITA would understand Shokz’s description here to be the exact opposite of what is required by Claim 1, *i.e.*, the housing panel and the housing back panel vibrating together nearly in-phase. Kyriakakis Decl. at ¶ 63.

Shokz's final infringement contentions offer no testing or proof that the accused products would "reduc[e] an amplitude of the first leaked sound wave" as required by Claim 15—Shokz just assumes it happens. Shokz's Final Infringement Contentions to Mojawa, Ex. C at 48-50 (MA0194-96); Ex. D at 68-70 (MA0205-07); Ex. E at 54-55 (MA0214-15); Ex. F at 33-34 (MA0221-22). So is true of the description in the '582 Patent specification.'582 Pat. at JA0062, 20:29-41. But such a result would not happen in a device with the requirements of Claim 1, where the vibrations of the housing panels of the rigid core housing are nearly in-phase and therefore amplified. Kyriakakis Decl. at ¶ 64. Shokz's own interpretation of its own claim language, as expressed in its infringement and invalidity contentions therefore sheds no light on this issue.

Shokz cites no intrinsic evidence to support its compression/suction theory described above. MA0149-50, Shokz's Final Validity Contentions, cover pleading at 77-78. Shokz cites to a different patent, U.S. Patent No. 11,115,751, as evidence a POSITA would have understood the interaction described by Shokz. MA0150-51, Shokz's Final Validity Contentions, cover pleading at 78-79. None of the disclosures cited by Shokz are intrinsic evidence to the patent. At any rate, the disclosures cited by Shokz parrot its theory and suffer from the same problems as the '582 Patent specification itself: in-phase vibrations of a rigid core housing result in amplification, not the reduction, of leaked sound waves. Kyriakakis Decl. at ¶ 65. A POSITA would understand the two housing panels in a closed cavity moving air up and down with nearly the same phase (Claim 1) and amplitude as described in the '582 Patent ("when the overall rigidity of the housing 700 is relatively large, the vibration amplitudes and phases of the housing panel 710 and the housing back panel 720 keep the same or substantially the same," JA0062, 20:22-56) superimposed on one another would not reduce amplitude of the leaked sound wave according to

the laws of physics. Kyriakakis Decl. at ¶ 65. All the patent describes as reducing sound leakage is the generic performance of a rigid core housing of a bone conduction earphone. A POSITA would not understand that performance alone to reduce sound leakage. Kyriakakis Decl. at ¶ 65.

The prosecution history offers no clarity on the contradiction between the claims. There is no discussion in the file history regarding the content of Claim 15. The claim was originally proposed by applicant as a dependent claim and eventually issued without amendment. Similarly, Claim 1 issued as originally proposed without amendment after applicant filed a terminal disclaimer to overcome a nonstatutory double patenting rejection of Claim 1. '582 Pros. History, JA1768-86, Amendment (Dec. 27, 2021), JA001701-08, Notice of Allowance (Jan. 12, 2022). The examiner only noted specific Claim 1 elements that were absent in the prior art, including the nearly in-phase claim element<sup>3</sup> that conflicts with Claim 15. JA001701-08, Notice of Allowance (Jan. 12, 2022). It is therefore possible the examiner focused on the Claim 1 language without recognizing its contradiction with Claim 15. Regardless, the prosecution history does not clarify the meaning of Claim 15 or alleviate its contradiction with Claim 1. Kyriakakis Decl. at ¶ 66.

The impossibility of Claim 15 creates irresolvable uncertainty over claim scope. It is unclear to a person of ordinary skill how dependent Claim 15 can be realized, as it must, in the context of independent Claim 1. A person of ordinary skill would understand that the results of Claim 15 could not occur simultaneously with the requirements of Claim 1 for the reasons provided above. Therefore, to a person of skill in the art, the claim term lacks any certainty as to

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<sup>3</sup> “the vibration of the earphone core drives the housing panel and the housing back panel to vibrate, the vibration of the housing panel having a first phase, the vibration of the housing back panel having a second phase, wherein when the vibration frequencies of the housing panel and the housing back panel is within a range of 2000 Hz to 3000 Hz, an absolute value of a difference between the first phase and the second phase is less than 60 degrees”

its meaning or scope, let alone reasonable certainty, and hence, the claim is indefinite.

Kyriakakis Decl. at ¶ 67.

**B. “a housing sheath integrally formed with the protective sleeve” (’582 Patent, Claim 13; ’084 Patent, Claim 11)**

| <b>Mojawa’s Construction</b>                                                               | <b>Shokz’s Construction</b>        |
|--------------------------------------------------------------------------------------------|------------------------------------|
| <b>“a housing sheath and a protective sleeve formed as a single piece whole structure”</b> | <b>Plain and ordinary meaning.</b> |

The term “a housing sheath *integrally formed* with the protective sleeve” means “a housing sheath and a protective sleeve *formed as a single piece whole structure*,” according to the explicit language in the patents’ specifications. There is no basis in the intrinsic record that justifies expanding the meaning of the term.

For example, the ’582 patent specification expressly reads “the housing sheath 17 may be *integrally formed* with the protective sleeve 16 *to form a whole structure*.” ’582 Pat. at JA0057, 10:35-44 (emphasis added); ’084 Pat. at JA0021, 10:45-54 (same);<sup>4</sup> *see also* ’582 Pat. at JA0065, 25:1-3 (“the bottom plate and the side wall may be *integrally formed as a whole*”) (emphasis added); ’084 Pat. at JA0029, 25:25-27 (same). The specification also specifies that “the housing sheath 17 may be *integrally formed* with the protective sleeve 16 on the periphery of the plug end 15 *by injection molding*,” a process that would result in the housing sheath and protective sleeve being formed as a single piece whole structure.’582 Pat. at JA0058, 11:11-15 (emphasis added); ’084 Pat. at JA0022, 11:21-24 (same). For example, elsewhere the specification describes how components may be “molded separately with corresponding molds instead of *using the*

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<sup>4</sup> The ’582 Patent and ’084 Patent were filed one day apart, share a majority of the same specification and claims, and claim priority to the same Chinese Application No. 201910009927.4. ’582 Pat. at JA0037, (22), (30); ’084 Pat. at JA0001, (22), (30). Accordingly, citations from one patent, where not identical in the other patent, apply equally to the construction of the claim term in both patents.

*same larger-sized mold to form the two integrally.*”’582 Pat. at JA0058, 11:58-12:3 (emphasis added);’084 Pat. at JA0022, 11:66-12:11 (same). The meaning of the claim term is not further discussed in the file histories of the two asserted patents.

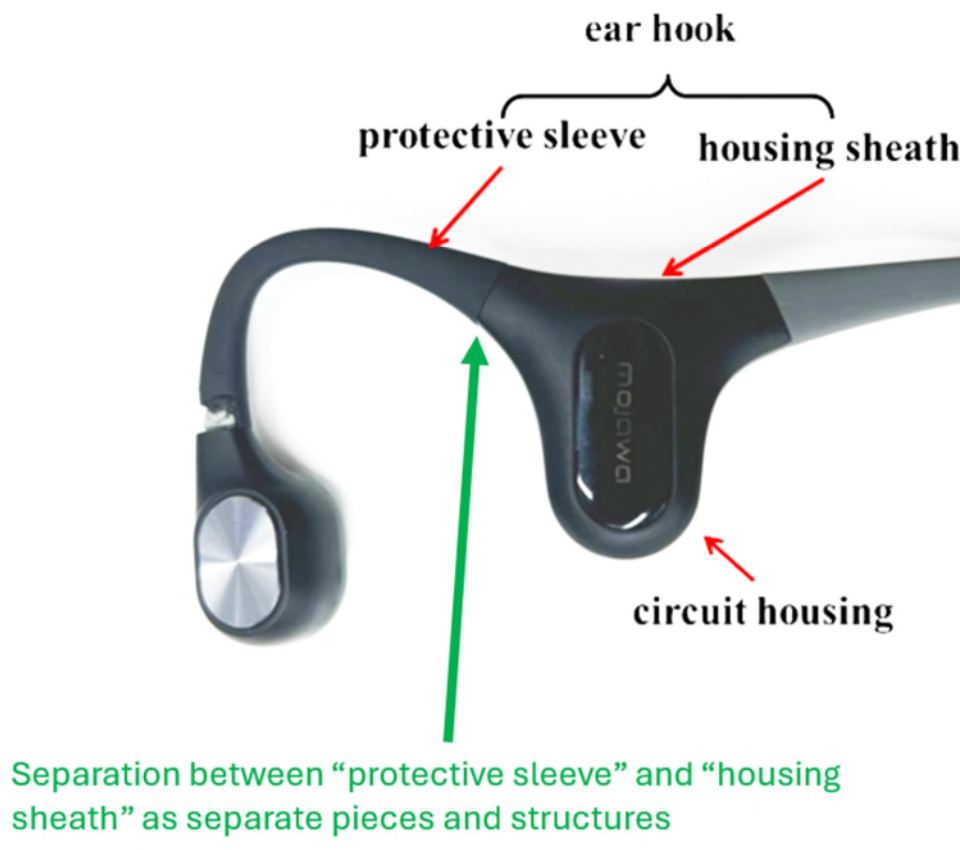
Mojawa’s construction correctly reflects the ordinary meaning of the term “integrally” or “integral.” MA0173 (Collins English Dictionary definition of “integrally” and “integral” reading “intact; entire . . . formed of constituent parts; united . . . a complete thing; whole”); MA0176 (Merriam-Webster Dictionary definition of “integral” reading “formed as a unit with another part . . . composed of parts that make up a whole . . . entire”).

A jury would have difficulty understanding “integrally formed” in the technical context of the patent because its meaning is not immediately apparent from the claim language alone, further necessitating Mojawa’s construction over Shokz’s “plain and ordinary meaning.” *See AFG Indus., Inc. v. Cardinal IG Co.*, 239 F.3d 1239, 1247 (Fed. Cir. 2001) (“It is critical for trial courts to set forth and express construction of the material claim terms in dispute, in part because the claim construction becomes the basis of the jury instructions . . .”).

Shokz proposes this term should be given its “plain and ordinary” meaning, but does not explain what that meaning is. It is therefore instructive to look to Shokz’s infringement contentions to discover the improper breadth Shokz assigns to this claim term. Throughout Shokz’s Final Infringement Contentions, it accuses purported “housing sheaths” and “protective sleeves” as being “integrally formed” when they are clearly not “formed as a single piece whole structure.” That is, the protective sleeve and housing sheath are separate pieces and structures. Shokz’s argument is incorrect, without specification support, and contradicts the patent’s disclosed embodiments. Shokz’s Final Infringement Contentions, Ex. D at 62 (MA0199)

(annotations added by Mojawa in green below); Ex. A at 35-36 (MA0179-80); Ex. B at 52-55 (MA0184-87); Ex. C at 43-47 (MA0189-93); Ex. E at 49-53 (MA0209-13).

The Accused Product includes a housing sheath integrally formed with the protective sleeve.



(Shokz\_0009863)

**C. “second magnetically conductive unit includes a bottom plate and a sidewall”  
('582 Patent, Claim 19)**

| Mojawa's Construction                                      | Shokz's Construction        |
|------------------------------------------------------------|-----------------------------|
| “groove-type U-shaped second magnetically conductive unit” | Plain and ordinary meaning. |

The term “second magnetically conductive unit includes a bottom plate and a sidewall” means “groove-type U-shaped second magnetically conductive unit” according to the explicit

language of the '582 patent specification. As with the “integrally formed” claim term, there is no basis in the intrinsic record that justifies expanding the meaning of the term.

For example, the '582 patent specification expressly reads:

In some embodiments, ***the second magnetically conductive unit 2106 may be a groove-type structure. The groove-type structure may include a U-shaped section (as shown in FIG. 15). The groove-type second magnetically conductive unit 2106 may include a bottom plate and a side wall.*** In some embodiments, the bottom plate and the side wall may be integrally formed as a whole. For example, the side wall may be formed by extending the bottom plate in a direction perpendicular to the bottom plate. In some embodiments, the bottom plate may be connected to the side wall through any one or more connection manners described in the present disclosure. The second magnetic unit 2108 may be disposed as a ring shape or a sheet shape.

'582 Pat. at JA0064-65, 24:63-25:09 (emphasis added), JA0069, 33:4-16 (same, referring to structures in Fig. 21).

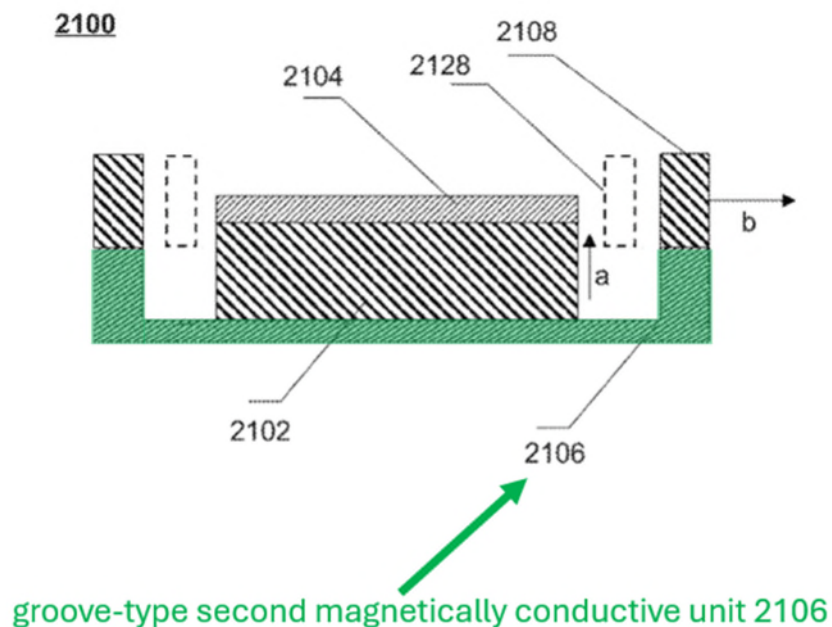


**FIG. 16**

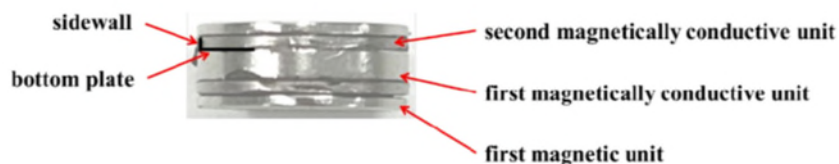
'582 Pat. at JA0049, Fig. 16 (annotated), JA0051, Fig. 21 (groove-type second magnetically conductive unit 3106). Mojawa's construction is properly consistent with the specification's description of the “sidewall” as a distinct component that allows other components, like second

magnetic unit 2108, to connect to it. '582 Pat. at JA0065, 25:32-39 (referring to Fig. 16: “***The lower surface of the second magnetic unit 2108 may be connected to the side wall of the second magnetically conductive unit 2106.*** The connection manners between the first magnetic unit **2102**, the first magnetically conductive unit **2104**, the second magnetically conductive unit **2106**, and/or the second magnetic unit **2108** may include bonding, snapping, welding, riveting, bolting, or the like, or any combination thereof.”) (emphasis added). The meaning of the claim term is not further discussed in the file histories of the two asserted patents.

A jury would have difficulty understanding this claim term in the technical context of the patent, including the orientation of the bottom plate and sidewall, because its meaning is not immediately apparent from the claim language alone, further necessitating Mojawa’s construction over Shokz’s “plain and ordinary meaning.” See *AFG Indus., Inc.*, 239 F.3d at 1247.

Because Shokz again provides no information on what “plain and ordinary” meaning it ascribes to this term, reference to Shokz’s infringement contentions is again helpful. Shokz argues in its Final Infringement Contentions that the “second magnetically conductive unit includes a bottom plate and a sidewall” can be a singular, solid disc shape that Shokz annotates a sidewall and bottom plate onto. Shokz’s Final Infringement Contentions, Ex. E at 65 (MA0218).

In the Accused Product, the second magnetically conductive unit includes a bottom plate and a sidewall.



(Shokz\_0009880)

Shokz’s argument is incorrect, without specification support, and contradicts the patent’s disclosed embodiments.

**D. “the control circuit or the battery driving the earphone core to vibrate” (’582 Patent, Claim 1; ’084 Patent, Claim 1)**

| <b>Mojawa’s Construction</b>                                                                           | <b>Shokz’s Construction</b>        |
|--------------------------------------------------------------------------------------------------------|------------------------------------|
| <b>“either the control circuit or the battery, but not both, driving the earphone core to vibrate”</b> | <b>Plain and ordinary meaning.</b> |

It is a well-established canon of claim construction that “or” is given its plain meaning designating alternatives and should not to be rewritten as “and.” *ABT Sys., LLC v. Robertshaw Controls Co.*, No. 11 C 5112, 2013 WL 1498997, at \*5-6 (N.D. Ill. Apr. 11, 2013) (refusing to construe “or” to mean “and” where “or” was used in the claims, appeared throughout the specification, was depicted in the figures, and “and” was unsupported by the prosecution history); *Schumer v. Lab’y Computer Sys., Inc.*, 308 F.3d 1304, 1311 (Fed. Cir. 2002) (“We have consistently interpreted the word ‘or’ to mean that the items in the sequence are alternatives to each other.”) (collecting cases); *MHL Custom, Inc. v. Waydoo USA, Inc.*, No. CV 21-91-RGA, 2022 WL 2290860, at \*3 (D. Del. June 24, 2022) (“‘Or’ usually designates alternatives. To deviate from the usual interpretation, a party must show that the deviation is clearly explained in the patent documents.”) (quotations omitted); *Kustom Signals, Inc. v. Applied Concepts, Inc.*, 264 F.3d 1326, 1331 (Fed. Cir. 2001) (“The district court construed ‘or’ and ‘either’ in their common usage as designating alternatives. We agree with this construction, for there is no indication that [applicant] used these words with a different meaning. Particularly, there is no basis whatsoever for believing that [applicant] intended its usage of ‘or’ somehow to embrace ‘and.’”).

Here, the Court has no reason to deviate from this well-established plain meaning, and should therefore construe the term “the control circuit or the battery driving the earphone core to vibrate” to mean “either the control circuit or the battery, but not both, driving the earphone core

to vibrate.” This construction is in accordance with the explicit language in the patent specifications. There is no basis in the intrinsic record that justifies changing the meaning of the term.

For this claim term, “or” is used in the claim language and specification of the asserted patents, not “and.” ’582 Pat. at JA0053, 1:57-58 (“The control circuit or the battery may drive the earphone core to vibrate to generate a sound.”), JA0070, Claim 1 (“the control circuit or the battery driving the earphone core to vibrate to generate a sound”); ’084 Pat. at JA0001, Abstract (“The control circuit or the battery may drive the earphone core to vibrate.”), JA0017, 1:47-48 (“The control circuit or the battery may drive the earphone core to vibrate.”), JA0034, Claim 1 (“the control circuit or the battery driving the earphone core to vibrate”). There is no disclosure in the intrinsic record of an embodiment where both the control circuit and the battery together drive the earphone core to vibrate. This understanding is in keeping with similar usage of “or” in the patents. The circuit housing is described as “accommodating a control circuit or a battery.” ’582 Pat. at JA0037, Abstract (emphasis added), JA0053, 1:54-56, JA0070, Claim 1; ’084 Pat. at JA0001, Abstract, JA0017, 1:45-46, JA0034, Claim 1. The control circuit or battery are therefore alternatives—only one may be in the circuit housing and only one may drive the earphone core.

Fig. 2 of the patents further supports this construction, where control circuit 60 and battery 70 are housed in separate circuit housings. ’582 Pat. at JA0040, Fig. 2 (annotated below), JA0056, 8:54-56 (“The number of circuit housings 30 is also two, which are used to accommodate the control circuit 60 and the battery 70 respectively.”); ’084 Pat. at JA0004, Fig. 2, JA0020, 8:63-65.

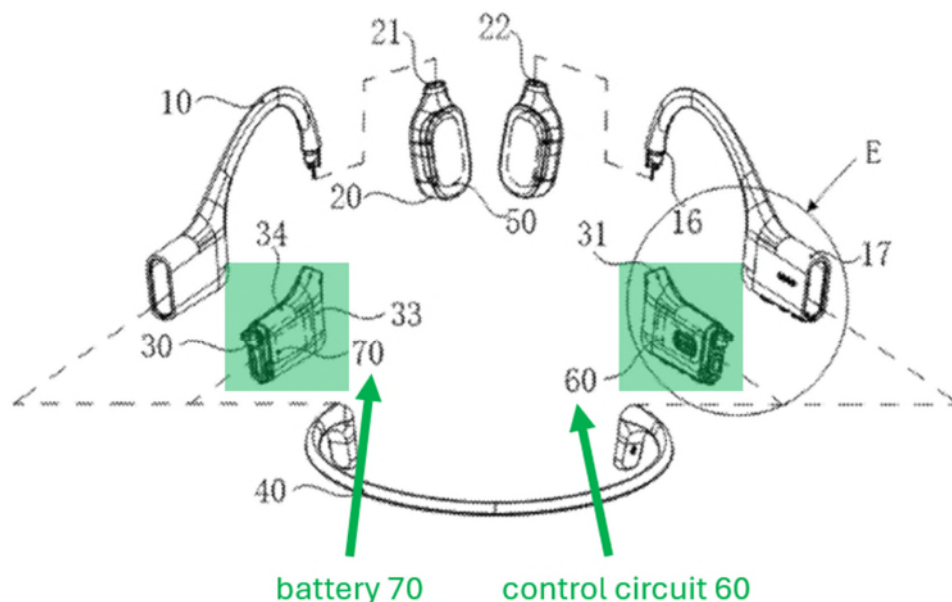


FIG. 2

Accordingly, the plain meaning of the claim is the alternative of a control circuit or battery in the one claimed circuit housing to drive the earphone core to vibrate, not both.

The claimed “or” language is reflected in the prosecution history in the same language of the specification and claims of the issued patents—the meaning of the claim term is not specifically or further discussed. Therefore, the claim language, specification, and prosecution history of the patents all support “or” retaining its plain meaning as designating alternatives and not meaning “and.” *ABT Sys., LLC*, 2013 WL 1498997, at \*5-6; *Schumer*, 308 F.3d at 1311; *MHL Custom, Inc.*, 2022 WL 2290860, at \*3; *Kustom Signals, Inc.*, 264 F.3d at 1331.

Following the parties’ meet and confer on claim terms, Mojawa understands Shokz’s reading of the claim term to be “at least one of the control circuit or the battery driving the earphone core to vibrate,” which would include the embodiment of both the control circuit and battery together driving the earphone core. As discussed above, there is no intrinsic record support for the embodiment of both the control circuit and battery driving the earphone core to vibrate. It is contrary to the alternative language used in the patent, including the battery and

control circuit occupying separate circuit housings. There is therefore no clear explanation in the patent documents warranting such deviation from the plain meaning of “or.” *MHL Custom, Inc.*, 2022 WL 2290860, at \*3.

## VI. CONCLUSION

For the foregoing reasons, Mojawa respectfully requests that the Court adopt Mojawa’s proposed claim constructions.

Dated: August 29, 2025

Respectfully submitted,

By: /s/ Shaobin Zhu

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# EXHIBIT A

**IN THE UNITED STATES DISTRICT COURT  
FOR THE NORTHERN DISTRICT OF ILLINOIS  
EASTERN DIVISION**

Shenzhen Shokz Co., Ltd.,

*Plaintiff,*

v.

Case No. 1:24-cv-06717

Shenzhen Wenming Technology Co., Ltd.,  
guizhoushengxinhongshengshangmaoyouxiang  
ongsi, Shenzhen Youbo Technology Co., Ltd.,  
Shanghai Kushi Information Technology Co.,  
Ltd., Suzhou Mojawa Intelligent Electronic Co.,  
Ltd., MRNEIO LLC

*Defendants.*

**Declaration of Chris Kyriakakis Regarding Claim Construction**

I declare under penalty of perjury under the laws of the United States of America that the following is true and correct. Executed this 28<sup>th</sup> day of August, 2025, in Los Angeles, CA.



Chris Kyriakakis

## **I. INTRODUCTION**

1. My name is Chris Kyriakakis. I have been retained by counsel for Defendant Suzhou Mojawa Intelligent Electronic Co., Ltd. (“Mojawa”) as an expert in this litigation to provide opinions concerning certain claim terms in U.S. Patent Nos. 11,310,582 (the “’582 Patent”) and 11,197,084 (the “’084 Patent,” collectively, “the Asserted Patents”).

2. My opinions are based on my review of the intrinsic record of the Asserted Patents, the documents cited in this Declaration, relevant state-of-the art references as of the priority dates of each patent, and my professional experience as detailed in this Declaration and my *curriculum vitae*.

3. I am being compensated at a rate of \$525 per hour for time spent on this matter. My compensation is not contingent upon the results of my study, the substance of my testimony, or the outcome of this litigation.

## **II. BACKGROUND AND QUALIFICATIONS**

4. I have summarized in this section my educational background, career history, and other relevant qualifications. A true and accurate copy of my *curriculum vitae* is attached hereto as Appendix A.

5. I earned my Bachelor of Science degree in Engineering and Applied Science from the California Institute of Technology (Caltech) in 1985. I received my Master of Science degree in Electrical Engineering in 1987 and my Ph.D. in Electrical Engineering in 1993, both from the University of Southern California (“USC”).

6. I am a tenured Associate Professor in the Department of Electrical and Computer Engineering at USC.

7. My research interests lie at the intersection of acoustics, psychoacoustics (the science that studies human perception of sound), and audio signal processing. I have worked in

the area of audio signal processing for more than 20 years with particular emphasis on spatial and 3D audio. I have published nearly 100 technical papers, including several peer-reviewed papers. I have published a book on spatial audio entitled Immersive Audio Signal Processing and hold several patents in audio processing for headphone optimization, acoustic measurement of loudspeakers in rooms, loudspeaker crossover optimization, and loudspeaker response correction using signal processing. My publications examine various aspects of sound measurement, echo cancellation, microphone arrays, noise removal, filter banks, how sound interacts with the acoustical elements of the environment, novel methods for surround sound recording and reproduction, and the perception of sound by human listeners.

8. A major focus of my research has been on developing novel multichannel audio capture and rendering algorithms. In addition to the mathematical development of the algorithms, I have performed several multichannel recordings with multiple wired and wireless microphones over the past 20 years. For example, in 2003, I performed a multichannel recording with a 64-track recording of a live performance of the group Duran Duran, 24-track recordings of the Boston Symphony and the Handel and Haydn Society, multi-track recordings of experimental music in the WGBH studios in Boston, 48-track recordings of the Dizzy Gillespie band at USC, live multi-track performances of Byzantine chanters in simulated ancient acoustic environments, as well as 32-track Byzantine studio chant recordings of Cappella Romana. In all of these recordings, a combination of wired and wireless microphones were used in conjunction with digital multitrack recording gear and SMPTE timecode synchronization.

9. Another focus of my early research was on head-related transfer functions (HRTFs) and how they can be measured and modeled using various signal processing approaches. I developed several implementations of HRTF-based 3D audio for rendering spatial

sounds over headphones. I have also researched microphone arrays for applications in enhanced far field voice recognition. This includes methods for Direction of Arrival finding and beam forming from linear and circular microphone arrays. I have also investigated methods for noise removal and reverberation reduction from microphone signals.

10. In addition, over the past few years I have worked on methods for echo cancellation for applications in wearable devices. Previous other work includes loudspeakers and how they interact with their acoustical environment, and specifically loudspeaker transducers. In particular, I have researched the role of sound reflections, absorption, and diffusion in the performance of loudspeakers. I have also published several technical papers on acoustical measurement methods in rooms and device enclosures and developed novel signal processing algorithms for optimizing sound system performance. I have worked on methods for echo cancellation for applications in wearable devices. Other topics I have researched include multichannel audio acquisition and rendering, virtual microphones and virtual speakers, hybrid headphone-loudspeaker rendering methods, and advanced signal processing techniques for optimizing sound quality from small portable devices.

11. I am the founding Director of the USC Immersive Audio Laboratory with facilities for experimental work in room acoustics, multichannel audio, and psychoacoustics. This laboratory also serves as a unique teaching facility for my undergraduate course in Introduction to Digital Audio and my graduate course in Immersive Audio Signal Processing. Both courses have a major acoustics component that examines the interaction of sound with the acoustical environment and the basic principles of microphones (including wireless microphones) and loudspeaker design. The graduate course was developed through a two-year grant I received from the National Science Foundation entitled “Collaborative Learning in

Engineering Using Immersive Environments,” and was the first of its kind to assess the impact of audio immersion in student learning. In addition to the courses I teach, I have also supervised and served on Ph.D. dissertation committees for more than 30 students.

12. From 2003-2018, I was the co-founder and Chief Technology Officer of Audyssey Laboratories, a USC spin-off company that develops and licenses audio technology to leading consumer electronics and automotive companies around the world. As part of my work at Audyssey, I developed a measurement methodology for headphones and earphones and created a database with 500+ measurements of products from nearly 100 manufacturers, created audio algorithms related to sound optimization that are used in millions of home theater systems, cars, and IMAX theaters worldwide.

13. I also developed audio algorithms and designed speakers. These speakers were novel acoustical designs that used a combination of unique enclosures, passive radiators (i.e., speaker diaphragms that are driven by changes in surrounding air pressure), and audio signal processing to optimize their performance and overcome limitations that arise from small drivers and enclosures. For example, we used signal processing technologies combined with novel acoustical design to extend the bass response of small woofers and passive radiators beyond what was previously possible in small speaker enclosures. The innovations in these designs have received awards, including Popular Science’s “Best of What’s New.”

14. In 2019, I joined Syng as the Chief Audio Scientist. Syng creates innovative products for next generation spatial audio and my role there includes research and development of audio algorithms for sound capture using microphone arrays to measure the acoustics of the room and loudspeaker beamforming for wirelessly rendering sound in various directions.

15. In April 2018 I was elected as Senior Member of the Institute of Electrical and Electronic Engineers (IEEE) in recognition of my contributions to the field of engineering. I am also a member of the Audio Engineering Society (AES), an association for professionals in the audio industry.

16. In 2006, I received a World Technology Network Award. This organization presents awards to innovators in several areas in which technology can foster a paradigm change. My award was for innovations in immersive audio that enable new capabilities in media and journalism. Other award recipients at that event included Vice President Al Gore, Google, and SpaceX. In addition, my work has been featured in multiple news articles, including pieces by *The Atlantic*, the *BBC World Service*, the *New York Times*, and National Public Radio.

17. In the late 1990s and early 2000s, I was a faculty researcher and later Deputy Director of the National Science Foundation's engineering research center established at USC. I studied the fundamental and technological limitations of immersive audio and the role of acoustics on the performance of microphones and loudspeakers. In 2003, together with one of my graduate students, I received the award for Best Paper at the Institute of Electrical and Electronics Engineers ("IEEE") Conference on Signals, Systems and Computers.

### **III. APPLICABLE LEGAL STANDARDS**

18. Within this statement, I apply my understanding of certain legal standards to opine on the scope and meaning of certain disputed claim terms. However, I am neither a lawyer nor an expert in patent law. The following is my understanding of these legal standards.

19. I understand that claim construction is for the Court to decide.

20. I understand that the patent claims are the numbered sentences at the end of each patent and define what a patent covers. The figures and text in the rest of the patent provides a description and/or examples of the prior art or the invention and provide a context for the claims,

but it is the claims that define the breadth of the patent's coverage. Each claim is effectively treated as if it was a separate patent, and each claim may cover more or less than another claim. Therefore, what a patent covers depends, in turn, on what each of its claims covers.

21. I understand that the words of a claim are generally given the ordinary and customary meaning that the term would have to a person of ordinary skill in the art at the time of invention. Because a claim is interpreted according to its meaning to a person of ordinary skill in the art, the knowledge, education, and experience of that person are also relevant to determining the scope and meaning of a patent claim.

22. I understand that, in construing terms, courts look first to the intrinsic evidence of record, which includes the patent itself (including the claims and specification) and the prosecution history. I also understand that courts may consider extrinsic evidence, such as expert and inventor testimony, dictionaries, and learned treatises, though courts should consider the intrinsic record first.

23. I understand that intrinsic evidence includes the prosecution history of a patent. The prosecution history of a patent provides the record of the examination of a patent application before the U.S. Patent and Trademark Office ("USPTO"). The prosecution history provides evidence of how the patent examiner and the inventor understood the patent application and the claims, and can therefore be instructive on how to interpret the claims. It is my understanding that arguments or amendments made concerning one patent application can be instructive as to the meaning of like terms in another related patent application.

24. I understand that particular embodiments appearing in the written description should not be used to limit claim language that has broader effect. I understand that even where a patent describes only a single embodiment, claims are not to be read restrictively unless the

patentee has demonstrated a clear intention to limit the claim scope using words or expressions of manifest exclusion or restriction.

25. I understand that a person of ordinary skill in the art is deemed to read the claim term not only in the context of the particular claim in which it appears, but also in the context of the entire patent, including the specification, the other claims, and the prosecution history.

26. I understand that while claim terms are understood in light of the specification, the scope of the claims is not necessarily limited to inventions that look like the ones shown in the figures and described in the specification. I realize that limiting claims from the specification is generally not permitted absent a clear disclosure that the patentee intended the claims to be limited as shown.

27. I understand that differences among claims can be a useful guide in understanding the meaning of particular claim terms. For example, I am familiar with the doctrine of “claim differentiation” where the presence of dependent claims that add a particular limitation to an independent claim gives rise to a presumption that the limitation in question is not present in the independent claim. It is also my understanding that language in a claim should not be construed so as to render claim language superfluous.

28. I understand that an issued patent is presumed valid. I also understand that the standard for indefiniteness is whether a person having ordinary skill in the art would understand what is claimed when the claim is read in light of the specification and prosecution history. A claim term is definite if, when viewed in light of the specification and prosecution history, it informs one skilled in the art about the scope of the invention with reasonable certainty.

29. When assessing whether a claim phrase is definite, I understand courts must take into account the inherent limitations of language in often not providing absolute certainty. At the

same time, a patent must be precise enough to afford clear notice of what is claimed in order to appraise the public of what remains available. I understand that the degree of precision necessary for adequate claims is a function of the nature of the subject matter, and that absolute precision is not required.

30. I further understand that given the imprecision of language, a claim may properly recite terms of degree, rather than fixed or definite values. Moreover, where relative terms and words of degree are used, those terms do not render patent claims invalid as long as they inform those skilled in the art about the scope of the invention with reasonable certainty. I understand that when a term of degree is used, reasonable certainty of a claim's scope may be found if a skilled artisan would understand the parameters of the invention after reviewing the intrinsic record.

31. I understand that indefiniteness is an invalidity defense, and that a defendant bears the burden to demonstrate a term is indefinite by clear and convincing evidence. I further understand that indefiniteness is a legal question with underlying factual determinations.

32. I understand that a claim is indefinite if, when read in light of the specification and the prosecution history, it fails to inform with reasonable certainty persons of ordinary skill in the art about the scope of the invention. I further understand that if a claim term is nonsensical or can be read to require an impossibility, it is indefinite.

#### **IV. LEVEL OF ORDINARY SKILL IN THE ART**

33. I understand that claim interpretation is from the perspective of a person of ordinary skill in the art at the time of the invention.

34. I understand that Shenzhen Shokz Co., Ltd. ("Shokz") claims that the '582 and '084 Patents are entitled to a priority date of August 24, 2019. I also understand that Mojawa asserts that the '582 and '084 Patents are entitled to a priority date of no earlier than December

30, 2020. I do not opine in this Declaration as to the correct priority date for these patents. In relation to issues of claim interpretation of these patents, I do not believe there is any difference in the knowledge of a person of ordinary skill in the art (“POSITA”) between August 24, 2019 and December 30, 2020. Accordingly, my opinion presented in this Declaration is the same regardless of whether the date of the invention is August 24, 2019, December 30, 2020, or any date in between.

35. In my opinion, a person of ordinary skill in the art relevant to the ’582 and ’084 Patents at the time of their invention would have had a Bachelors’ degree in electrical or computer engineering or a comparable field of study, plus approximately two to three years of professional experience with acoustic technology. Additional graduate education could substitute for professional experience, and significant experience in the field could substitute for formal education.

## **V. TECHNOLOGY BACKGROUND**

36. I have been asked to consider the construction of certain terms in the Asserted Patents. My opinions regarding the meaning of the terms in dispute are provided below. My opinions are based on my review of the intrinsic record of the Asserted Patents, the documents cited in this Declaration, and my experience as detailed in this Declaration and my CV.

### **A. The ’582 Patent**

37. The ’582 Patent is titled “Loudspeaker Apparatus.” ’582 Pat. at JA0037, cover.<sup>1</sup> The ’582 Patent is directed to a loudspeaker apparatus, specifically, bone conduction headphones with a modular design that includes an ear hook 10 surrounded by a protective sleeve 16 that is

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<sup>1</sup> The citations to “JA” in my declaration refer to the Joint Appendix that I understand is being submitted to the Court in connection with Mojawa’s opening claim construction brief.

connected at one end to a core housing 20 for accommodating an earphone core 50, and on the other end to a circuit housing 30 for accommodating a control circuit 60 or battery 70. *See, e.g.*, '582 Pat. at JA0037, Abstract, JA0056-57, 8:35-9:19, JA0070, 36:18-42, JA0040, Fig. 2.

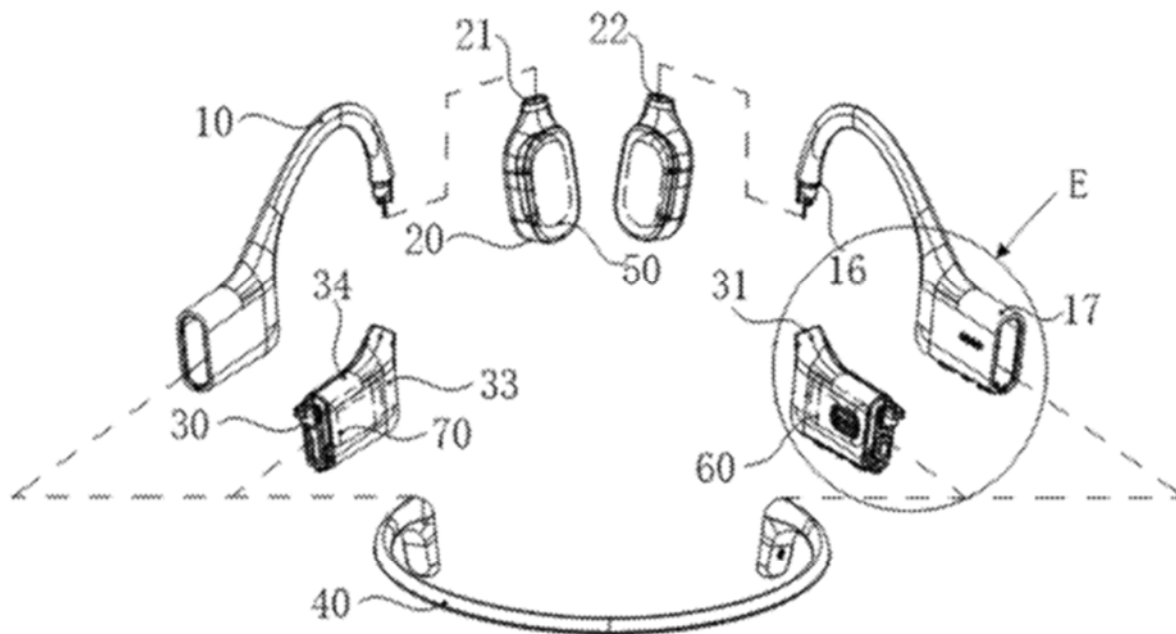


**FIG. 2**

38. The modular design of the loudspeaker apparatus is reflected by the ear hook 10, which includes a first “plug end” 14 for affixing the core housing 20 and second “plug end” 15 for affixing the circuit housing 30. '582 Pat. at JA0037, Abstract, JA0056-57, 8:35-9:19, JA0070, 36:18-42, JA0040-42, Figs. 2, 5. The plug ends 14, 15 mate with corresponding sockets in the core housing 20 and circuit housing 30. '582 Pat. at JA0053, 2:21-52, JA0058, 12:4-12, JA0060, 16:33-37.

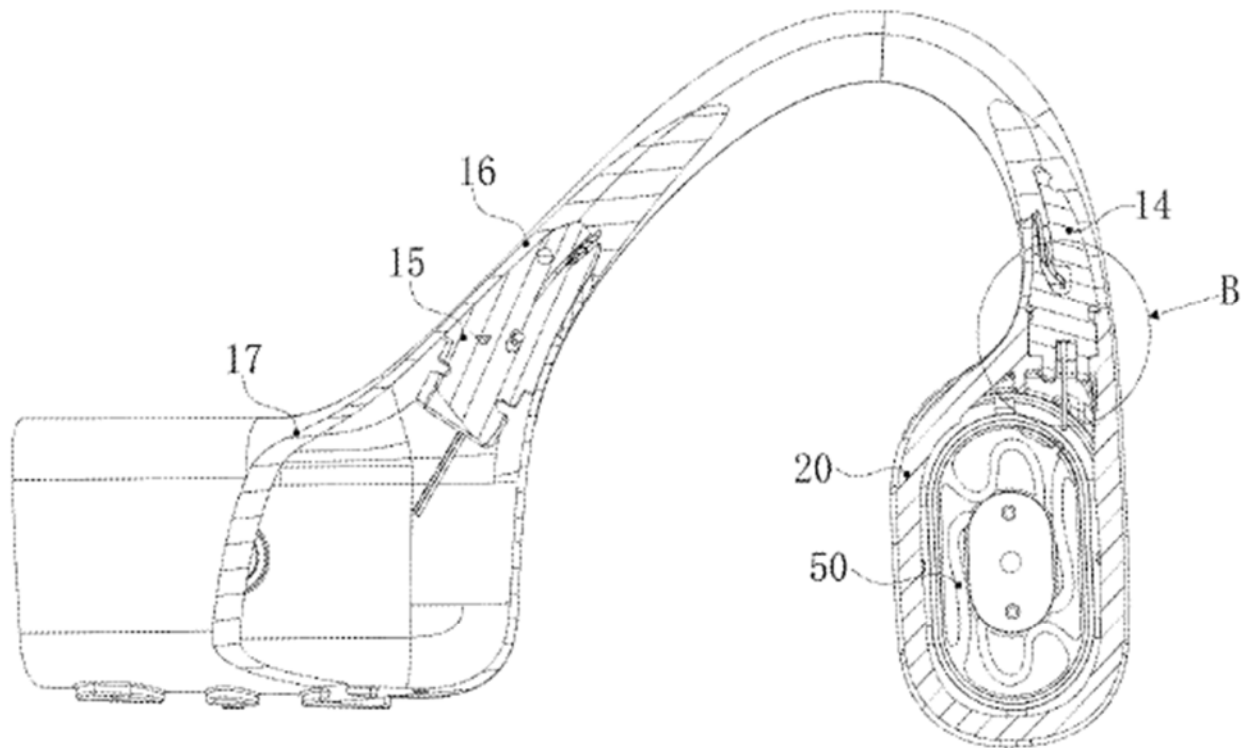


**Fig. 5**

39. Bone conduction speakers typically include a housing in contact with the human body, as generically illustrated in Figure 14 by housing 700. *E.g.*, '582 Pat. at JA0047, Fig. 14, JA0062, 20:22-56. The speakers create sound by transmitting vibration from a vibration mechanism to a housing panel 710 in contact with the human body, and then that vibration travels to the cochlea in the inner ear where the vibrations are converted into neural signals. *See, e.g., id.* The housing 700 also includes a side panel 730 and a back panel 720. *Id.*

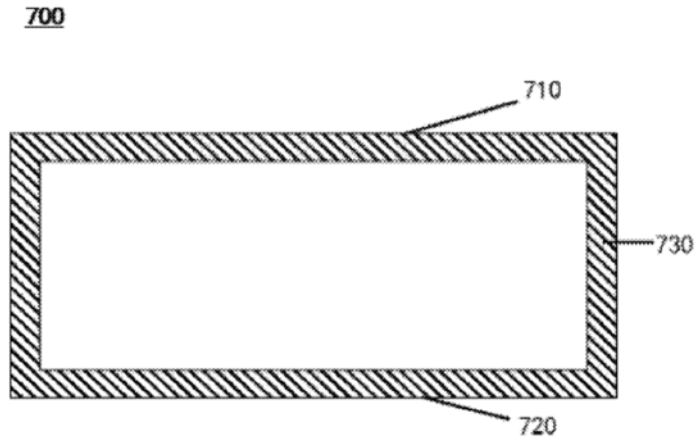


**Fig. 14**

40. The '582 Patent also discloses a magnetic circuit component 2100 for inclusion in the bone conduction speaker to generate sound. '582 Pat. at JA0048-51, Figs. 15-21, JA0063-69, 22:55-34:13, JA0071, 38:20-57. As shown below in Figure 16, "the magnetic circuit component 2100 may include a first magnetic unit 2102, a first magnetically conductive unit 2104, a second magnetically conductive unit 2106, and a second magnetic unit 2108." '582 Pat. at JA0064, 24:38-41. A voice coil 2128 may also be located in the gap between magnets. '582 Pat. at JA0065, 25:43-44.

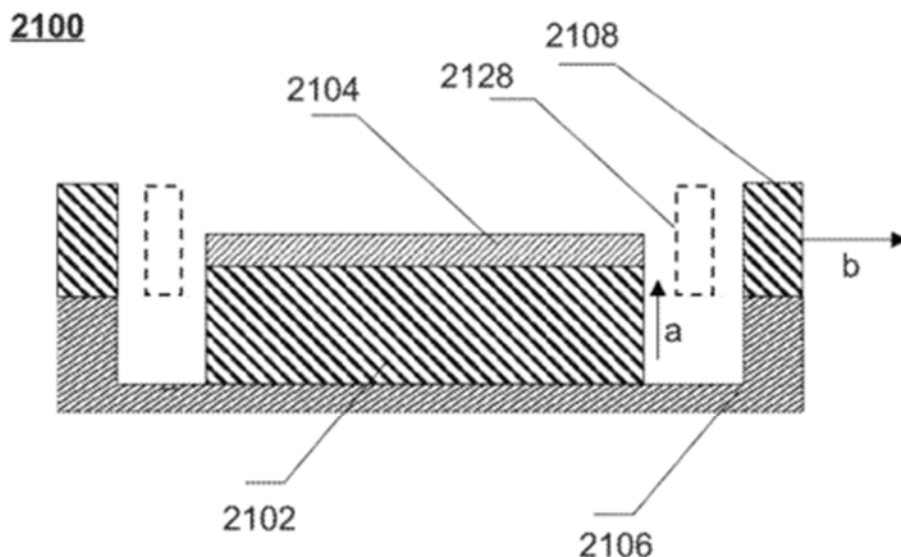


FIG. 16

### 1. Sound leakage as described in the '582 Patent

41. The '582 Patent makes reference to the sound leakage of its invention. The specification mirrors language that is later claimed in Claim 15:

In some embodiments, the vibration of the housing panel may generate *a first leaked sound wave*. The vibration of the housing back panel may generate *a second leaked sound wave*. *The first leaked sound wave and the second leaked sound wave* may be superimposed on each other, which reduces an amplitude of *the first leaked sound wave*.

'582 Pat. at JA0054, 3:4-9 (emphasis added); see also '582 Pat. at JA0071, Claim 15, JA0062, 20:29-41.

42. The patent also describes among “[t]he beneficial effects of the embodiments of the present disclosure” that “by increasing the overall rigidity of the housing, the housing panel and the housing back panel may vibrate with the same or substantially the same amplitude and

phase at higher frequencies, *thereby reducing the sound leakage of the loudspeaker apparatus.*”

’582 Pat. at JA0071, 35:53-66 (emphasis added).

43. In discussing a different embodiment of the invention transmitting a sound through air conduction, not bone conduction, the patent states “[a]mong the sounds generated by the sound source **1510** and the sound source **1520**, one portion may be transmitted to the ear of the user to form the sound heard by the user. *Another portion may be transmitted to the environment to form a leaked sound.*” ’582 Pat. at JA0070, 35:3-20 (emphasis added).

## VI. CONSTRUCTION OF DISPUTED TERMS

### A. The ’582 Patent

1. *“wherein the first leaked sound wave and the second leaked sound wave are superimposed on each other, which reduces an amplitude of the first leaked sound wave” (’582 Pat., cl. 15)*

| Claim Phrase                                                                                                                                                     | Term or | Patent and Claim(s) | Shokz’s Proposed Construction              | Mojawa’s Proposed Construction |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------|---------------------|--------------------------------------------|--------------------------------|
| “wherein the first leaked sound wave and the second leaked sound wave are superimposed on each other, which reduces an amplitude of the first leaked sound wave” |         | ’582 Patent, cl. 15 | Plain and ordinary meaning; not indefinite | Indefinite                     |

44. I understand that the parties dispute the construction of the following term in Claim 15 of the ’582 Patent: “wherein the first leaked sound wave and the second leaked sound wave are superimposed on each other, which reduces an amplitude of the first leaked sound wave.” I understand that Shokz proposes that all terms at issue in the asserted claims of the patents-in-suit be construed according to their plain and ordinary meaning, and that no terms are

indefinite. I understand that Mojawa contends that the term is indefinite. Having considered the parties' positions, I agree with Mojawa's interpretation.

45. It is my opinion that the claim term, when read in light of the specification and file history, does not inform a person of ordinary skill in the art, with reasonable certainty, of the scope of the invention. In other words, I believe a person of ordinary skill would find this term to be indefinite. Claim 15 is indefinite as nonsensical or impossible for the following reasons: (a) when the first leaked sound wave and the second leaked sound wave are superimposed, the first leaked sound wave ceases to exist and cannot have an amplitude reduction; and (b) superimposed nearly in-phase waves increase amplitude, and a first leaked sound wave's amplitude would be increased in the resultant superimposed wave.

- a. Claim 15 is indefinite because when the first leaked sound wave and the second leaked sound wave are superimposed, the first leaked sound wave ceases to exist and cannot have an amplitude reduction

46. Claim 15 requires the "first leaked sound wave and the second leaked sound wave are superimposed on each other," while simultaneously claiming "reduc[ing] an amplitude of the first leaked sound wave." A POSITA would understand that when first and second waves are superimposed on each other, the first and second waves cease and become a singular, resultant sound wave. Accordingly, one could not separate out the "first leaked sound wave" for measurement from the combined sound wave. MA0015-16, Raymond A. Serway & John W. Jewett, Jr., *Physics for Scientists and Engineers with Modern Physics* 535-36 (9th ed. 2014) (two superimposed sound waves at 60-degree phase difference create a single resultant wave).<sup>2</sup> Claim 15 is indefinite for at least this reason alone because it is nonsensical or requires an impossibility,

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<sup>2</sup> The citations to "MA" in my declaration refer to the Mojawa Appendix that I understand is being submitted to the Court in connection with Mojawa's opening claim construction brief.

*i.e.*, the first leaked sound wave amplitude cannot be reduced or measured when superimposition of the waves creates a new combined wave.

- b. Claim 15 is also indefinite because superimposed nearly in-phase waves increase amplitude, and a first leaked sound wave's amplitude would be increased in the resultant superimposed wave

47. Dependent Claim 15 of the '582 Patent is also indefinite because it inherently conflicts with independent Claim 1, from which it depends. Claim 1 claims the amplification of nearly in-phase vibrations of the housing panel and housing back panel, whereas Claim 15 depends from Claim 1 and simultaneously requires a reduction of the amplitude of a leaked sound wave of the housing panel by the same rigid bone conduction speaker. Because amplified nearly in-phase vibrations increase amplitude, a person of ordinary skill would find it nonsensical or impossible for the core housing to both amplify and decrease sound simultaneously. The specification does not explain how this can be so.

48. The '582 Patent specification does nothing to resolve this facial conflict in the claim language. The '582 Patent specification does not define its claimed "leaked sound waves." In the context of the embodiment relevant to Claim 15, the specification only discusses sound leakage in general terms, including parroting the claim language. '582 Pat. at JA0062, 20:29-41. The patent is conclusory as to how the speaker would behave regarding the subject matter of Claim 15. The '582 Patent specification mentions the "first leaked sound wave" and "second leaked sound wave," but provides no detail as to how amplitude is increased and reduced. '582 Pat. at JA0054, 3:4-9, JA0062, 20:29-41.

49. A POSITA would understand generally that bone conduction earphones may leak sound waves into the outside air depending on their construction and force of their vibration. Despite a POSITA not being able to conceptualize or measure the "first leaked sound wave" once it is superimposed on the "second leaked sound wave" as discussed above, a POSITA

reading the claim term “reduces an amplitude of the first leaked sound wave” would expect **destructive** interference to be the cause of a reduction in amplitude of a sound wave—*i.e.*, the two combined sound waves would be out of phase, including when meeting nearly crest-to-trough. MA0049-52, John D. Cutnell & Kenneth W. Johnson, *Physics* 508-11 (8th ed. 2009); MA0058-72, F. Alton Everest & Ken C. Pohlmann, *Master Handbook of Acoustics* 135-49 (5th ed. 2009). A POSITA would further expect the bone conduction earphones to be designed in such a way as to achieve this result. But that is the exact opposite of what the disputed claims require, as explained below.

50. The '582 Patent does not explain how the leaked sound waves—generated by the housing panels vibrating nearly in-phase—would result in a **reduction** of amplitude of the first leaked sound wave, rather than an **increase** in amplitude of the first leaked sound wave. Claim 1 requires the vibrations of the housing panel and housing back panel to be nearly in-phase. '582 Pat. at JA0070, Claim 1 (“an absolute value of a difference between the first phase and the second phase is less than 60 degrees”). But Claim 15 requires that when the housing panel’s leaked sound wave and the housing back panel’s leaked sound wave are “superimposed on each other,” the amplitude of the first leaked sound wave is “**reduce[d]**.” '582 Pat. at JA0071, Claim 15 (emphasis added).

51. A person of ordinary skill in the art would understand superimposed, in-phase sound waves would necessarily result in an **increase** in amplitude of the resultant sound wave, not a reduction. MA0049-52, Cutnell & Johnson, *supra*, at 508-11; MA0058-72, Everest & Pohlmann, *supra*, 135-49. This is the concept of **constructive** interference. For example, in *Master Handbook of Acoustics*, Fig. 10-2 depicts adding sine waves, and the closer to in-phase the waves are, the higher the added amplitude. MA0060-61, Everest & Pohlmann, *supra*, at 137-

38. As another example, the *Physics* textbook explains the basics of constructive interference that any POSITA would understand. MA0049-50, Cutnell & Johnson, *supra*, at 508-09. When two sound waves meet crest-to-crest and trough-to-trough, they exhibit constructive interference and an amplified sound. *Id.* The '582 Patent cannot avoid this law of physics, and a POSITA would understand this.

52. This is understood in reference to mathematical equations. MA0016-16, Serway & Jewett, *supra*, at 535-36. A POSITA would consider two sinusoidal signals, both with amplitude  $A$ , same frequency  $\omega$ , and a phase difference  $\Delta\phi$ :

$$s_1(t) = A\sin(\omega t)$$

$$s_2(t) = A\sin(\omega t + \Delta\phi)$$

53. When added together, the equation becomes:

$$s_{combined}(t) = s_1(t) + s_2(t) = A\sin(\omega t) + A\sin(\omega t + \Delta\phi)$$

54. The well-known trigonometric identity can then be used:

$$\sin x + \sin y = 2 \sin\left(\frac{x+y}{2}\right) \cos\left(\frac{x-y}{2}\right)$$

Here:  $x = \omega t$  and  $y = \omega t + \Delta\phi$ .

55. This equation then gives the following, as also cited in Serway & Jewett, MA0016, at 536:

$$s_{combined}(t) = 2A \sin\left(\omega t + \frac{\Delta\phi}{2}\right) \cos\left(\frac{\Delta\phi}{2}\right)$$

56. The equation can be rewritten as:

$$s_{combined}(t) = 2A \cos\left(\frac{\Delta\phi}{2}\right) \sin\left(\omega t + \frac{\Delta\phi}{2}\right)$$

57. The amplitude of the combined signal is:

$$A_{combined} = 2A \cos\left(\frac{\Delta\phi}{2}\right)$$

58. The oscillating part of the combined signal is:

$$\sin\left(\omega t + \frac{\Delta\phi}{2}\right)$$

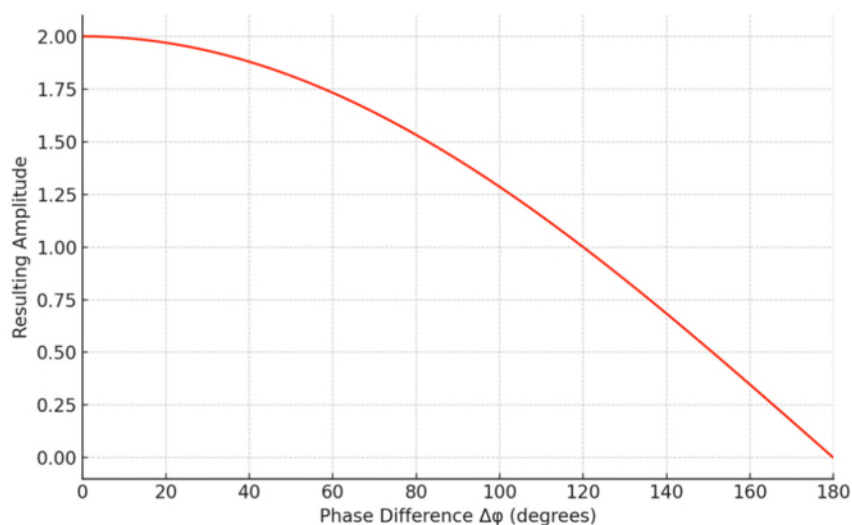
59. The oscillating part of the combined signal has the same frequency as the two original sinusoids, but is phase shifted by  $\frac{\Delta\phi}{2}$ . For example:

$$A = 1, \Delta\phi = 60^\circ = \frac{\pi}{3}$$

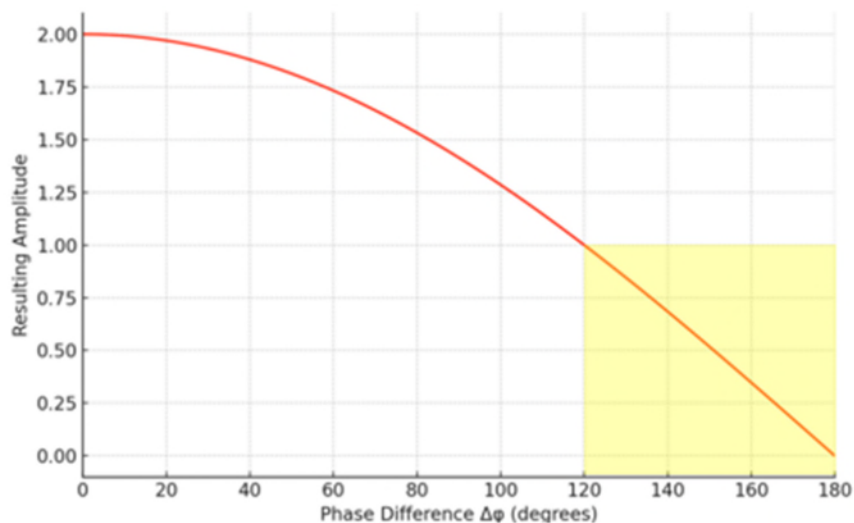
$$s_{combined}(t) = 2 \frac{\sqrt{3}}{2} \sin(\omega t + 30^\circ) = \sqrt{3} \sin(\omega t + 30^\circ)$$

60. Therefore, at a 60-degree phase difference (see Claim 1's requirement "an absolute value of a difference between the first phase and the second phase is less than 60 degrees"), vibrations cause leakage reinforcement of  $\sqrt{3} = 1.73$ , or a 73% increase and not a reduction as Claim 15 suggests.

61. The graph below shows how the combined amplitude of two sound waves changes as phase difference increases from  $0^\circ$  to  $180^\circ$ . At the out-of-phase condition ( $180^\circ$ ), the sound waves fully cancel each other out ("reduce" amplitude), but at all other phase differences, including those at 60 degrees and less than 60 degrees, the combined amplitude of the sound waves is increased.



62. Indeed, as shown in the graph below annotated in yellow, the phase difference of the sound waves would need to be greater than 120 degrees in order for the resulting amplitude to be below 1.00, *i.e.*, in order for the claimed amplitude reduction of the “first leaked sound wave” as suggested by Claim 15 to occur. This directly contradicts Claim 1’s “less than 60 degrees” phase difference requirement.



63. I understand that in Shokz’s final validity contentions, it posits “a POSITA would not identify any contradiction that would cause doubt as to the inventors’ possession of claim 15’s subject matter,” because “[a]s a POSITA would readily recognize, the housing panel

compresses the surrounding air when it moves toward the facial skin, while the housing back panel suctions the air.” MA0149-50, Shokz’s Final Validity Contentions to Mojawa, cover pleading at 77-78. “Likewise, when the housing panel moves away from the facial skin, it suctions the surrounding air while the housing back panel compresses the surrounding air.” MA0150, *id.* at 78. “Therefore, if the vibration amplitude and phase of the housing panel and the housing back panel remain the same, their forces on the surrounding air will be opposite, thus reducing air movement, reducing sound leakage, and ‘reduc[ing] an amplitude of the first leaked sound wave.’” MA0150, *id.* But a POSITA would understand Shokz’s description here to be the exact opposite of what is required by Claim 1, *i.e.*, the housing panel and the housing back panel vibrating together nearly in-phase.

64. Shokz’s final infringement contentions offer no testing or proof that the accused products would “reduc[e] an amplitude of the first leaked sound wave” as required by Claim 1—Shokz just assumes it happens. Shokz’s Final Infringement Contentions to Mojawa, Ex. C at 48-50 (MA0194-96); Ex. D at 68-70 (MA0205-07); Ex. E at 54-55 (MA0214-15); Ex. F at 33-34 (MA0221-22). So is true of the description in the ’582 Patent specification. ’582 Pat. at JA00062, 20:29-41. But such a result would not happen in a device with the requirements of Claim 1, where the vibrations of the housing panels of the rigid core housing are nearly in-phase and therefore amplified. Shokz’s own interpretation of its own claim language, as expressed in its infringement and invalidity contentions therefore sheds no light on this issue.

65. Shokz cites no intrinsic evidence to support its compression/suction theory described above. MA0149-50, Shokz’s Final Validity Contentions, cover pleading at 77-78. Shokz cites to a different patent, U.S. Patent No. 11,115,751, as evidence a POSITA would have understood the interaction described by Shokz. MA0150-51, Shokz’s Final Validity Contentions,

cover pleading at 78-79. None of the disclosures cited by Shokz are intrinsic evidence to the patent. At any rate, the disclosures cited by Shokz parrot its theory and suffer from the same problems as the '582 Patent specification itself: in-phase vibrations of a rigid core housing result in amplification, not the reduction, of leaked sound waves. A POSITA would understand the two housing panels in a closed cavity moving air up and down with nearly the same phase (Claim 1) and amplitude as described in the '582 Patent ("when the overall rigidity of the housing 700 is relatively large, the vibration amplitudes and phases of the housing panel 710 and the housing back panel 720 keep the same or substantially the same," JA0062, 20:22-56) superimposed on one another would not reduce amplitude of the leaked sound wave according to the laws of physics. All the patent describes as reducing sound leakage is the generic performance of a rigid core housing of a bone conduction earphone. A POSITA would not understand that performance alone to reduce sound leakage.

66. The prosecution history offers no clarity on the contradiction between the claims. There is no discussion in the file history regarding the content of Claim 15. The claim was originally proposed by applicant as a dependent claim and eventually issued without amendment. Similarly, Claim 1 issued as originally proposed without amendment after applicant filed a terminal disclaimer to overcome a nonstatutory double patenting rejection of Claim 1. JA1768-86, '582 Pros. History at Amendment (Dec. 27, 2021), JA001701-08, Notice of Allowance (Jan. 12, 2022). The examiner only noted specific Claim 1 elements that were absent in the prior art, including the nearly in-phase claim element<sup>3</sup> that conflicts with Claim 15. JA001701-08, Notice

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<sup>3</sup> "the vibration of the earphone core drives the housing panel and the housing back panel to vibrate, the vibration of the housing panel having a first phase, the vibration of the housing back panel having a second phase, wherein when the vibration frequencies of the housing panel and the housing back panel is within a range of 2000 Hz to 3000 Hz, an absolute value of a difference between the first phase and the second phase is less than 60 degrees"

of Allowance (Jan. 12, 2022). It is therefore possible the examiner focused on the Claim 1 language without recognizing its contradiction with Claim 15. Regardless, the prosecution history does not clarify the meaning of Claim 15 or alleviate its contradiction with Claim 1.

67. The impossibility of Claim 15 creates irresolvable uncertainty over claim scope. It is unclear to a person of ordinary skill how dependent Claim 15 can be realized, as it must, in the context of independent Claim 1. A person of ordinary skill would understand that the results of Claim 15 could not occur simultaneously with the requirements of Claim 1 for the reasons provided above. In my opinion, therefore, to a person of skill in the art, the claim term lacks any certainty as to its meaning or scope, let alone reasonable certainty, and hence, the claim is indefinite.

# APPENDIX A

## Prof. Chris Kyriakakis

### Contact

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 Wikipedia: [http://en.wikipedia.org/wiki/Chris\\_Kyriakakis](http://en.wikipedia.org/wiki/Chris_Kyriakakis)

### Education

|                    |                                                                                        |
|--------------------|----------------------------------------------------------------------------------------|
| <b>PhD</b><br>1993 | <b>University of Southern California (USC)</b><br>Electrical Engineering               |
| <b>MS</b><br>1987  | <b>University of Southern California (USC)</b><br>Electrical Engineering               |
| <b>BS</b><br>1985  | <b>California Institute of Technology (Caltech)</b><br>Engineering and Applied Science |

### Positions

|                                              |                                      |
|----------------------------------------------|--------------------------------------|
| <b>Associate Professor</b><br>2002-Present   | <b>USC</b><br>Electrical Engineering |
| <b>Assistant Professor</b><br>1996-2002      | <b>USC</b><br>Electrical Engineering |
| <b>Research Fellow</b><br>1993-1996          | <b>USC</b><br>Electrical Engineering |
| <b>CTO</b><br>2002-2018                      | <b>Audyssey Laboratories</b>         |
| <b>Chief Audio Scientist</b><br>2019-Present | <b>SYNG</b>                          |

### Research Areas

Immersive audio signal processing, machine learning for audio and acoustics, room equalization, room acoustics, headphone acoustics, multichannel audio streaming, microphone array processing, head-related transfer function modeling, adaptive algorithms for virtual microphones, virtual loudspeakers, multichannel audio rendering, archaeoacoustics.

### Honors and Awards

|      |                                                                                          |
|------|------------------------------------------------------------------------------------------|
| 2018 | Elected as Senior Member of the Institute of Electrical and Electronics Engineers (IEEE) |
| 2006 | World Technology Network Award                                                           |

James P. Clark, Chairman of the World Technology Network: “The World Technology Awards program is a very inspiring way to identify and honor the most innovative people and organizations in the technology world...We look forward to assisting Prof. Kyriakakis continue to help create our collective future and change our world.”

- 2004 National Academy of Engineering: Frontiers of Engineering Session Chairman
- 2003 Best Paper Award: IEEE 37<sup>th</sup> Asilomar Conference on Signals, Systems, & Computers

## **Professional Service (Past and Current)**

### **Society Memberships**

Member of the Audio Engineering Society (AES)  
Senior Member of the IEEE  
Member of the Acoustical Society of America (ASA)  
Member IEEE Technical Committee on Multimedia  
Member of AES Technical Committee on Multichannel and Binaural Audio  
Member of AES Technical Committee on Audio for Games

### **Reviewer**

National Science Foundation  
IEEE Transactions on Multimedia  
IEEE Transactions on Signal Processing  
IEEE Transactions on Audio, Speech, and Language Processing  
European Association for Signal Processing (EURASIP)  
IEEE International Conference on Acoustics, Speech, and Signal Processing (ICASSP)  
IEEE Workshop on Applications of Signal Processing to Audio (WASPAA)  
IEEE Workshop on Multimedia Signal Processing  
ACM Special Interest Group on Graphics and Interactive Techniques (SIGGRAPH)  
European Signal Processing Conference (EUSIPCO)  
Audio Engineering Society  
Acoustical Society of America

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1. S. Bharitkar and C. Kyriakakis, "Immersive Audio Signal Processing," Springer-Verlag, New York, (2006).
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4. Systems and Methods for Loudspeaker Layout Mapping W02023070105A2 (2023)
5. Systems and Methods for Audio Upmixing EP 4252432 (2023)
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13. Room Acoustic Response Modeling and Equalization with Linear Predictive Coding and Parametric Filters. 8,363,853 (2013)
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16. Phase Equalization for Multi-Channel Loudspeaker-Room Responses. 8,218,789 (2010)

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19. Personal Audio Docking Station. D629,391 (2010)
20. Cross-Over Frequency Selection and Optimization of Response Around Cross-Over. 7,826,626 (2010)
21. System and Method for Automatic Room Acoustic Correction in Multi-Channel Audio Environments. 7,769,183 (2010)
22. Phase Equalization for Multi-Channel Loudspeaker-Room Responses. 7,720,237 (2010)
23. System and Method for Automatic Multiple Listener Room Acoustic Correction with Low Filter Orders. 7,567,675 (2009)

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<https://www.youtube.com/watch?v=82QTD0RoB0Q>
- January 10, 2021**     **The New Yorker:** The origins of video-chat voice  
<https://www.newyorker.com/tech/annals-of-technology/the-origins-of-video-chat-voice>
- May 11, 2019**     **Observer:** Inside the world of sound designers who create tech's noisy notifications  
<https://observer.com/2019/05/app-sounds-notifications-design/>
- May 1, 2019**     **New York Magazine:** I tried a \$500 sound-therapy machine  
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- December 2, 2017**     **BBC World Service:** Symphony of the Stones  
<http://www.bbc.co.uk/programmes/w3csvq4j>
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**CERTIFICATE OF SERVICE**

I, Shaobin Zhu, hereby certify that on August 29, 2025, a copy of the foregoing DEFENDANT SUZHOU MOJAWA INTELLIGENT ELECTRONIC CO., LTD.'S OPENING CLAIM CONSTRUCTION BRIEF was filed electronically. Notice of this filing will be served on Plaintiff's counsel via the CM/ECF system.

/s/ Shaobin Zhu  
Shaobin Zhu