Paper No. 41

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

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

v.

RESONANT SYSTEMS, INC.,
Patent Owner.

Case No. IPR2023-00993
U.S. Patent No. 9,941,830

PATENT OWNER'S SUR-REPLY

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Exhibit No	*Description*
2001	Order Denying Samsung Motion to Stay Pending IPR
2002	Time to Trial Statistics (excerpted)
2003	Resonant Systems Patent Infringement Contentions (cover document)
2004	Samsung Invalidity Contentions
2005	Declaration of Paul Kroeger in support of motion for *Pro Hac Vice* recognition
2006	Declaration of Christian Conkle in support of motion for *Pro Hac Vice* recognition
2007	Declaration of Christian Conkle in support of corrected motion for *Pro Hac Vice* recognition
2008	Expert Declaration of Keith W. Goossen, Ph.D.
2009	Curriculum Vitae of Keith W. Goossen, Ph.D.
2010	Transcript of Deposition of Andrew Wolfe, Ph.D., March 28, 2024
2011	Resonant Systems v. Samsung Joint Claim Construction Statement (cover document)
2012	Resonant Systems v. Samsung Joint Claim Construction Statement Exhibit A
2013	Getting Started with the Palm m100 Handheld
2014	Motorola ULTRA Express FLX User's Guide
2015	[Reserved
2016	Excerpts of P. Horowitz and W. Hill, The Art of Electronics, 2nd Edition
2017	Transcript of Deposition of Andrew Wolfe, Ph.D., August 21, 2024

I. INTRODUCTION

In its Patent Owner's Response, Resonant Systems demonstrated that Samsung had failed to establish obviousness of the challenged claims. The Reply fails to demonstrate that any of the claims is obvious under any of the obviousness grounds presented in the Petition. Accordingly, Samsung's grounds should be rejected and the validity of all challenged claims confirmed.

II. CLAIM CONSTRUCTION

As the Reply confirms, the parties agree that it is unnecessary to resolve any disputes concerning the constructions of "moveable component," "driving component," or the dependency of claim 4 in order to decide this IPR. As for the "control component" terms, the parties agree that they should be construed as means-plus-function terms, but disagree as to certain aspects of the corresponding structure. As explained further below, to the extent that the Board resolves the remaining disputes, it should adopt the constructions offered in the Patent Owner's Response.

A. "moveable component"

The parties agree that it is unnecessary to decide whether this term is a means-plus-function term or otherwise to construe it in order to resolve this IPR. (Reply at 7.) However, to the extent the Board resolves the dispute as to

whether this is a mean-plus-function term, the requirement that the component be "moveable" is fundamentally a requirement of structure, namely that the component be structured so as to be moveable, rather than having a shape that made it immovable or being in some way rigidly fixed to the housing, for example.

As noted in the Patent Owner's Response, rewriting "movable component" as "a component that moves" changes the plain meaning of the claim term. The Reply has no response on this point. Rather, it argues that "essentially any physical component can perform the function of being moved" and points to the "highly disparate" movable components in the disclosed embodiments. (Reply at 2.) But Samsung cites to no authority suggesting that mere breadth of possible embodiments for a claim term means it is a means-plus-function term. As this term imposes structural requirements, it should be construed as a non-means-plus-function term.

B. "driving component…"

The parties likewise agree that it is unnecessary to resolve the parties' disputes concerning this term in order to resolve this IPR. (Reply at 4.) Both agree that the term is a means-plus-function term and should be construed to encompass at least electromagnetic coils. (Reply at 3–4.)

However, to the extent the Board resolves the remaining disputes concerning this term, it should not be limited solely to "electromagnetic coils," for the reasons explained in the Patent Owner's Response. Embodiments of the invention such as Figure 10 contain an "electromagnet," without any statements limiting such an electromagnet to an electromagnetic coil. Petitioners do not dispute that "electromagnet" is a class of structures known to a POSITA or that the electromagnets in the disclosed embodiments perform the claimed function of the "driving component . . . ." The fact that other embodiments are described as using coils specifically is not an adequate reason to limit the corresponding structures from embodiments that refer to the broader class of "electromagnets."

C. "control component…"

The Board addressed the "control component . . ." limitations in its institution decisions for both this IPR and co-pending IPR2023-00992. While the analyses in these two institution decisions differs, both institution decisions conclude that it is unnecessary to determine whether 35 U.S.C. § 112, ¶ 6 governs these terms—and therefore unnecessary to determine what the corresponding structure is—in order to decide institution. (IPR2023-00992, Institution Decision at 27; IPR2023-00993, Institution Decision at 10.)

In a recent decision denying institution of IPR2024-00570, brought by Sony challenging the ’830 patent, the Board did construe the “control component . . .” terms. (IPR2024-00570, Paper 9.) There, the Board agreed with the parties in that IPR—and in the present IPR—that the terms are means-plus-function terms, and it adopted the following corresponding structure for embodiments involving a microprocessor:

> In summary, the corresponding structure of the “control component” under a means plus function interpretation that relies upon a microprocessor (and memory) as corresponding structure further requires algorithmic structure at least for 1) computing an output value corresponding to a user-selected amplitude of oscillation and outputting the value to the claimed power supply so that the power supply outputs an appropriate current amplitude to a coil, and 2) operating a timer or its equivalent to flip the polarity of a control value periodically corresponding to a user-selected frequency and input the control value to an H-bridge switch circuit to change the direction of the current through the coil as supplied by the power supply.

(*Id.* at 21.) This identification of structure differs in certain ways from the structure identified by Patent Owner in that IPR (*id.* at 13) and in the present IPR, and Patent Owner does not advocate the Board adopting its IPR2024-00570 construction in this IPR. However, the Board should determine that the

"control component . . ." terms are means-plus-function, as it did in IPR2024-00570 and as each of the parties argues in this IPR.

The Reply largely fails to address the arguments of the Patent Owner's Response concerning these terms. (*Compare* POR at 9–17 *with* Reply at 5–7.) To the extent the Reply does address these terms, it fails to establish that Petitioners' identification of structure should be adopted.

Petitioners argue that the corresponding structure must include an output to an H-bridge, because the claimed function includes control of frequency. (Reply at 5–6.) However, this argument rests on an unduly narrow interpretation of the claimed function. The parties agree that the claimed function is to "control[] supply of power from the power supply to the driving component to cause the moveable component to oscillate at a frequency and an amplitude specified by one or more stored values." (Reply at 5.) This claimed function: (1) requires controlling supply of power from the power supply to the driving component, (2) requires that the supply of power cause the moveable component to oscillate, and (3) requires that the oscillation be at a frequency and an amplitude specified by one or more stored values. While the claimed function does require that the oscillation be at a frequency specified by one or more stored values, it does not require that the claimed control component itself control that frequency.

Concerning the control component terms in claims 3 and 4, Patent Owner does not believe the distinction between receiving an output signal and receiving the value of an output signal to be a material one. Indeed, Petitioners' proposed construction omits the receiving step altogether. To the extent that the Board believes this distinction is material, it could adopt Patent Owner's propose construction with the modification that the steps include "(a) receive an output signal, (b) compare the value of that signal to a different value, which could be a previous value, ..." Alternatively, the Board could omit the receiving step, as proposed by Petitioners.

D. Claims 4–6

The parties agree that the Board need not decide the question of whether claim 4 depends upon claim 3, rather than upon claim 1. (Reply at 7.) The Patent Owner's Response explains the reasons for concluding that the identification of claim 1, rather than claim 3, as the parent claim for claim 4 was a typographical error. Neither the Petition nor the Reply disputes this conclusion. Accordingly, to the extent that the Board resolves the issue, it should determine that claim 4 and its dependent claims depend from claim 3.

III. OBVIOUSNESS

A. The Mapping of Prior Art in the Petition Fails to Satisfy Element 1[f] and Related Elements for Grounds 1A-U, 2A-I

The Reply seeks to establish that H-bridges, oscillator circuits, and inverters were "well-known." (Reply at 17.) Accepting *arguendo* that this is true, this argument is a red herring. The relevant question is whether Petitioners have shown that Fukumoto in combination with a POSITA's purported knowledge of such circuits would have rendered obvious a device that satisfies the properly construed claims. As explained in the Patent Owner's Response and in further detail below, they have failed to do so.

As explained in the Patent Owner's Response, the Petition's obviousness arguments all rest on the "control component" including a processor. (POR at 19–20.) The Reply confirms this, identifying "the CPU 113 and drive signal generation circuit 114 in Fukumoto" as the "control component" under an (incorrect) non-MPF construction (Reply at 20–21) and "a processor and H Bridge switch" as the "control component" under its MPF construction (Reply at 21–22). Accordingly, the control component must perform an algorithm with a step including providing an output to the power supply, under any of the parties' means-plus-function constructions or the construction adopted by the Board in IPR2024-00570.

In an attempt to salvage their obviousness challenge, Petitioners change their mapping of Fukumoto to the claims in their Reply. Specifically, they argue that "the petition's MPF analysis explains that Fukumoto's power supply includes drive signal generation circuit 114." (Reply at 21.) But the Petition never identifies drive signal generation circuit 114 as a part of the power supply.

For element 1[c], i.e. for the "power supply" of the claims, the Petition never mentions drive signal generation circuit 114. Indeed for grounds 1A-U, the Petition fails to mention any specific component in Fukumoto as the claimed "power supply." (Pet. at 15–16.) Rather, it points to the disclosures of "small drive power" and of "power consumption" to argue that Fukumoto "discloses or suggests" a power supply, without suggesting that element 114 or any other specific element in Fukumoto's teachings is actually part of such a power supply. (*Id.*) For grounds 2A-I, the Petition does not even mention Fukumoto at all, in arguing that element 1[c] would be obvious. (Pet. at 79–80.)

In its discussion of element 1[f], the Petition likewise never identifies element 114 as a part of the power supply. At least in the context of its non-MPF theories, the Petition expressly identifies element 114 of Fukumoto as a part of the "control component," not the "power supply." (Petition at 21.) The

Reply quotes a statement from the Petition that the CPU "instructs the drive signal generation circuit 114 to generate a drive signal" as allegedly "explain[ing] that Fukumoto's power supply includes drive signal generation circuit 114." (Reply at 21.) But in making this argument, the Reply omits half of the sentence it relies upon. The actual statement in the Petition is:

> Additionally, Fukumoto's CPU provides a corresponding output to the power supply when it "instructs the drive signal generation circuit 114 to generate a drive signal," ***and in response***, "the drive signal generation circuit 114 generates a drive signal using the waveform data supplied from the CPU 113."

(Pet. at 22 (emphasis added).) The Petition makes clear that its theory is that the output to the power supply occurs when the drive signal generation circuit 114 generates a drive signal, not when the CPU instructs the drive signal generation circuit 114. If the Petition really contended that drive signal generation circuit 114 was part of the power supply and that instruction from the CPU to this circuit constituted providing an output to the power supply, as the Reply argues, there would have been no reason to include the second half of the sentence quoted above.

Moreover, the Petition expressly refers to "a processor, circuitry to convert power supplied from, for example, the battery in the electronic device to the AC drive signal (equivalent to the '830 patent's disclosed H-bridge

switch)." (Pet. at 23.) The only natural interpretation of a statement that power is "supplied" from a battery is that the battery is (at least an example of) the "power supply" in the Petition's mapping of the claims.

Petitioners were required to set forth their theory of obviousness in their Petition and to do so clearly. *Harmonic Inc. v. Avid Tech., Inc.*, 815 F.3d 1356, 1363 (Fed. Cir. 2016) (citing 35 U.S.C. § 312(a)(3) as "requiring IPR petitions to identify 'with particularity . . . the evidence that supports the grounds for the challenge to each claim'"); *Wasica Finance GMBH v. Continental Auto. Systems*, 853 F.3d 1272, 1286 (Fed. Cir. 2017) (holding that new arguments in a reply brief are "foreclosed by statute, our precedent, and Board guidelines"); *Ariosa Diagnostics v. Verinata Health, Inc.*, 805 F.3d 1359, 1367 (Fed. Cir. 2015) (affirming Board rejection of reply arguments that relied "on previously unidentified portions of a prior-art reference to make a meaningfully distinct contention.")

Petitioners should not be permitted to change their mapping of Fukumoto to the claimed "power supply" and related limitations after Patent Owner has submitted its Response, pointing out the flaws in this mapping. *Wasica*, 853 F.3d at 1286 (noting that "[a]fter [patent owner] pointed out the flaws of this position, [petitioner]'s ensuing arguments to the Board and to us effectively abandoned its petition in favor of a new argument" and affirming the Board's

decision to reject these new arguments as untimely). Because the mapping of prior art to the claim limitations set forth in the Petition fails to satisfy the claims under any correct construction of "control component," Petitioners' grounds should be rejected.

Moreover, under Petitioners' proposed constructions of the "control component" terms, Petitioners fail to show that use of oscillators or inverters in Fukumoto's system would involve an equivalent to the algorithm step of "provid[ing] a corresponding output to the H-bridge switch." Even accepting Petitioners' arguments that an oscillator or inventor could accept an output from a processor as an input (Reply at 18), Petitioners fail to address the differences between the inputs to these components and the inputs to an H-bridge or to provide any non-conclusory argument that the algorithm steps to provide these outputs would be equivalent. For this additional reason, Petitioners' obviousness arguments for all grounds fail under their proposed construction of "control component."

B. Petitioners Fail to Establish a Motivation to Combine Embodiments of Fukumoto to Satisfy the Limitations of Claim 8 for Grounds 1A-1C

Petitioners' argument that it is not required to provide a motivation to combine the disclosures of different embodiments of a single reference misstates the law. The part of *General Electric* quoted by Petitioners speaks of

elements "present together" in a prior art reference and counsels against "dis-sect[ing]" a reference "into collections of individual elements," thereby "re-quiring a party showing obviousness to re-do the work already done in the prior art reference." *General Electric Co. v. Raytheon Techs. Corp.*, 983 F.3d 1334, 1352 (Fed. Cir. 2020).

In other words, *General Electric* states that there is no need to show a motivation to combine elements in the way that a prior art reference has al-ready combined them, by including them within a ***single*** embodiment. *Gen-eral Electric* certainly does not announce a general presumption of motivation to combine ***different*** embodiments of a reference, in every possible manner that a party challenging the patent might suggest would satisfy a challenged claim. Indeed, the Federal Circuit has clearly stated that both a motivation to combine and reasonable expectation of success must be demonstrated, when seeking to combine multiple embodiments from the same reference. *In re Ste-pan Co*., 868 F.3d 1342, 1346 n.1 (Fed. Cir. 2017) ("Whether a rejection is based on combining disclosures from multiple references, ***combining multi-ple embodiments from a single reference***, or selecting from large lists of ele-ments in a single reference, ***there must be a motivation to make the combination and a reasonable expectation that such a combination would be successful***. . . ." (emphasis added)).

Petitioners assert that Fukumoto "explicitly suggests" modifying its Figure 3 embodiment with its Figure 83 embodiment, but the Reply fails to point to any such explicit suggestion. (Reply at 23.) The statement in Fukumoto that "the vibrator generator is not limited to a linear oscillatory actuator" says nothing about changing the number of springs in the Figure 3 embodiment, particularly when the embodiment with an additional spring would still be a "linear oscillatory actuator." The statements concerning Figure 83 are expressly statements about modifying an "electrostatic type oscillatory actuator" and does not "explicitly suggest" anything about the Figure 3 electromagnetic embodiment.

Petitioners cite Dr. Wolfe's deposition testimony as "explain[ing]" that increasing the driving force in Fukumoto's Figure 3 "would require" a second spring. (Reply at 23–24.) But the cited testimony does not say anything about a second spring being required. To the contrary, Dr. Wolfe's testimony confirmed that the force applied to a spring to achieve a given displacement can alternatively be increased by using a single spring with a greater spring constant. (Ex. 2010 at 45:11–23.)

Neither the Petition nor the Reply provide a reasoned explanation, supported by reliable evidence, for why a POSITA would have been motivated to modify Fukumoto's electromagnetic embodiment of Figure 3 to add a second

spring. Accordingly, the fail to establish that claim 8 is obvious under any of grounds that rest on Fukumoto for this limitation. (Grounds 1A–C.)

C. Petitioners Fail to Demonstrate that Combinations Involving Ueda (or Any Other Combinations) Render Claims 3-6 Obvious Under Their Proposed Constructions for Grounds 1A-1F, 2D-2F

To the extent that the Board adopts Petitioners' construction for "control component" in claims 3 and 4, requiring conversion of a signal to an integer and comparison of that integer, Petitioners have failed to demonstrate that limitation is rendered obvious by any of their combinations involving Ueda—or by any of their other invalidity grounds.

As noted in the Patent Owner's Response, the Petition never even mentions integers, except to recite Petitioners' proposed constructions for "control component." (POR at 30–31.) In the Reply, they argue for the first time that Ueda actually discloses conversion to an integer, as a POSITA purportedly "would readily have understood." (Reply at 25.) Surprisingly, their expert Dr. Wolfe did not offer any opinions in his supplemental declaration to support this new position concerning Ueda's disclosures and what a POSITA would have understood. (Ex. 1047.) Rather, they cite to paragraphs from Dr. Wolfe's original declaration, which like the Petition say nothing about integers other than to recite Petitioners' proposed constructions. (Reply at 25.)

Petitioners' unsupported attorney argument that Ueda discloses conversion to an integer (and comparison of the integer) is not credible. Ueda never mentions integers. (Ex. 1008.) Indeed, it never mentions or suggests digital signals or algorithms of any kind. (*Id.*) In contrast, Ueda's specification contains the word "voltage" 369 times. Ueda consistently reads as an analog system, utilizing feedback control to control analog voltages. (*E.g.*, *id.*, ¶ [0028].) Comparing the magnitude of the output signals Oop and Dop, as described in Ueda ¶ [0149] does not require conversion to a digital value, let alone to an integer. (*Id.*, ¶ [0149].) At the very least, the attorney assertions in the Reply do not demonstrate that conversion to an integer is required. (Reply at 25.)

Petitioners also argue, apparently in the alternative, that Ueda's algorithm would be implemented in a "general-purpose processor" and utilized conversion to "digital values," based upon the combination with Fukumoto or with Ogusu-Fukumoto. (Reply at 26.) This is a new argument. In the Petition, the argument was that Ueda itself taught a processor programmed with the necessary steps, including conversion to an integer. (Pet. at 50–51.) As noted above, this is not a credible position, because Ueda never mentions integers, digital values, or processors, and neither Petitioners nor their expert explain why a POSITA would understand its teachings to disclose use of a processor.

The new argument—that it would have been obvious to modify Ueda's teachings to implement Ueda's algorithm in a general-purpose processor—is unsupported. As purported support, the Reply cites to paragraphs from the original declaration of Dr. Wolfe that say nothing about a processor, other than to acknowledge it is a requirement of Petitioners' proposed claim constructions. (Reply at 26; Ex. 1003, ¶¶ 241, 337.) The Reply also cites to paragraphs from the supplemental declaration of Dr. Wolfe, but those new paragraphs offer no reasoned argument for why a POSITA would have been motivated to implement Ueda's algorithm in a general-purpose processor, but instead cite the paragraphs from his original declaration that failed to substantively address the processor issue. (Reply at 26; Ex. 1047, ¶¶ 16–17.)

Petitioners have failed to provide any reasoned, supported, non-conclusory explanation for why a POSITA would have been motivated to implement an algorithm based upon Ueda in a processor, let alone to convert to integers and compare integers as part of that implementation. Accordingly, they have failed to show that claims 3–6 are obvious under Respondents' proposed claim constructions for the "control component" terms in claims 3 and 4.

D. Petitioners Fail to Demonstrate a Motivation to Combine Fukumoto with Erixon or with Fuller for Grounds 1G-1L

Petitioners argue that Patent Owner's arguments against a motivation to combine Fukumoto with Erixon or with Fuller are "contrary to the law" because they assume physical incorporation of the Erixon or Fuller motors into Fukumoto. But it is Petitioners, not Patent Owner, that argued the combinations would involve "simple substitution." (Pet. at 59–60, 63–64, 66.)

Patent Owner's Response explained a consequence of this "simple substitution" of the tube-shaped structures of Erixon or Fuller into Fukumoto, namely that incorporating the tube-shaped structures into Fukumoto's PDA-type device would result in vibrations perpendicular to the direction necessary to provide the key-press haptic feedback required in Fukumoto. (POR at 33–34, 37–38.) As a result, a POSITA would not be motivated to make the "simple substitutions" proposed by Petitioners.

Petitioners were not required to argue for simple substitution. They could have argued for some change to the tube-shaped structures of Erixon or Fuller to satisfy the requirements of Fukumoto, but even in the Reply they declined to do so. As for the argument that Fuller's motor could be incorporated into Fukumoto scaled to "very small" size, Petitioners fail to explain how a POSITA would have been motivated to replace the existing vibrating structure in Fukumoto with such a "very small" version of Fuller's motor. "Very small"

motors will have correspondingly "very small" masses and produce correspondingly "very small" vibrations. Substantially smaller vibrations will not produce the same key-press haptic feedback that is provided in Fukumoto's PDA.

For these reasons and the reasons set forth in the Patent Owner's Response, Petitioners have failed to establish a POSITA would have been motivated to combine Fukumoto with Erixon or with Fuller as Petitioners propose.

E. Petitioners Fail to Demonstrate that Combinations Involving Dong Render Claim 14 Obvious for Grounds 1M-1O

The Patent Owner's Response demonstrated that neither Ogusu or Dong shows the use of paramagnetic materials shaped and positioned to reduce reluctance of a magnetic circuit. In particular, Dr. Goossen explained that the tungsten counterweight in Dong is not part of Dong's magnetic circuit. (Ex. 2008, ¶¶ 140–141.) Petitioners' expert does not address this issue in his supplemental declaration (Ex. 1047), and Petitioners instead resort to attorney argument in an attempt to rebut Dr. Goossen. (Reply at 13–15.) This attorney argument is unpersuasive. Petitioners note that the magnet and counterweight in Dong move, but they fail to show how much they move or how such motion would affect the magnetic field lines in Dong's Figure 6. They further fail to demonstrate that the tungsten counterweight would form part of the magnetic circuit or reduce the reluctance of that circuit as the magnet and counterweight

moved. In the absence of any prior art that actually shows paramagnetic materials shaped and positioned to reduce reluctance of a magnetic circuit, Petitioners have failed to demonstrate that a POSITA aware of the teachings of Fukumoto, Dong, and Ogusu would have been motivated to modify them to satisfy the limitations of claim 14. For this reason and for the other reasons set forth in the Patent Owner's Response, Petitioners have failed to demonstrate that claim 14 is obvious.

F. Petitioners Fail to Establish that the Proposed Combinations Involving Fukumoto and Saiki Satisfy the Limitations of Claim 16 for Grounds 1S-1U

As explained in the Patent Owner's Response, the Petition relies upon the addition of frequency signals P1 and P2 as purportedly satisfying the limitation "a primary oscillation frequency modulated by a modulating oscillation frequency," with P1 as the "primary oscillation frequency" and P2 as the "modulating oscillation frequency." (POR at 49–50.) As the Response and Patent Owner's expert Dr. Goossen explain, such addition of two frequency signals is not "modulation." (*Id.*)

Nothing in the evidence cited in Petitioners' Reply indicates otherwise. For example, Dr. Wolfe's supplemental declaration quotes from two dictionary definitions. The first definition is from an IEEE standards dictionary:

> **modulation (1) (A) (data transmission)** *(Carrier)*. (i) The process by which some characteristic of a carrier is varied in accordance with a modulating wave. (ii) The variation of some characteristic of a carrier. *See also:* angle modulation; modulation index. **(B) (data transmission)** *(Signal transmission system)*. (i) A process whereby certain characteristics of a wave, often called the carrier, are varied or selected in accordance with a modulating function. (ii) The result of such a process. *See also:* angle modulation; modulation index.

(Ex. 1049 at 4.) Each of the sub-definitions in this definition requires varying a characteristic of a carrier. The second definition, from the American Heritage Science Dictionary is similar:

> **modulate** (mŏj′ə-lāt′) To vary the amplitude, frequency, or some other characteristic of a signal or power source. See also **amplitude modulation, frequency modulation.**

(Ex. 1050 at 4.) Like the IEEE dictionary definition, this definition requires "vary[ing]" a characteristic (such as amplitude or frequency) of an existing signal.

Simply adding the frequency P2 to the primary oscillation frequency P1 does not satisfy these definitions. The characteristics of P1 such as amplitude or frequency are left unchanged. A separate signal P2 is simply added.

In addition to citing these dictionary definitions, Dr. Wolfe also discusses examples of forms of modulation from textbooks and data sheets. (Ex. 1047, ¶¶ 9–13.) But none of those examples achieves modulation by the simple addition of two signals. Nothing cited in the Reply or in the supplemental Wolfe declaration suggests that adding P2 to P1 would be considered *modulating* P1

by P2, as modulation is understood in the art or in the context of the challenged patent.

Because Petitioners have failed to demonstrate that their prior art combinations teach or render obvious "a primary oscillation frequency modulated by a modulating oscillation frequency," under the plain meaning of the terms "modulated" and "modulating," their challenges to claim 16 should be rejected.

IV. CONCLUSION

For the reasons set forth above, Resonant Systems respectfully requests that the Board affirm the validity of all challenged claims.

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CERTIFICATE OF WORD COUNT

I certify that there are 4,336 words in this paper, excluding the portions exempted under 37 C.F.R. § 42.24(a)(1), according to the word count tool in Microsoft Word.

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CERTIFICATE OF SERVICE

I hereby certify that "Patent Owner's Sur-Reply" was served on August 29, 2024 by email sent to:

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