

UNITED STATES PATENT AND TRADEMARK OFFICE

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BEFORE THE PATENT TRIAL AND APPEAL BOARD

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APPLE INC.,  
Petitioner,

v.

THL HOLDING COMPANY, LLC,  
Patent Owner.

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U.S. Patent No. 11,350,246 to Howard et al.

Case No.: IPR2024-00399

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**PATENT OWNER'S PRELIMINARY RESPONSE TO PETITION  
FOR *INTER PARTES* REVIEW UNDER 37 C.F.R. § 42.107**

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## **I. Introduction**

Pursuant to 37 C.F.R. § 42.107, Patent Owner, THL Holding Company, LLC (“THL”), submits the following Preliminary Response (“Preliminary Response”) to the Petition for *Inter Partes* Review of U.S. Patent No. 11,350,246 (“the ’246 Patent”).

Patent Owner respectfully requests that the Patent Trial and Appeal Board (“the Board”) deny the Petition on every ground alleged by the Petitioner.

## **II. Standard for granting *inter partes* review**

The Board may only grant a petition for *inter partes* review where “the information presented in the petition . . . shows that there is a reasonable likelihood that the petitioner would prevail with respect to at least 1 of the claims challenged in the petition.” 35 U.S.C. § 314(a); 37 C.F.R. § 42.108(c). Petitioner bears the burden of showing that this statutory threshold has been met. *See* Office Patent Trial Practice Guide, 77 Fed. Reg. 48,756, 48,756 (Aug. 14, 2012) [hereinafter “Practice Guide”].

The Practice Guide specifies that, among the several preliminary responses a patent owner can submit to a petition, a reason for denying the petition is that “[t]he prior art lacks a material limitation in all of the independent claims.” Practice Guide, 77 Fed. Reg. at 48,764. In this Preliminary Response, the Patent Owner challenges the Petition on this basis.

In its February 27, 2023 Updated Guidance for Making a Proper Determination of Obviousness, the Office provided the following guidance regarding reliance on conclusory expert opinion in the obviousness inquiry:

[T]he Federal Circuit has made it clear that ***an expert's conclusory opinion about a matter relevant to the obviousness inquiry may be unavailing unless accompanied by factual support.*** See, for example, *Ethicon*, 844 F.3d at 1352 (concluding in the context of an ex parte appeal that the Board properly gave little weight to conclusory expert testimony regarding objective indicia); *Quanergy Sys., Inc. v. Velodyne Lidar USA, Inc.*, 24 F.4th 1406, 1417 (Fed. Cir. 2022) (agreeing with the Board, in the context of an inter partes review proceeding, that ***the proffered expert testimony was “incomplete, unspecific, and ultimately conclusory” and therefore not entitled to controlling weight***). Consistently, in the context of proceedings before the PTAB, Office regulations provide that ***“[e]xpert testimony that does not disclose the underlying facts or data on which the opinion is based is entitled to little or no weight.”*** 37 CFR 42.65(a); see also *Xerox Corp. v. Bytemark, Inc.*, No. IPR2022–00624, 2022 WL 3648989, at \*6 (PTAB 2022) (precedential) (The USPTO Director affirmed that because “the cited declaration testimony is conclusory and unsupported, [it] adds little to the conclusory assertion for which it is offered to support, and is entitled to little weight.”).

(February 27, 2023 Updated Guidance for Making a Proper Determination of Obviousness, Federal Register Vol. 89, No. 39 at 14453, emphasis added.) In this Preliminary Response, the Patent Owner asserts the Petition is based on conclusory

expert opinion in violation of this recent guidance.

### **III. Summary of the Grounds and Preliminary Response**

Ground #1 of the Petition asserts that independent claims 1 and 11, and dependent claims 13-14, are invalid as obvious in view of Kalliola (Ex. 1004), Turunen (Ex. 1005), Oswald (Ex. 1006), Vauclair (Ex. 1007), and Kalayjian (Ex. 1008). Because the cited references fail to teach or suggest a limitation of each challenged independent claim, and because the Petition fails to disclose a reasoned and factual basis for its many significant modifications to the references, the Board should deny institution on Ground #1.

Grounds #2 and #3 challenge only claims that are dependent on independent claims 1 or 11 addressed in Ground #1. Thus, Grounds #2 and #3 are subject to Ground #1 with respect to all challenged claims.

In this Preliminary Response, Patent Owner challenges Ground #1 with respect to independent claims 1 and 11, the only independent claims challenged in the Petition.

#### IV. Arguments

**A. The proposed combination fails to teach or suggest a limitation of each challenged independent claim**

**1. Claim 1: None of the cited references teach or suggest using UWB time of flight calculations (as construed) to estimate distance**

Claim 1 recites a mobile communication device configured to “*estimate a distance* between the mobile communication device and the at least one remote device *based on ultra-wideband communication between the one or more ultra-wideband transceivers and the at least one remote device and time of flight calculations.*” (Ex. 1001, 38:9-14, emphasis added.) The Petition applies the Patent Owner’s proposed construction for the term “time of flight calculations,” which is “determining the amount of time between *when a signal is transmitted* and *when a reply signal is received.*” (Petition at 6.) Neither Petitioner nor Patent Owner identify, or request, a different claim construction.

None of the cited references discloses or suggests estimating a distance using UWB time of flight calculations as claimed and construed. The Petition does not assert that Kalliola, Turunen, or Vauclair disclose UWB-based time of flight calculations for determining distance. The Petition cites Kalayjian and Oswald for this claim limitation. (Petition at 41-43.)

Kalayjian discloses using only the “*Bluetooth®* communication protocol” to determine distance between a “master” device (310) and a “slave” device (320):

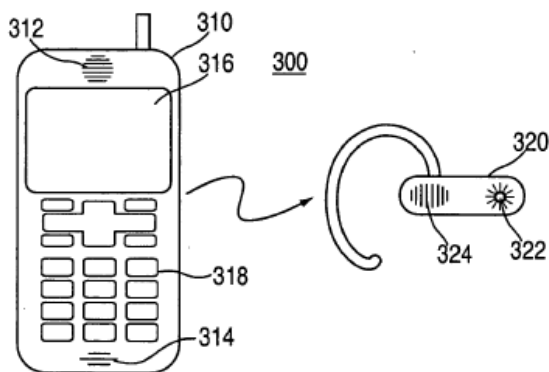


FIG. 3a

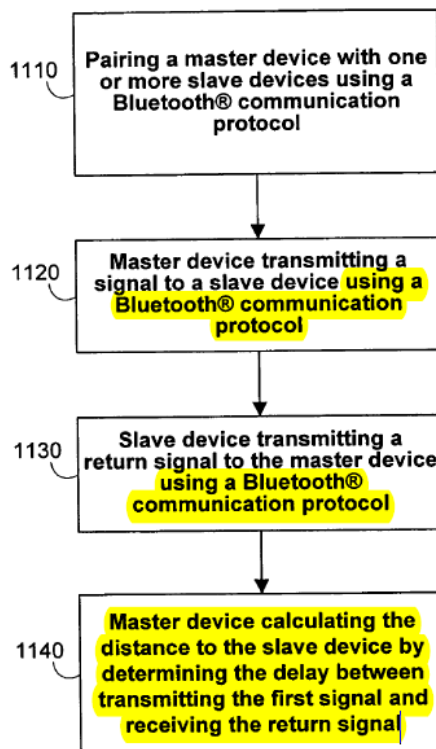


FIG. 11

(Ex. 1008, Kalayjian at ¶¶40, 41, 55 and Figs. 3a, 11.)

Kalayjian does not mention UWB communication, let alone using UWB to determine distance using time of flight calculations as claimed and construed. It is beyond dispute, therefore, that Kalliola, Turunen, Vauclair or Kalayjian, taken alone or in combination, disclose or render this claim limitation obvious.

In an attempt to fill this gap, the Petition cites Oswald's determination of "range delay." (Petition at 43, *citing* Ex. 1006, Oswald at [0286] and [0288].) But the cited passages of Oswald do not disclose the claim language as construed. Oswald discloses only "the delay between *transmission* and *reception* of a pulse" (Ex. 1006, Oswald at [0286]) and "the delay between the *transmission of a pulse* and

the *reception of the pulse* at the unit in question” (Ex. 1006, Oswald at [0288].) This is **not** the claimed “time of flight calculation,” which requires calculating a time difference between the transmission and receipt of two different signals: (i) a transmitted signal and (ii) a “reply signal.” (Petition at 6, construing “time of flight calculation” as “determining the amount of time between when *a signal* is *transmitted* and when a *reply signal* is *received*.” (Petition at 6.)

In Oswald, there is only one “signal,” not two signals as the adopted claim construction requires. This is further confirmed in Figure 1 of Oswald, which shows the “object” 102 being tracked as having only a “transmitter” 104, and the separate control unit 300 having only “receiving” units 200 and 202:

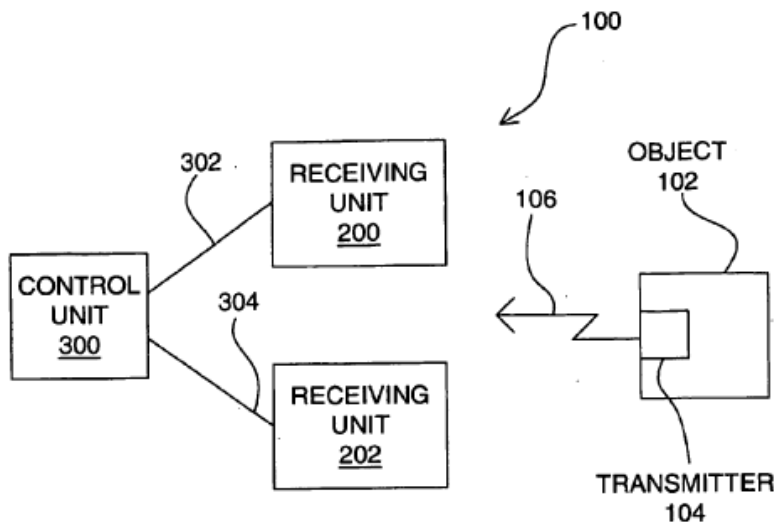


Figure 1

Ex. 1006, Fig. 1

Oswald’s Figures 3 and 6 similarly show one-way communication from the object to the receiving units:

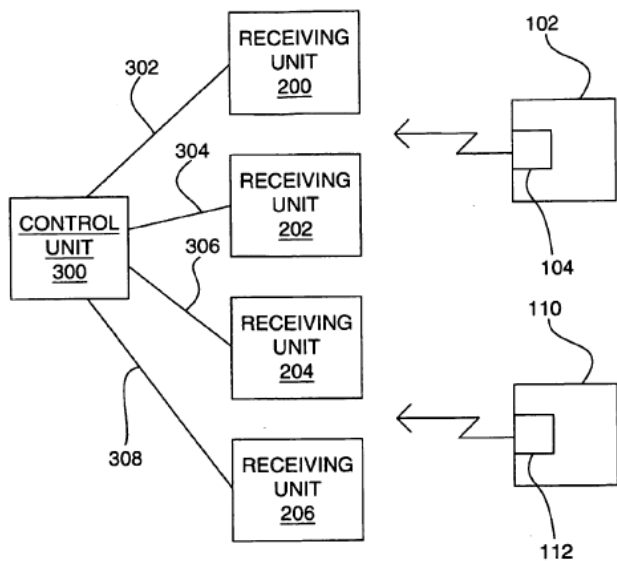


Figure 3

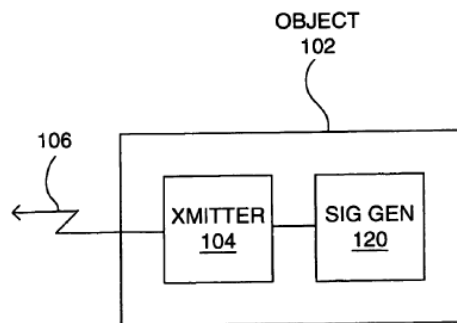


Figure 6

**Ex. 1006, Figs. 3 and 6**

The Petition does not identify any passage of Oswald, and there is none, disclosing the determination of the distance between the receiving units and the object using time of flight calculations as construed, *i.e.*, “determining the amount of time between when *a signal is transmitted* and when *a reply signal is received*.”

Thus, neither Kalayjian nor Oswald (or any other cited reference) disclose or even suggest the use of a UWB “signal” and “reply signal” for time of flight calculations to estimate a distance between the mobile and remote device as claimed.

The Petition states “Oswald recognizes that UWB transmissions are more favorable for indoor applications than narrowband transmissions (Bluetooth) because ‘narrowband pulses can propagate poorly and/or highly unpredictably.’” (Petition at 44 *citing* Ex. 1006, Oswald at [0278] and Ex. 1003, Buehrer Decl., at ¶233.) But if a POSITA were to use Oswald’s cited UWB approach to distance

calculations in the proposed combination, the result would not meet the construction for “time of flight calculations.”

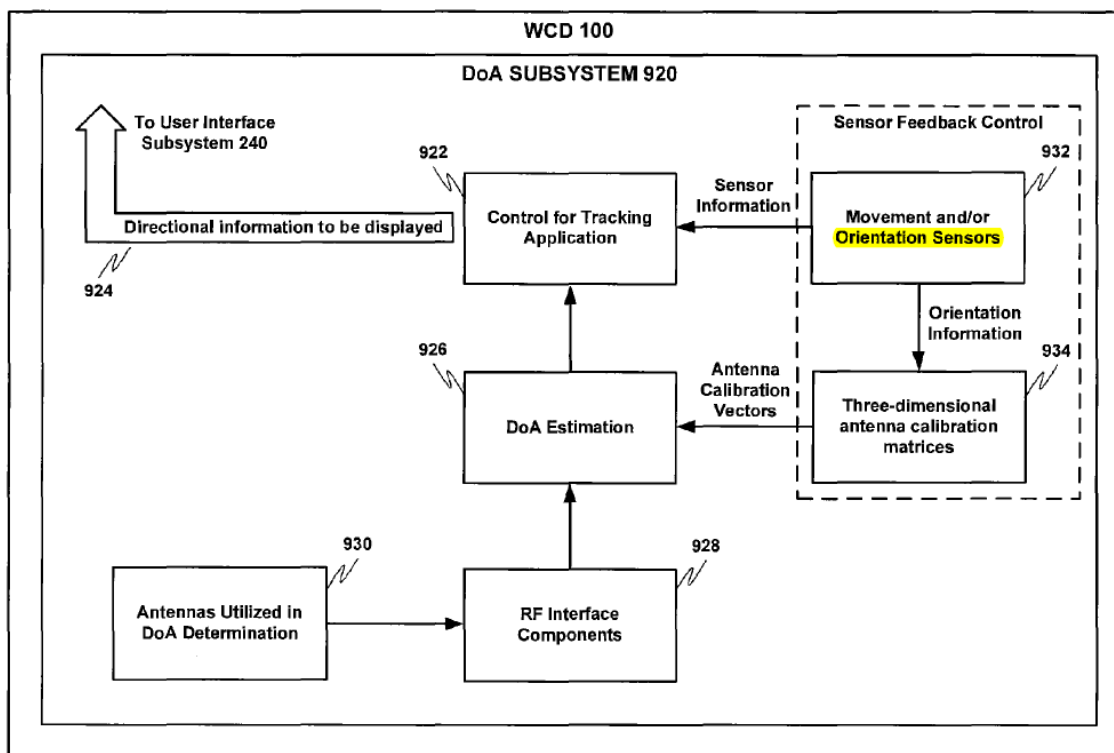
For this reason, the Petition fails to establish a *prima facie* case of obviousness for Claim 1.

2. **Claim 11: None of the cited references teach or suggest estimating direction based on rotation of the mobile communication device detected by the orientation sensor**

Claim 11 recites “*an orientation sensor to detect rotation of the mobile communication device*” and a mobile communication device configured to “determine a direction to the at least one remote device based on signal delay of ultra-wideband communications between the two or more antennas and the at least one remote device and on *rotation of the mobile communication device detected by the orientation sensor.*” (Ex. 1001, 39:13-14 and 39:33-38, emphasis added.) None of the cited references discloses or suggest an orientation sensor to detect rotation of the mobile device, or determining the direction to a remote device based on the detected rotation. The Petition relies solely on Kalliola for these limitations of claim 11. (Petition at 54-64.)

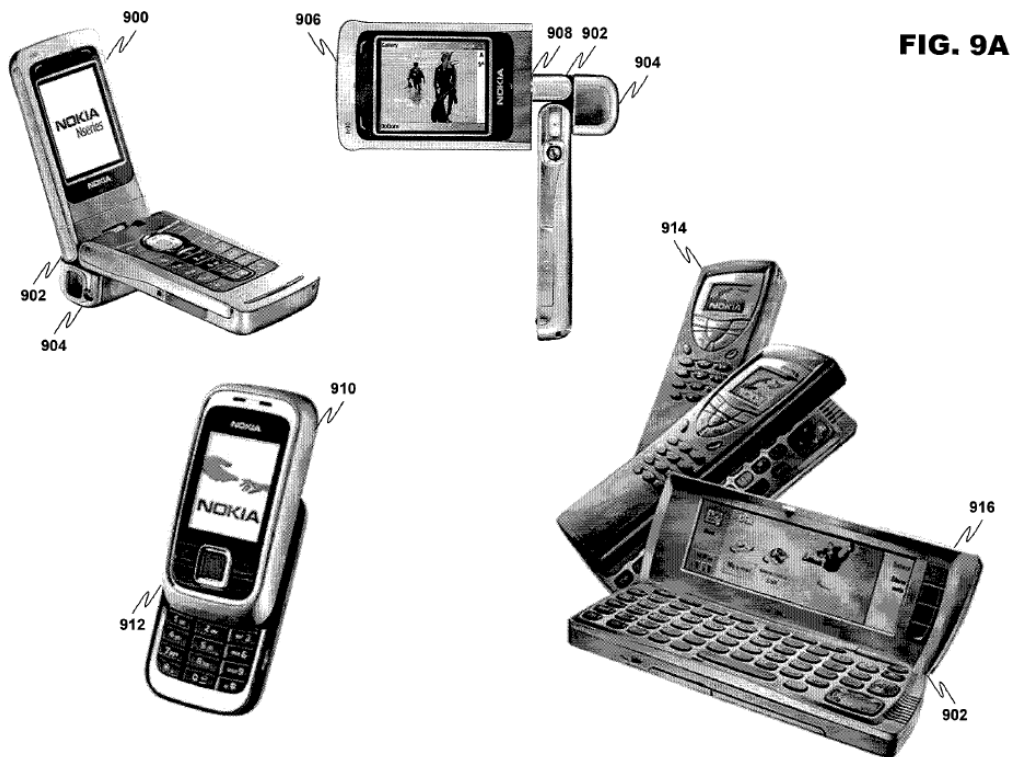
For the “orientation sensor” claim limitation, the Petition cites Kalliola’s “orientation sensors” 932 used in Kalliola’s “wireless communication device” (“WCD”) 100 as disclosed in Figure 9B. (Petition at 54-56.)

**FIG. 9B**



**Ex. 1004, Kalliola, Fig. 9B**

But Kalliola's orientation sensors do not "detect rotation of *the mobile communication device*" as claimed. Instead, those sensors "provide information on the *relative orientation* of *two sections* of WCD 100." (Ex. 1004, Kalliola at [0078], [0081], Figs. 9A-9B.) Kalliola's Figure 9A shows several embodiments of WCD 100, each having "two sections" for which the disclosed "orientation sensors" detect the "relative orientation."



Ex. 1004, Kalliola, Fig. 9A

The Petition admits that Kalliola's orientation sensor detects "whether a flip cover of the device is open or closed" and "detects when the cover of the WCD is rotated into an open/closed position." (Petition at 55.) But the Petition improperly concludes (in a conclusory fashion) that Kalliola discloses the **claimed** orientation sensor, which "detect[s] rotation of **the mobile communication device.**" (Petition at 56, boldface added.)

The orientation sensor disclosed in Kalliola determines "relative" orientation, *i.e.*, the relative orientation of two phone "sections." As such, Kalliola's orientation sensor is incapable of detecting the orientation of the entire phone. If the orientation sensor in Kalliola were configured to determine the orientation of the mobile

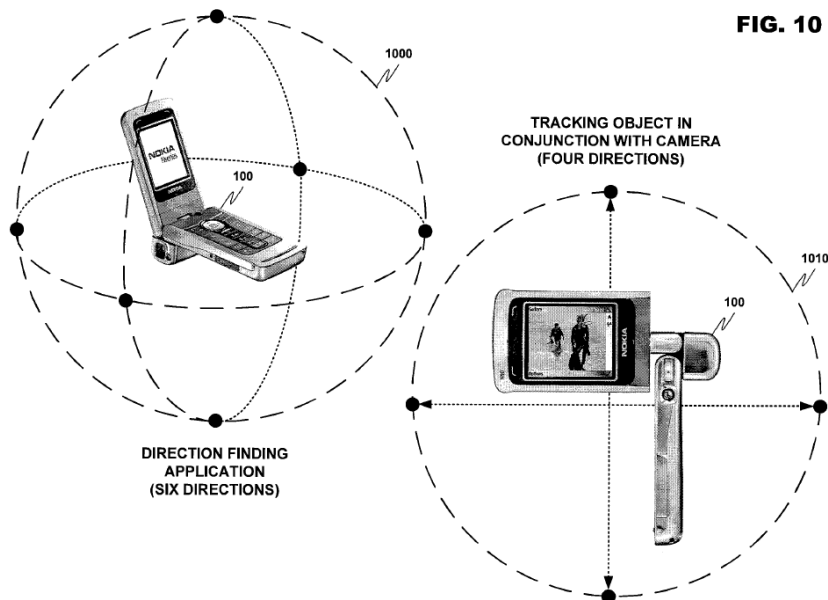
communication device (and it is not), then it would not be able to determine the relative orientation of the two sections as disclosed, thus defeating its intended purpose.

The Petition makes no attempt to fill the gap between the claim language (which requires determining the orientation of the mobile device) and the disclosure in Kalliola (which discloses only determining the orientation of one phone section relative to another). The Petition references the Patent Owner's reliance on a "gyroscope" in the parallel litigation to satisfy the orientation sensor claim limitations. (Petition at 57.) But in the litigation, the iPhone gyroscope cited by the Patent Owner determines the orientation of the iPhone device as claimed, not the relative orientation of two portions of the device as disclosed in Kalliola. (*Id.*, citing THL's Infringement Contentions, Ex. 1013 at 38.)

For the claimed direction determination based on the rotation detected by the orientation sensor, the Petition cites three different embodiments of Kalliola. First, the Petition cites Kalliola's use of the orientation sensor to determine which "mode" to use when performing its "Direction of Arrival" or "DoA" calculations. (Petition at 59-62, *citing* Ex. 1004, Kalliola at [0081]-[0087].) Kalliola explains how these modes vary depending on the "relative orientation" of the phone's two sections – **not** the "rotation of the mobile communication device" as claimed:

FIG. 10 discloses two examples of applications wherein different antenna calibration vectors may be employed. In the first example application 1000, WCD 100 may be configured in a mode allowing a user to seek a target including a locating beacon. ***The orientation of WCD 100 in a “flip-phone open” mode may trigger 3-D antenna module 934 to set a specific antenna configuration, such as an antenna calibration vector utilizing six directional antennas*** sensing in a spherical-pattern matrix as shown at 1000, for use in DoA estimation. ***In an alternative scenario, the example disclosed at 1010 shows sections of WCD 100 in another relative orientation.*** As previously described in FIG. 9A, information received from sensors 902 and/or 908 may trigger the activation of camera 904. In this particular application of DoA estimation, user 110 may desire to track the location of a target so that it may appear on the display of WCD 100.

(Ex. 1004, Kalliola at [0082], emphasis added.)



**Ex. 1004, Fig. 10**

Thus, in this embodiment, Kalliola is not determining direction to the remote object based on the rotation of the mobile communication device as claimed. Instead, Kalliola is determining – based on the “relative orientation” of the two phone “sections” – whether to perform direction finding with six directional antennas (example 1000), or four antennas together with the camera (example 1010). This disclosure does not meet the relevant claim language.

Next, the Petition points to an embodiment in Kalliola in which it uses “motion sensors” (not orientation sensors) to determine whether movement (not “rotation”) of the mobile device has stopped, during which the DoA estimation is “paused” to “conserve power.” (Petition at 63 *citing* Ex. 1004, Kalliola at [0014] and [0084].) “[T]he tracker application halts the DoA estimation when motion sensors determine that WCD 100 is stationary” and “[a]t a time when motion

resumes, the DoA application control 902 may resume the DoA estimation in order to provide updated directional information through a display on WCD 100.” (Ex. 1004, Kalliola at [0084].)

This embodiment of Kalliola is not directed to the claimed “**orientation** sensor” which is used to “**detect rotation** of the mobile communication device” to enable the device to “**determine a direction** to the at least one remote device **based . . . on rotation** of the mobile communication device detected by the orientation sensor.” (Ex. 1001, 39:13-14 and 39:33-38, emphasis added.) Not only does the motion sensor in Kalliola not determine rotation of the mobile device, it is used to **stop** the direction determination to “conserve power,” not support that determination as claimed.

Last, the Petition points to an embodiment in Kalliola which the motion sensor (not the orientation sensor) is used to determine when a user “moves WCD 100 too quickly for an accurate DoA estimation.” (Petition at 64 *citing* Ex. 1004, Kalliola at [0086].) “Increased activity detected by motion sensors in WCD 100 may trigger a configuration that increases the speed of the DoA estimation[.]” (Ex. 1004, Kalliola at [0086].) But as with the previous embodiment, Kalliola’s motion sensor is not an orientation sensor and is not being used to determine the direction to the remote device based on the “rotation” of the mobile device as recited in independent claim 11.

Because the references upon which Ground #1 is based fail to teach or suggest limitations of independent claims 1 and 11 (the only challenged independent claims), the Board should deny institution of the Petition.

**B. The Petition fails to provide a reasoned and factual basis for “substituting” the Bluetooth positioning systems in both Kalayjian and Kalliola with the UWB system disclosed in Oswald to reach claim 1**

Claim 1 recites a mobile communication device configured to (i) “*estimate a distance*” to a remote device “based on ultra-wideband communication between the one or more *ultra-wideband* transceivers and the at least one remote device and time of flight calculations” and (ii) “*determine a direction* to the at least one remote device based on signal delay of *ultra-wideband* communications.” (Ex. 1001, 38:9-17, emphasis added.)

The Petition cites Kalayjian and Oswald for the UWB distance calculation, and Kalliola and Oswald for the UWB direction determination. (Petition at 41-43 and 45-48.) But both Kalayjian and Kalliola each disclose using **Bluetooth** for their respective distance and direction calculations. Kalayjian discloses using the “**Bluetooth**® communication protocol” to communicate between a “master” device (310) and a “slave” device (320). Similarly, Kalliola discloses “BT/BTLEE [Bluetooth™ or Bluetooth Low End Extension] receiver 620 receives signals multiplexed from Antennas A1-A6 and uses this information to determine relative direction using DoA [Direction of Arrival] signal processing as previously

described.” (Ex. 1004, Kalliola at [0071].) Neither Kalayjian nor Kalliola discloses using UWB signals for the claimed distance and direction determinations.

The Petition asserts that a POSITA would have considered it obvious to **remove** the Bluetooth transceivers disclosed in both Kalayjian and Kalliola for their respective distance and direction calculations, and **replace** them with the UWB transceivers disclosed in Oswald. (Petition at 43-44 and 46-51, respectively.) As explained below, however, the proposed modifications are based on conclusory expert assertions lacking factual support. In addition, the proposed modification fundamentally changes the principle behind how Kalliola determines direction to a remote object. The Petition should be denied because it fails to present a reasoned fact-based analysis to support the alleged obviousness of proposed modifications of Kalliola and Kalayjian based on Oswald.

**1. The Petition ignores Oswald’s express teaching to NOT use the direction-finding technique described in Kalliola**

Kalliola uses a Bluetooth antenna array together with “beamforming” and antenna array processing to determine the direction to a remote device. (Ex. 1004, Kalliola at [0060-0062] and [0070-0071].) Oswald, in contrast, uses a **different** direction-finding approach (a “time domain process”) and **expressly rejects** “using array data processing or beam forming,” *i.e.*, the method Kalliola uses to determine direction. (Ex. 1006, Oswald at [0013], emphasis added.) The Petition fails to

address this teaching in Oswald.

The Petition asserts a POSITA would have considered it obvious to “substitute” Oswald’s UWB direction finding approach for Kalliola’s Bluetooth approach, which uses beamforming. (Petition at 45-48.) But because Oswald expressly rejects “using array data processing or beamforming,” a POSITA would **not** have had a reason to substitute Oswald’s direction-finding approach for Kalliola’s. Such a substitution would require an impermissible change in Kalliola’s principle of operation for direction finding, namely from Kalliola’s antenna array processing and beam forming to Oswald’s “time domain” direction finding process.

In addition, Kalliola already identifies **and solves** the purported “reason” stated in the Petition for substituting Kalliola’s direction finding technique and architecture with that of Oswald. The Petition asserts a POSITA would have been motivated to make the substitution because “DoA estimation accuracy decreases in the presence of multipath propagation or noise” and “[m]ultipath radio propagation causes fading that can lead to rapid changes of the DoA estimates and temporary mispointings.” (Petition at 48-49.) The Petition asserts that its modification of Kalliola “would have predictably increased the accuracy of the WCD’s directional measurements, thereby improving similar object-finding systems in the same way.” (Petition at 50, *citing* Ex. 1003, Buehrer Decl. at ¶249; Ex. 1003, Buehrer Decl., ¶¶183-186.)

But Kalliola ***expressly recognized*** the multipath propagation issue described in the Petition, and provided ***multiple solutions*** to address that issue to improve the accuracy of its Bluetooth-based direction calculations. For “noisy” multipath propagation, Kalliola proposes “improving the resolution of the array through increasing its size by adding more antenna elements” and ensuring the “distance between any two antenna elements in the array [does] not exceed half a wavelength.” (Ex. 1004, Kalliola at [0064].) For “fading” resulting from multipath propagation, Kalliola proposes using a “tracking algorithm” that “keep[s] a register of several DoA estimates and choos[es] the one with highest average power to be selected as the actual output.” (Ex. 1004, Kalliola at [0065].)

In other words, Kalliola already identified – and solved – the propagation issues the Petition cites as the reason to wholesale replace Kalliola’s Bluetooth antenna array with Oswald’s UWB antenna array. But in asserting that the proposed re-engineering of Kalliola in view of Oswald “would have predictably increased the accuracy of [Kalliola’s] directional measurements,” ***the Petition failed to take Kalliola’s stated improvements in its Bluetooth-based direction finding approach.*** It is ***un***reasonable to baldly assert the proposed modification of Kalliola would result in increased accuracy without taking Kalliola’s stated improvements into account. Because the Petition failed to do so, there is no ***factual*** basis for the Petition’s conclusory assertion that the substitution of Kalliola’s Bluetooth array with

Oswald's UWB array would have led to an improvement – the only basis in the Petition for the proposed modification:

[T]he Federal Circuit has made it clear that ***an expert's conclusory opinion about a matter relevant to the obviousness inquiry may be unavailing unless accompanied by factual support.*** See, for example, *Ethicon*, 844 F.3d at 1352 (concluding in the context of an ex parte appeal that the Board properly gave little weight to conclusory expert testimony regarding objective indicia); *Quanergy Sys., Inc. v. Velodyne Lidar USA, Inc.*, 24 F.4th 1406, 1417 (Fed. Cir. 2022) (agreeing with the Board, in the context of an inter partes review proceeding, that ***the proffered expert testimony was “incomplete, unspecific, and ultimately conclusory” and therefore not entitled to controlling weight***). Consistently, in the context of proceedings before the PTAB, Office regulations provide that ***“[e]xpert testimony that does not disclose the underlying facts or data on which the opinion is based is entitled to little or no weight.”*** 37 CFR 42.65(a); *see also Xerox Corp. v. Bytemark, Inc.*, No. IPR2022–00624, 2022 WL 3648989, at \*6 (PTAB 2022) (precedential) (The USPTO Director affirmed that because “the cited declaration testimony is conclusory and unsupported, [it] adds little to the conclusory assertion for which it is offered to support, and is entitled to little weight.”).

(February 27, 2023 Updated Guidance for Making a Proper Determination of Obviousness, Federal Register Vol. 89, No. 39 at 14453, emphasis added.)

Petitioner's expert failed to address the multiple improvements that Kalliola expressly describes to resolve the identified propagation issues, which included

(1) “improving the resolution of the array through increasing its size by adding more antenna elements” and ensuring the “distance between any two antenna elements in the array [does] not exceed half a wavelength,” and (2) using a “tracking algorithm” that “keep[s] a register of several DoA estimates and choos[es] the one with highest average power to be selected as the actual output.” (Ex. 1004, Kalliola at [0064-0065].)

Because the Petition did not weigh these improvements when asserting that a POSITA would have been motivated to substitute Kalliola’s Bluetooth array with Oswald’s Bluetooth array, the Petition lacks a reasoned analysis and factual support for its obviousness conclusion and should be entitled to no weight. 37 C.F.R. § 42.65(a); *Xerox Corp. v. Bytemark, Inc.*, No. IPR2022–00624, 2022 WL 3648989, at \*6 (PTAB 2022) (precedential).

**2. The Petition uses hindsight when it adopts Kalayjian’s Bluetooth communications for the claimed alert request signal, but rejects those same communications for the claimed distance calculation**

Claim 1 recites a mobile communication device configured to “transmit an audio alert request signal to the at least one remote device via the **Bluetooth** transceiver” and “estimate a distance between the mobile communication device and the at least one remote device based on ultra-wideband communication between the one or more **ultra-wideband transceivers** and the at least one remote device and time of flight calculations.” (Ex. 1001, 38:7-14, emphasis added.)

For both limitations, the Petition relies on the teachings of Kalayjian to modify Kalliola. With respect to the claimed Bluetooth audio alert request signal, the Petition asserts that a POSITA would have considered it obvious to **add** Kalayjian's ability to use "Bluetooth" to "prompt the slave device to beep" to Kalliola. (Petition at 38-40.) But for the claimed distance estimation, the Petition proposes **replacing** Kalayjian's Bluetooth communication with Oswald's UWB communication. (Petition at 43.) In other words, the Petition **relies** on Kalayjian's Bluetooth communication to satisfy the alert signal limitation, but **replaces** that same Bluetooth communication to satisfy the claimed distance calculation.

An objective POSITA would not rely on one feature in a prior art reference to add to another, and at the same time replace that feature in the same combination. Clearly, the Petition is using the claim language as a roadmap to pick – and then unpick – the teachings from the prior art.

In addition, as explained above, none of the prior art references – alone or in combination – disclose the use of UWB time of flight calculations (as construed) to determine a distance estimate between the mobile and remote device as recited in claim 1.

For these reasons, the Board should reject Ground #1. Because Ground #1 is the only ground that challenges independent claims 1 and 11, the Board should deny the Petition in its entirety.

## V. Conclusion

For the above reasons, Patent Owner respectfully requests that the Board deny the Petition for *inter partes* review of the '246 Patent.

Respectfully submitted,

Dated: April 30, 2024

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**Certificate of Service**

The undersigned hereby certifies that on April 30, 2024, a complete and entire copy of **Patent Owner's Preliminary Response to Petition For *Inter Partes* Review Under 37 C.F.R. § 42.107**, was served via electronic mail to the attorneys listed below:

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**Certificate of Compliance Pursuant to 37 C.F.R. § 42.24**

This paper complies with the type-volume limitation of 37 C.F.R. § 42.24. The paper contains 4,033 words, excluding the parts of the paper exempted by § 42.24(a).

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Respectfully submitted,

Dated: April 30, 2024

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