

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

SAMSUNG ELECTRONICS CO., LTD.,
Petitioner,

v.

CM HK LIMITED,
Patent Owner

IPR2025-01023
Patent 10,852,846

**PATENT OWNER'S SUR-REPLY TO PETITION
FOR *INTER PARTES* REVIEW OF U.S. PATENT 10,852,846**

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EXHIBIT LIST

Ex. No.	Description
2002	<i>Samsung Electronics Co., Ltd., et al., v. CM HK, Ltd. et al.</i> , Case No. 4:24-cv-06567 at Docket 1 (N.D. Cal Sep. 18, 2024), Samsung Electronics Co., Ltd., and Samsung Electronics America, Inc.’s Complaint for Declaratory Judgment
2003	<i>CM HK, Limited, v. Samsung Electronics Co., Ltd., et al.</i> , Case No. 2:24-cv-00880 at Docket 46 (E.D. Tex. June 26, 2025), Defendants Samsung Electronics Co, Ltd. And Samsung Electronics America, Inc.’s Renewed Motion to Stay Pending Resolution of Any Motion to Dismiss the NDCA Action
2004	<i>CM HK, Limited, v. Samsung Electronics Co., Ltd., et al.</i> , Case No. 2:24-cv-00880 at Docket 47 (E.D. Tex. July 9, 2025), Plaintiff CM HK Ltd.’s Opposition to Defendants’ Motion to Dismiss, Transfer, or Stay
2005	<i>Samsung Electronics Co., Ltd., et al., v. CM HK, Ltd.</i> , Case No. 4:24-cv-06567 at Docket 73 (N.D. Cal May 15, 2025), Order Granting Defendant CM HK, Ltd.’s Motion to Dismiss
2006	<i>Samsung Electronics Co., Ltd., et al., v. CM HK, Ltd.</i> , Case No. 4:24-cv-06567 at Docket 80 (N.D. Cal June 10, 2025), Joint Stipulation and Order to Stay All Deadlines in the Scheduling Order
2007	<i>Samsung Electronics Co., Ltd., et al., v. CM HK, Ltd.</i> , Case No. 4:24-cv-06567 at Docket 72 (N.D. Cal May 13, 2025), Joint Claim Construction and Prehearing Statement
2008	<i>CM HK, Limited, v. Samsung Electronics Co., Ltd., et al.</i> , Case No. 2:24-cv-00880 at Docket 2 (E.D. Tex. November 1, 2024), Plaintiff’s Original Complaint for Patent Infringement
2009	<i>CM HK, Limited, v. Samsung Electronics Co., Ltd., et al.</i> , Case No. 2:24-cv-00880 at Docket 17 (E.D. Tex. Jan 28, 2025), Plaintiff’s Amended Complaint for Patent infringement
2010	<i>CM HK, Limited, v. Samsung Electronics Co., Ltd., et al.</i> , Case No. 2:24-cv-00880 at Docket 36 (E.D. Tex. Mar. 3, 2025), Docket Control Order

2011	<i>CM HK, Limited, v. Samsung Electronics Co., Ltd., et al.</i> , Case No. 2:24-cv-00880, (E.D. Tex. Jan. 7, 2025), Plaintiff’s P.R. 3-1 & 3-2 Disclosures
2012	<i>CM HK, Limited, v. Samsung Electronics Co., Ltd., et al.</i> , Case No. 2:24-cv-00880, (E.D. Tex. Mar. 4, 2025), Defendants Samsung Electronics Co., Ltd and Samsung Electronics America, Inc’s Local Patent Rule 3-3 Disclosures
2013	Docket Navigator, “Time to Trial for Judge Rodney Gilstrap” (August 7, 2025)
2014	Docket Navigator, “Time to Trial for Eastern District of Texas,” (August 7, 2025)
2015	U.S. Patent Publication No. 2011/0199298, Bassompierre et al.
2016	Email from Bratton, Ariell, RE: Samsung v. CM HK, Ltd., Case No. 4:24-cv-06567 (N.D. Cal.), IPR Threats to Evans, Christopher (May 2, 2025)
2017	March 24, 2025, Director’s Memo, <i>Guidance on USPTO’s rescission of “Interim Procedure for Discretionary Denials in AIA Post-Grant Proceedings with Parallel District Court Litigation,”</i> Boalick, Scott R. (August 7, 2025)
2018	Patent Trial and Appeal Board, FAQs for Interim Processes for PTAB Workload Management (accessed August 15, 2025)
2019	U.S. Patent Publication No. 2009/0262074, Nasiri et al
2020	U.S. Patent Publication No. 2011/0163950, Ye et al
2021	U.S. Patent Publication No. 2011/0175806, Ye et al
2022	Declaration of Christopher L. Evans
2023	<i>CyWee Group Ltd. v. Samsung Electronics Co., Ltd., et al.</i> , Case No. 2:17-cv-00140-RWS-RSP (E.D. Tex. Mar. 21, 2018), Declaration of Dr. Joseph J. LaViola, Jr. Ph.D. in support of CyWee Group Ltd.’s Reply Claim Construction Brief
2024	<i>Samsung Electronics Co., Ltd., et al., v. CM HK, Ltd.</i> , Case No. 4:24-cv-06567 at Docket 110 (N.D. Cal. Aug. 27, 2025), Samsung’s Opposition to CM HK’s Rule 11 Motion for Sanctions

2025	<i>CyWee Group Ltd. v. Samsung Electronics Co., Ltd., et al.</i> , Case No. 2:17-cv-00140-RWS-RSP at Docket 67 (E.D. Tex. Mar. 9, 2018), Samsung's Responsive Claim Construction Brief
2026	<i>CyWee Group Ltd. v. Samsung Electronics Co., Ltd., et al.</i> , Case No. 2:17-cv-00140-RWS-RSP at Docket 67-1 (E.D. Tex. Mar. 9, 2018), Responsive Declaration of M. Ray Mercer, Ph.D.
2027	Andre Cornman & Darren Mei, <i>Extended Kalman Filtering</i> (Stanford EE 267, Virtual Reality Course Report, Gordon Wetzstein & Robert Konrad instructors, 2019)
2028	U.S. Patent & Trademark Office, Memorandum from Coke Morgan Stewart, Acting Under Sec'y of Commerce for Intellectual Prop. & Acting Dir. of the U.S. Patent & Trademark Office, to Members of the Patent Trial & Appeal Bd. (July 31, 2025), Enforcement and Non-Waiver of 37 C.F.R. § 42.104(b)(4) and Permissible Uses of General Knowledge in Inter Partes Reviews
2029	<i>Samsung Electronics Co., Ltd., et al., v. CM HK, Ltd.</i> , Case No. 4:24-cv-06567 at Docket 93 (N.D. Cal Aug. 13, 2025), CM HK's Rule 11 Motion for Sanctions
2030	<i>Samsung Electronics Co., Ltd., et al., v. CM HK, Ltd.</i> , Case No. 4:24-cv-06567 at Docket 116 (N.D. Cal Sep. 03, 2025), CM HK's Reply in support of its Rule 11 Motion for Sanctions
2031	<i>Google LLC v. CyWee Group Ltd.</i> , IPR2018-01257 (P.T.A.B. Jun. 14, 2018), Declaration of Prof. Majid Sarrafzadeh.
2032	Declaration of Prof. Majid Sarrafzadeh from IPR2018-01257 and IPR2018-01258 dated June 17, 2019
2033	Rebuttal Declaration of Prof. Majid Sarrafzadeh from IPR2018-01257 dated June 13, 2018
2034	U.S. Patent 10,201,746 B1
2035	Deposition Transcript of Majid Sarrafzadeh on Feb. 27, 2026
2036	Excerpts from Expert Report of Dr. M. Ray Mercer Regarding Noninfringement dated Dec. 3, 2018 in <i>CyWee Group Ltd. v. Samsung Elects. Co., Ltd. et al</i> , No. 2:17-cv-00140-WCB-RSP (E.D. Tex.).

2037	Expert Report of Dr. M. Ray Mercer Regarding Invalidity dated Oct. 8, 2018 in <i>CyWee Group Ltd. v. Samsung Elects. Co., Ltd. et al</i> , No. 2:17-cv-00140-WCB-RSP (E.D. Tex.)
2038	D. M. Henderson, <i>Euler Angles, Quaternions, and Transformation Matrices—Working Relationships</i> , McDonnell Douglas Tech. Servs. Co. (1977).
2039	Exhibits 2020 through 2030 from IPR2018-01257 and IPR2018-01258
2040	Declaration of Dr. Joseph LaViola in support of Patent Owner’s Response
2041	<i>Samsung Electronics Co., Ltd., et al., v. CM HK, Ltd.</i> , Case No. 4:24-cv-06567 at Docket 51-1 (N.D. Cal Jan. 28, 2025), Declaration of Dr. Shun-Nan Liou in Support of CM HK’s Motion to Dismiss
2042	<i>Samsung Electronics Co., Ltd., et al., v. CM HK, Ltd.</i> , Case No. 4:24-cv-06567 at Docket 61-2 (N.D. Cal Feb. 18, 2025), Declaration of Dr. Shun-Nan Liou in Support of CM HK’s Reply in Support of its Motion to Dismiss
2043	Curriculum Vitae of Dr. Joseph LaViola
2044	National Pension Service - National Pension Fund Report 2024
2045	BigGo Finance – South Korea’s National Pension Fund Sees Stock Holdings Surge by ~\$48 Billion in Q4, Driven by Samsung and SK Hynix Rally, January 10, 2026
2046	Maeil Business News Korea – Printed from https://www.mk.co.kr/en/stock/12007600 on April 5, 2026
2047	<i>Samsung Electronics Co., Ltd., et al. v. CM HK, Limited</i> , Case No. 4:24cv-06567-JST, (N.D. Cal. Mar. 14, 2025), Samsung Electronics Co., Ltd and Samsung Electronics America, Inc’s Local Patent Rule 3-3 Disclosures
2048	<i>Samsung Electronics Co., Ltd., et al. v. CM HK, Limited</i> , Case No. 4:24cv-06567-JST, (N.D. Cal. Mar. 28, 2025), Samsung Electronics Co., Ltd and Samsung Electronics America, Inc’s Local Patent Rule 4-1 Disclosures
2049	<i>Samsung Electronics Co., Ltd., et al. v. CM HK, Limited</i> , Case No. 4:24cv-06567-JST, (N.D. Cal. Apr. 18, 2025), Samsung Electronics Co., Ltd and Samsung Electronics America, Inc’s Local Patent Rule 4-2 Disclosures

2050	Email correspondence between parties and the Board dated May 15, 2026 through May 18, 2026
2051	<i>Samsung Electronics Co., Ltd., et al. v. CM HK, Limited</i> , Case No. 4:24-cv-06567-JST, ECF No. 207 (N.D. Cal. Apr. 18, 2025), Samsung's Motion to Retain Confidentiality with Exhibits 1-6
2052	Robert A. Matthews, Jr., <i>Annotated Patent Digest</i> § 23:25.120 (May 2026 update)

I. INTRODUCTION

Petitioner bears the burden to prove, by a preponderance of the evidence that claims 1, 3, 7, and 9 of U.S. Patent No. 10,852,846 (“’846 Patent”) are unpatentable.

Petitioner alleges that a POSITA would derive the ’846 Patent’s quaternion-based equations from Bassompierre’s Euler angle EKF and modify Bassompierre’s process to calculate resultant angles from a quaternion. But derivability is not disclosure. Bassompierre does not disclose a quaternion EKF and does not compute any absolute orientations because Bassompierre decouples reference frames so that yaw is fixed at zero by design. Petitioner’s theory relies entirely on its expert’s rewrite of Bassompierre using the ’846 Patent as both his hindsight guide and target.

Petitioner’s Reply also fails on claim construction. It argues “plain and ordinary meaning” for terms it simultaneously contends are indefinite in co-pending district court litigation, imports a “3D pointing device” into claims that recite only an “electronic device,” and invokes an unsupported grammatical rule to strip the “spatial reference frame” limitation from the operative claim step.

II. ARGUMENT

A. CLAIM CONSTRUCTIONS.

1. Electronic Device – Claims 1, 3

Patent Owner’s Proposed Construction	Petitioner’s Proposed Construction
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A device comprising a display device and a motion sensor module, both subject to movement and rotations in the spatial reference frame	Plain and ordinary meaning
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The dispute is whether the “electronic device” is limited to a device with an attached display or is broad enough to encompass a split configuration in which a stationary display is separate from the motion sensor module. The claim language resolves it:

1. An **electronic device subject to movements and rotations in dynamic environments**, comprising:
a display device associated with a display reference frame;
a motion sensor module ...
a computing processor having processor circuitry configured to **calculate a resulting deviation comprising resultant angles associated with the movements and the rotations of the electronic device in the spatial reference frame** by: ... (Ex. 1001 at 31:9-27.)

Claim 1 expressly defines the “electronic device” to include “a display device,” “a motion sensor module,” and “computing processor.” (Ex. 1001 at 31:9-27.) And calculates “a resulting deviation comprising resultant angles” based on the “movements and rotations of the electronic device in the spatial reference frame.” (Ex. 1001 at 31:9-27.) The “spatial reference frame” is the “reference frame of the electronic device ... comprising both the display and the motion sensor module.” (Ex. 2040 at ¶ 109.) The “thing that’s moving in the spatial reference frame is the

electronic device.” (Ex. 1022 at 113:2-5.) A “POSITA would understand that the display device and the motion sensor module are both components of the same electronic device, [which is] the object that is subject to movements and rotations.” (Ex. 2040 at ¶ 105.) And that the “display moves with the electronic device because it is part of it.” (*Id.*) So, the entire “electronic device,” including the “display device,” is subject to movements and rotations in “the spatial reference frame.” (Ex. 1022 at 113:2-114:13 (testifying that electronic device, including display, moves in the spatial reference frame)).

The ’846 Patent’s specification discloses embodiments of an “electronic device” with an integrated display, such as a “smartphone, tablet PC, or navigational equipment.” (Ex. 1001 at 13:8-16 (“The portable electronic device 600 may further comprise a built-in display 682; examples of the portable electronic device ... may include smartphone, tablet PC, or navigational equipment.”), 17:29-33 (same), 22:50-52 (same), 23:66-24:15 (same), 26:65-27:3 (same), 30:65-67 (same), FIG. 6.)). As a result, the “display reference frame associated with a display may need not to be external to the spatial reference frame in terms of the hardware configuration of the present invention.” (*Id.* at 13:12-16; *see also* Ex. 2035 at 38:7-20 (“... the spatial reference frame and the display reference frame could potentially be the same frame.”)).

Patent Owner’s proposed construction “simply leaves out some alternative

embodiments ... while capturing one embodiment expressly described” as permitted. *SIMO Holdings Inc. v. Hong Kong uCloudlink Network Tech. Ltd.*, 983 F.3d 1367, 1379–80 (Fed. Cir. 2021). The Federal Circuit has repeatedly held that when “the patent describes multiple embodiments, every claim does not need to cover every embodiment.” *Apple Inc. v. Andrea Elecs. Corp.*, 949 F.3d 697, 708 (Fed. Cir. 2020) quoting *Pacing Techs., LLC v. Garmin Int’l, Inc.*, 778 F.3d 1021, 1026 (Fed. Cir. 2015). Because it “is the claims, not the preferred embodiments, that define the metes and bounds of the patentee’s invention.” *IQRIS Techs. LLC v. Point Blank Enters., Inc.*, 130 F.4th 998, 1004 (Fed. Cir. 2025). That is the case here.

Samsung’s argument that Patent Owner’s construction “cannot be correct” because it “would require excluding the embodiment of Figure 5 from the claim scope” seeks to impermissibly confine the claims to specific embodiments. And, “although the specification often describes very specific embodiments of the invention, we have repeatedly warned against confining the claims to those embodiments.” *Phillips v. AWH Corp.*, 415 F.3d 1303, 1323 (Fed. Cir. 2005) (en banc). “Electronic device” should not be construed to allow “the disclosed embodiment to outweigh the language of the claim.” *See, e.g., Rolls-Royce, PLC v. United Techs. Corp.*, 603 F.3d 1325, 1334 (Fed. Cir. 2010) (cleaned up); *accord August Tech. Corp. v. Camtek, Ltd.*, 655 F.3d 1278, 1285 (Fed. Cir. 2011).

Petitioner’s reliance on Dr. LaViola’s deposition testimony is also misplaced.

The Board should “discount any expert testimony ‘that is clearly at odds with the claim construction mandated by the claims themselves, the written description, and the prosecution history, in other words, with the written record of the patent.’” *Phillips v. AWH Corp.*, 415 F.3d at 1318; see also *DESA IP, LLC v. EML Techs., LLC*, 211 F. App'x 932, 936 (Fed. Cir. 2007) (“Expert testimony in conflict with the intrinsic evidence, however, should have been accorded no weight.”). Therefore, even if Dr. LaViola had opined that claim 1 covers Figure 5 it would not matter because that testimony conflicts with the claim language. But he did not.

Dr. LaViola testified that claim 1 does *not* cover the split display configuration depicted in Figure 5. Ex. 1022 at 112:13-114:13 (“Q So would [claim 1] cover a split display configuration like Figure 5? A No.”), 117:16-119:19 (“Does Claim 1 of the 847 [sic] patent cover embodiment of Figure 5? A I guess Figure 5, as it is drawn, the answer would be no.”), 120:1-22 (“So as it is drawn [Figure 5], because there is nothing showing that there’s a connection, physical connection between – or anything that would indicate that these would be moving together, then I don’t believe Claim 1 covers it.”), 125:11-126:9 (“Q Does Claim 1 describe a separate display device? A No. It describes an electronic device that contains a display device, a motion sensor, and a computing processor.”), 126:17–128:12 (“Q Does Claim 1 of the ’846 patent cover the embodiment of Figure 5? A As it is drawn in the figure, no.”). And confirmed that the display moves in the spatial reference frame. *Id.* at

113:2-114:13 (“Well, in this particular claim, because we have a display reference frame here, and display device, that would imply that the rotations of the electronic device are in the spatial reference frame. And if they're in the spatial reference frame, then that would imply that the display device is also in the spatial reference frame.”), 117:16-119:12 (same), 125:11–126:9 (“Q So you agree that the display moves with the electronic device because it is part of it? A. Yes. It is part of it, based on this claim.”). Dr. LaViola’s testimony confirms Patent Owner’s construction.

Therefore, the Board should construe “electronic device” to mean “a device comprising a display device and a motion sensor module, both subject to movement and rotations in the spatial reference frame” or its equivalent.

2. Spatial Reference Frame – Claims 1, 7

Patent Owner’s Proposed Construction	Petitioner’s Proposed Construction
Claim 1: frame of reference associated with the electronic device, which always has its origin at the same point in the device and in which the axes are always fixed with respect to the device Claim 7: frame of reference associated with a device, which always has its origin at the same point in the device and in which the axes are always fixed with respect to the device	reference frame associated with a 3D pointing device, which always has its origin at the same point in the device and in which the axes are always fixed with respect to the device

The parties agree that this term requires a frame of reference “which always has its origin at the same point in the device and in which the axes are always fixed with

respect to the device.” They disagree only on whether the reference frame is tied to the “electronic device,” as the claims recite, or to a “3D pointing device,” which appears nowhere. Patent Owner now proposes separate constructions for claims 1 and 7 because, as Petitioner notes, claim 7 is a method claim not tied to a particular device.

The claim language ties the “spatial reference frame” to the “electronic device” twice: the motion sensor module is “associated with the movements and rotations of the electronic device in a spatial reference frame,” and the computing processor is “configured to calculate a resulting deviation comprising resultant angles associated with *the movements and the rotations of the electronic device* in the spatial reference frame.” (Ex. 1001, claim 1 (emphasis added).) No claim recites a “3D pointing device.” (*Id.*)

The prior IPR confirms this. In IPR2018-01257, involving a related patent, the parties agreed that “spatial reference frame” meant “a reference frame associated with the 3D pointing device, which always has its origin at the same point in the device and in which the axes are always fixed with respect to the device.” (Ex. 1013 at 46.) But the claim there specifically recited “a 3D pointing device, comprising: ... an accelerometer, generating a first signal set comprising axial accelerations associated with movements and rotations of the 3D pointing device in the spatial reference frame.” (Ex. 1010 at 35:40-58.) That is nearly identical to the ’846 Patent’s

counterpart claim language, except the '846 Patent's claims recite "electronic device" where the earlier claim recited a "3D pointing device" (Ex. 1001 at 31:9-21.) The agreed construction tracked the device the claim itself named. It should do the same here with "electronic device" substituted for "3D pointing device."

The specification agrees, describing embodiments in which the spatial reference frame is that of an electronic device. (Ex. 1001 at 23:27-35 ("a resultant deviation including deviation angles in a spatial reference frame of an electronic device, including ... a smartphone or other portable electronic apparatus"); *see also id.* at 5:30-36, 8:3-8, 8:35-39, 13:4-16, 13:49-61, 13:62-14:7, 17:29-37, 19:16-28, Figs. 6, 7, 8, 10, 11, 12.)

Petitioner advances two arguments in support of its "3D pointing device" construction. Both fail.

First, Petitioner argues against Patent Owner's construction because claim 7 of the '846 patent "does not recite 'electronic device.'" (Paper 36, "Reply" at 10.) This is true, claim 7 is a method claim that does not recite any device:

7. *A method* for determining movements and rotations in dynamic environments, comprising:

generating, with a rotation sensor having sensor circuitry measured angular velocities;

generating, with an accelerometer having accelerometer circuitry measured axial accelerations;

calculating, with a computing processor having processor circuitry,
a resulting deviation comprising resultant angles *associated with
the movements and the rotations in a spatial reference frame* by:

(Ex. 1001, Claim 7 (emphasis added).) So, it does not provide any support to either party's proposal. Claim 7 does not specify "what element rotates in the spatial reference frame." (Reply at 10.) Because "the same claim term can have different constructions depending upon the context of how the term is used within the claims and specification," *Aventis Pharm. Inc. v. Amino Chemicals Ltd.*, 715 F.3d 1363, 1374 (Fed. Cir. 2013), Patent Owner construes "spatial reference frame" in claim 7 as a "frame of reference associated with a device, which always has its origin at the same point in the device and in which the axes are always fixed with respect to the device." Petitioner's observation that claim 7 "does not specify what element rotates in the spatial reference frame" confirms the term should not be limited to any particular device; least of all a "3D pointing device" the claim never mentions. (Reply at 10.)

Second, Petitioner argues that in claim 1 "***only the motion sensor module*** is expressly recited as being associated with the movements and rotations in the spatial reference frame." (Reply at 10.) The claim says otherwise. The "movements and rotations of the electronic device" occur "in a spatial reference frame." (Ex. 1001, claim 1.) The motion sensor module is merely a component of the "electronic device." (*Id.*) The computing processor clause recites the electronic device and the

spatial reference frame a second time, independently confirming that the reference frame is tied to the electronic device. (*Id.*) Petitioner's contrary reading rests entirely on Figure 5, which shows an embodiment where “the spatial reference frame can be the reference frame of a component (the 3D pointer device 560) within that electronic device.” (Reply at 11-12.) But a construction “does not need to cover every embodiment,” *Apple Inc. v. Andrea Elecs. Corp.*, 949 F.3d 697, 708 (Fed. Cir. 2020), and the Federal Circuit has “repeatedly warned against confining the claims to [specific] embodiments,” *Phillips v. AWH Corp.*, 415 F.3d 1303, 1323 (Fed. Cir. 2005) (en banc), and against “read[ing] limitations from the specification into claims.” *Toshiba Corp. v. Imation Corp.*, 681 F.3d 1358, 1369 (Fed. Cir. 2012). A single figure cannot override claim 1’s express, twice-stated recitation that the “spatial reference frame” is tied to the electronic device. A claim is not limited to inventions looking like those in the drawings. (See *CCS Fitness, Inc. v. Brunswick Corp.*, 288 F.3d 1359, 1367 (Fed. Cir. 2002).

Finally, Petitioner’s construction cannot be reconciled with its argument in district court that the term “spatial reference frame” is indefinite under 35 U.S.C. § 112(2) because it “fail[s] to inform, with reasonable certainty, those skilled in the art about the scope of the invention.” (Ex. 2012 at 69-70; Ex. 2047 at 69-70; Paper 32 at 3.) That inconsistency further undermines Petitioner’s construction.

Accordingly, the Board should reject Petitioner’s invitation to import a “3D

pointing device limitation” into claims 1 and 7 and instead adopt Patent Owner’s constructions.

3. Predicted axial accelerations – Claims 1, 7

Patent Owner’s Proposed Construction	Petitioner’s Proposed Construction
Claim 1: Gravitational acceleration along the electronic device’s axes derived from the current quaternion	Plain and ordinary meaning: prediction of an axial acceleration

This term raises three questions: (i) whether it must be construed at all; (ii) whether it means gravitational acceleration along the device’s axes derived from the current quaternion; and (iii) whether Petitioner has advanced inconsistent constructions without explanation.

First, the Board must construe the term because the parties dispute its scope. *O2 Micro Int’l Ltd. v. Beyond Innovation Tech. Co.*, 521 F.3d 1351, 1360 (Fed. Cir. 2008) (“When the parties raise an actual dispute regarding the proper scope of these claims, the court, not the jury, must resolve that dispute.”). The construction “must ... be explicit, at least as to any construction disputed by [the] parties.” (*CSR, PLC v. Skullcandy, Inc.*, 594 F. App’x 672, 678 (Fed. Cir. 2014) citing *Gechter v. Davidson*, 116 F.3d 1454, 1457 (Fed. Cir. 1997). Petitioner contends there is no dispute because Patent Owner’s construction “does not address Petitioner’s analysis that a POSITA would have been motivated to use the Euler angle-based Equation 22 of Bassompierre in quaternion form.” (Reply at 3.) In other words, Petitioner

concedes that the “predicted axial accelerations” must be derived from a quaternion.

Second, Patent Owner’s construction comes directly from the claims and the specification. Claim 1 recites converting the measured angular velocities at time T, based on the previous quaternion, “into a current quaternion and predicted axial accelerations without using the measured axial accelerations corresponding to time T.” (Ex. 1001, claim 1.) The predicted axial accelerations are thus computed from the device’s orientation, expressed as a quaternion. “This is a direct mathematical transformation because the current quaternion encodes an orientation, and from that orientation, the direction of gravity relative to the device’s body axes can be computed precisely.” (Ex. 2040, ¶ 68.) A quaternion carries “no information about the device’s linear motion or rotational velocity,” so converting it into predicted axial accelerations “yields the components of gravitational acceleration along each device axis and nothing more.” (Ex. 2040, ¶¶ 96, 117.) Equations 2 through 4 in the specification convert the current quaternion into “the gravitational acceleration components that the accelerometer should be measuring if the device were oriented exactly as the current quaternion describes.” (*Id.*, ¶ 68.) Gravity is the only axial acceleration that can be predicted from a quaternion or the device’s orientation.

The specification confirms that “predicted axial accelerations” are “calculated based on the abovementioned current state or second quaternion,” and that “the computing processor may use a data conversion utility to convert quaternion into the

predicted axial accelerations Ax' , Ay' and Az' ” through equations (2), (3), and (4). (Ex. 1001, 17:8-28, Figs. 7, 8, 10, 11.)

Additionally, Claim 1 of the related '687 Patent explicitly recites “converting variables of the current quaternion into predicted axial accelerations corresponding to time T.” (IPR2025-01071, Ex. 1001, claim 1.) Because the two patents descend from the same parent application and share a specification, their common terms should be construed consistently. *Innovative Growers Equip., Inc. v. Pipp Mobile Storage Sys., Inc.*, No. IPR2022-00893, 2023 WL 7107846, at *14 (P.T.A.B. Oct. 27, 2023) (citing *SightSound Techs., LLC v. Apple Inc.*, 809 F.3d 1307, 1316 (Fed. Cir. 2015)); see also *In re Katz Interactive Call Processing Pat. Litig.*, 639 F.3d 1303, 1325 (Fed. Cir. 2011).

Petitioner, by contrast, supports its construction, “prediction of an axial acceleration” only with Dr. Sarrafzadeh’s testimony. (Reply at 4 (citing Ex. 2036).) But the Board “should discount any expert testimony ‘that is clearly at odds with the claim construction mandated by the claims themselves, the written description, and the prosecution history, in other words, with the written record of the patent.’” *Phillips*, 415 F.3d at 1318. Petitioner’s proposed construction merely rephrases “predicted axial accelerations” without clarifying its scope.

Third, Petitioner offers no explanation for its inconsistent positions. Petitioner relies exclusively on the Institution Decision, arguing that the “Board has already

noted that Petitioner has sufficient reason to contend here that ‘predicted axial accelerations’ should be accorded its plain and ordinary meaning.” (Reply at 4 (citing Paper 17 at 22-23).) But the Institution Decision did not address Dr. Mercer’s reports or Petitioner’s indefiniteness defenses asserted in district court. (See *generally* Paper 17.) Moreover, the Institution Decision was procured because of Petitioner’s misconduct that is currently pending before the Board in Patent Owner’s Authorized Motion for Sanctions. (Paper 32.)

Finally, Petitioner’s complaint that Patent Owner submitted only a redacted excerpt of Dr. Mercer’s report is irrelevant. Petitioner has the complete report and could have filed any missing portion to support their position. Petitioner did not. The cited excerpts accurately reflect Dr. Mercer’s claim interpretations and Petitioner offers no explanation for abandoning those positions here.

Accordingly, the Board should adopt Patent Owner’s construction for this term.

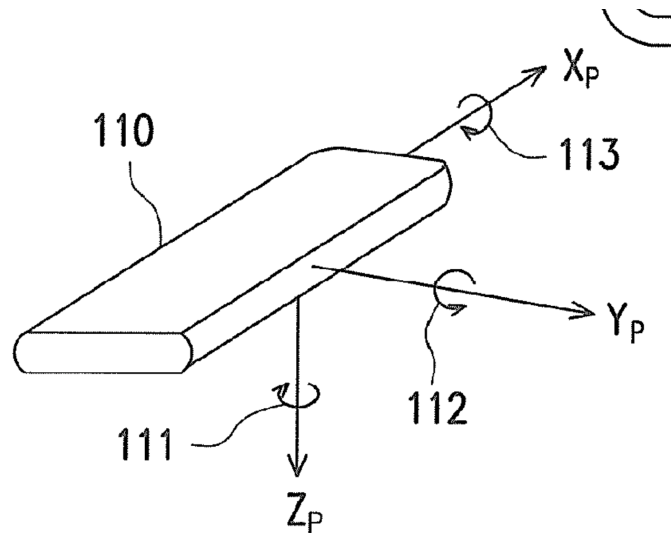
4. Resultant Angles – Claims 1, 7

Patent Owner’s Proposed Construction	Petitioner’s Proposed Construction
yaw, pitch, and roll angles	plain and ordinary meaning

The issue for this term is whether Patent Owner’s construction is unnecessarily limiting because it includes yaw. It is not. Petitioner identifies Bassompierre’s pitch and roll angles as the “resultant angles.” (Reply at 16.)

Patent Owner’s construction comes directly from the specification. (Patent

Owner's Response at 37-40.) Figure 1 depicts "resultant angles" as the rotational angles about the three orthogonal axes: the yaw angle (111) about Z_p , the pitch angle (112) about Y_p , and the roll angle (113) about X_p :



(Ex. 1001, Fig. 1.) The specification describes them the same way: "resultant angles includes the yaw angle, pitch angle and roll angle ... associated with the spatial reference frame, preferably about each of *three orthogonal coordinate axes* of the spatial reference frame." (*Id.*, 26:4-12 (emphasis added). Petitioner admits "The system keeps track of the 'orientation' of pointing device 110 by measuring three deviation angles: yaw angle 111 representing the device's rotation about axis Z_p , pitch angle 112 representing its rotation about axis Y_p , and roll angle 113 representing its rotation about axis X_p ." (Pet. at 6-7 citing Ex. 1001 2:2-14.) The same "three orthogonal coordinate axes" language is cited by Petitioner as

“confirming lack of the lexicography mandating PO’s proposed construction.” (Reply at 12 (citing Ex. 1001, 11:36-40; 12:61-13:1; 13:49-57).) But those passages are not inconsistent with Patent Owner’s construction because “Euler angles represent orientation as three sequential angles (yaw, pitch, and roll) about three orthogonal axes.” (Ex. 2040, ¶ 54.)

Petitioner’s attack on the inclusion of yaw in Patent Owner’s construction fails because it improperly imports an accuracy limitation into the claims and misapplies claim differentiation. Patent Owner’s expert testified that a three-axis gyroscope “provides angular velocities for roll, pitch, and yaw,” and “if you integrate angular velocity, it will give you the orientation for roll, pitch, and yaw.” (Ex. 1022, 22:5-20; *see* Ex. 2040, ¶ 71.) And that “absolute orientation” can be calculated using only a gyroscope and accelerometer. (Ex 1022, 37:19-38:6.) This testimony is un rebutted. Petitioner relies on Dr. LaViola’s testimony that yaw angle predictions drift and are less accurate in the absence of magnetometer readings. (Reply at 13 (citing Ex. 1022, 24:12-15, 26:14-27:6, 37:19-38:6, 107:21-109:3).) But that testimony is irrelevant because the claims at issue have no drift or accuracy related limitations.

Petitioner’s claim-differentiation argument fails because the yaw angles referenced in dependent claims 2, 5, 8 and 11 are not part of the “resultant angles.” Claims 2 and 8 recite a “measured yaw angle” and a “predicted yaw angle” as intermediate values in the EKF correction. (Ex. 1001, claims 2, 8.) Those

intermediate yaw angles are not the final “resultant angles” that represent the device’s orientation (or updated quaternion); they are intermediate steps used to compute that orientation. Thus, claim differentiation does not apply because Patent Owner’s construction is consistent with those dependent claims; it does not render them “void, meaningless, or superfluous.” *See Intel Corp. v. Qualcomm Inc.*, 21 F.4th 801, 810 (Fed. Cir. 2021).

Finally, Petitioner’s construction cannot be reconciled with its argument in district court that the term “resulting deviations comprising resultant angles” is indefinite. (Ex. 2012 at 69-70; Ex. 2047 at 69-70; Paper 32 at 3.)

Accordingly, the Board should adopt Patent Owner’s construction.

5. Quaternion – Claims 1, 3, 7, 9

Patent Owner’s Proposed Construction	Petitioner’s Proposed Construction
Plain and ordinary meaning, which is: a four-component mathematical representation used to represent three-dimensional orientation as a single rotation	Plain and ordinary meaning

Petitioner argues that no construction is needed because it ‘does not resolve any dispute between the parties.’ (Reply at 1.) That is incorrect. The construction resolves the threshold question of what Bassompierre must disclose. Patent Owner’s construction confirms that Petitioner can prevail only by proving that a POSITA “would ... have been motivated to use quaternions instead of Euler angles in

Bassompierre's EKF.” (Reply at 2.) Accordingly, the Board should adopt Patent Owner’s proposed construction.

B. BASSOMPIÈRE DOES NOT DISCLOSE THE FOLLOWING CLAIM LIMITATIONS.

As Patent Owner’s Response showed, Bassompierre does not teach multiple claim elements, including “electronic device,” “quaternions,” “predicted axial accelerations,” “spatial reference frame,” “resultant angles,” and “data association model.” Petitioner’s answer takes two forms: disputing Patent Owner’s claim constructions, or conceding that Bassompierre is written in Euler angles and arguing that a POSITA “would know how to derive” the limitation “in quaternion form.” The first is answered by the claim construction section above; the second is a modification argument, not a disclosure. Neither shows that Bassompierre teaches the claimed limitations.

1. Electronic device and spatial reference frame.

Petitioner’s argument that Bassompierre discloses these elements turns entirely on both term’s construction, which is addressed above in the claim construction section. (*Supra* § II.A.1.)

2. Quaternion.

Petitioner’s argument that Bassompierre discloses “quaternions” is based entirely on “*modifying* Bassompierre’s Euler-based EKF equations to use quaternions...” (Reply at 14-15 (emphasis added).) Bassompierre does not inherently teach this

limitation. And, as explained below, a POSITA would not have modified Bassompierre to create that quaternion version. (Patent Owner Response at 52-57; *infra* § II.C.)

3. Predicted axial accelerations.

Patent Owner does not agree that Equation 22 of Bassompierre teaches “predicted axial accelerations” because it does not derive them from the current quaternion as required by the claims. Once again, Petitioner argues that POSITA “would know to *derive* [equation 22] in quaternion form...” (Reply at 15 (emphasis added).) So, Bassompierre does not inherently teach this limitation. And, as explained below, a POSITA would not have modified Bassompierre to create that quaternion version. (Patent Owner Response at 52-57; *infra* § II.C.)

4. Resultant angles.

Petitioner’s assertion that Patent Owner “does not dispute that the pitch and roll angles in Bassompierre equation 23 constitute ‘resultant angles’” mischaracterizes the record. (Reply at 16.) This limitation is missing entirely from Bassompierre. The “resultant angles” must include yaw, pitch, and roll reflecting the device’s absolute orientation. (*Supra* § II.A.4.) Bassompierre does not “provide content” based on the device’s absolute orientation, but rather two axes of angular velocity ω_v and ω_w . (Ex. 1006 Eq. 24 and FIG. 6.) So, the “absolute orientation of the device relative to the screen is therefore immaterial to pointer control” in Bassompierre. (Ex. 2040, ¶ 74.)

Petitioner's entire case rests on the Euler angle state vector being replaced by a quaternion state vector so that pitch and roll angles (Petitioner's alleged "resultant angles") are removed from Bassompierre's quaternion-converted EKF equations. Petitioner alleges that a POSITA would convert their quaternion EKF output into Euler angles, discard yaw, and compute ω_v and ω_w based on pitch and roll. (Reply at 17 (citing Ex. 1007, 271).) But this disclosure is nowhere in Bassompierre. And Petitioner's modification never "provides content" based on the orientation as claimed, but rather two axes of angular velocity. The angular velocities themselves are not based on a "resultant deviation" because yaw is discarded before they are calculated to maintain the separation of reference frames required by Bassompierre. (Ex. 1006 Eq. 24.)

Further, as explained below, a POSITA would not have modified Bassompierre in this way. (Patent Owner Response at 45-51; *infra* § II.C.)

5. Data association model.

Petitioner concedes Equation 23 is in Euler form and again argues that a POSITA "would readily know to implement" it "with a four-dimensional current quaternion." (Reply at 18.) Again, this is a modification argument, not proof that Bassompierre inherently discloses this element. But, as explained below, a POSITA would not have modified Bassompierre's equation 23 in quaternion form. (Patent Owner Response at 52-57; *infra* § II.C.)

C. PETITIONER HAS NOT SHOWN THAT A POSITA WOULD HAVE BEEN CAPABLE OR MOTIVATED TO MODIFY BASSOMPIÈRE.

Petitioner has not shown that a POSITA would have been capable or motivated to make the same modifications to Bassomprière that Dr. Sarrafzadeh did.

Petitioner relies exclusively on Bassomprière for everything except “electronic device.” A single reference renders a claim obvious only if it would have been obvious to modify it to reach the claimed invention, *Arendi S.A.R.L. v. Apple Inc.*, 832 F.3d 1355, 1361 (Fed. Cir. 2016), which requires proof of some “suggestion or motivation to modify the teachings of that reference,” *SIBIA Neurosciences, Inc. v. Cadus Pharm. Corp.*, 225 F.3d 1349, 1356 (Fed. Cir. 2000). It is not enough for Petitioner to show that a POSITA could have modified Bassomprière; Petitioner must show that a POSITA would have been motivated to do so.

1. No Capability.

Petitioner’s Reply repeatedly mischaracterizes the record, stating that “PO does not dispute” Petitioner’s modified quaternion equations. (*See, e.g.*, Reply at 2, 15, 16, 19, 20, and 22 (“PO does not dispute ...”).) In fact, Patent Owner has repeatedly disputed the mathematical validity and origination of Petitioner’s proposed modifications. Specifically, terms $\dot{q}$ and $\hat{x}_k^-$ relied on for “previous” and “current quaternion” are not equivalent. (Paper 8 at 27-30; Paper 25 at 56-57.) Dr. Sarrafzadeh did not perform a proper rotation to obtain the “predicted axial

acceleration.” (Paper 25 at 59-60.) And, Petitioner has failed to show how a POSITA would obtain and use the matrix multiplication equation relied on for “updated quaternion” and “data association model.” (Paper 8 at 30-31; Paper 25 at 46, 51.)

Dr. LaViola testified that Dr. Sarrafzadeh is “a person of extraordinary skill in the art” whose knowledge “goes beyond a POSITA.” (Ex. 2040, ¶ 37; Ex. 1022, 15:21-16:11, 18:19-20:13.) Dr. Sarrafzadeh’s inability to provide coherent, workable quaternion counterpart equations despite his high level of expertise is strong evidence that a POSITA is also not capable of constructing a quaternion EKF from Bassompierre.

2. No Motivation.

Petitioner argues that a POSITA would have been motivated to modify Bassompierre because of the “computational efficiency of quaternions over Euler angles” and because “Bassompierre and the asserted claims pursue the same objectives.” (Reply at 20-23.) Both fail.

Regarding computational efficiency, Petitioner’s only proof is Bassompierre’s statement that quaternions avoid “computations of the sines and cosines of the pitch and roll angles that are greedy in terms of computation power.” (Reply at 21 (citing Ex. 1006, 20:10-13.) But Dr. LaViola testified that “a POSITA would have recognized that the additional overhead of a quaternion implementation provides no performance advantage for a two-degree-of-freedom system like Bassompierre’s.”

(Ex. 2040, ¶ 139.) And Petitioner's expert admitted that "[I]t's not always advantageous to use quaternions over Euler angles." (Ex. 2035, 255:17-21.) There is no evidence that Dr. Sarrafzadeh's conversion of Bassompierre from Euler angles to quaternions is more computationally efficient.

Further, to arrive at the claimed "resultant angles." Petitioner requires a POSITA to: (1) use a quaternion EKF to obtain an alleged "updated quaternion"; (2) calculate roll, pitch, and yaw angles from the updated quaternion then discard the yaw; and (3) compute the axial velocities in the carrier frame from the roll and pitch. (Reply at 13.) Bassompierre teaches away from such modification and teaches that angular velocity can be calculated directly from a quaternion. (Ex. 1006 Eq. 27.)

Regarding objectives, the experts agree that the '846 Patent claims "describe an electronic device" and method that "track[s] an electronic device's orientation in a spatial reference frame, output as resultant angles comprising yaw, pitch and roll angles." (Ex. 2040, ¶ 65; Ex. 1002, ¶ 46 ("The '846 patent's field of endeavor is ... to provide orientation of a device in three-dimensional space.")) The specification states the goal is "outputting ... deviation including 3D angles in a spatial reference frame in an 'absolute' manner." (Ex. 1001, 30:33-41.) "Absolute orientation is the exact orientation of an object." (Ex. 1022, 35:15-22.) The claims require that "resultant angles" are translated into a "real-time movement pattern in the display reference frame." (Ex. 1001, claim 1.)

By contrast, Bassompierre's objective is "a system for moving a pointer on a screen" using "angular velocities," and seeks to correct the "tilt or torsion" problem that arises when a user holds the pointer at 45 degrees rather than horizontal. (Ex. 2040, ¶ 73; Ex. 1002, ¶ 44; Ex. 1006, 2:16-22.) To do so, Bassompierre decouples the pointer's absolute spatial orientation from cursor movement through its carrier reference frame. (Paper 25 at 55-56.) Therefore, even a motivated POSITA following Bassompierre would not arrive at the claimed yaw, pitch, and roll output. Further, a motivated POSITA would never determine cursor movements based on pitch or roll, but rather angular velocity. Bassompierre and the '846 patent do not have the same objectives.

Accordingly, Petitioner has shown neither a motivation to modify Bassompierre nor that a POSITA could have done so, and its theory rests on hindsight.

D. COMBINING BASSOMPIÈRE WITH NASIRI DOES NOT CURE THE DEFICIENCIES.

The Petition added Nasiri for a single, contingent purpose: to address the possibility that the Board construes "electronic device" to require the display and motion sensor module to occupy the same housing. (Pet. at 64.) Outside that housing question, Ground 2 incorporates Ground 1's analysis wholesale. Nasiri teaches no element of the EKF algorithm, no quaternion-based measurement model, no predicted axial accelerations, and no sensor fusion methodology.

Petitioner's assertion that Patent Owner "does not contest" that the combination

“satisfies all limitations” is incorrect. (Reply at 23.) Patent Owner contests that Nasiri discloses any claim limitations beyond that integrated display. All other claim limitations in Ground 2 are supplied by Bassompierre and fail for the reasons discussed above and in Patent Owner’s Response.

III. CONCLUSION

For the foregoing reasons, the Board should adopt Patent Owner’s constructions of “electronic device,” “spatial reference frame,” “predicted axial accelerations,” “resultant angles,” and “quaternion.” Under those constructions, Bassompierre, which is written in Euler angles and discloses only a split-configuration pointer, does not disclose the challenged limitations. And Petitioner has not shown a motivation to modify Bassompierre’s EKF to use quaternions or that a POSITA would have been able to do so. The Bassompierre-Nasiri combination fails for the same reasons and supplies no limitation beyond an integrated device. Patent Owner respectfully requests that the Board confirm the patentability of claims 1, 3, 7, and 9.

Respectfully Submitted,

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CERTIFICATE OF WORD COUNT (37 C.F.R. § 42.24(d))

Pursuant to 37 CFR § 42.24(d), the undersigned certifies that this brief complies with the type-volume limitations of 37 CFR § 42.24(c)(4). This brief contains **5,524** words as calculated by the “Word Count” feature of Microsoft Word, the word processing program used to create it, which is less than the 5,600 word count limit.

This brief also complies with the general format requirements of 37 C.F.R. § 42.6(a) and has been prepared using Microsoft Word in 14-point Times New Roman font.

Respectfully submitted,

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August 12, 2026
Date

CERTIFICATE OF SERVICE 37 C.F.R. § 42.6(e)

The undersigned hereby certifies that the above document was served
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