

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

TESLA, INC.,
Petitioner,

v.

IQAR INC.,
Patent Owner.

IPR2024-00545
Patent 8,972,161 B1

Before JASON W. MELVIN, SEAN P. O'HANLON, and
BRENT M. DOUGAL, *Administrative Patent Judges*.

O'HANLON, *Administrative Patent Judge*.

DECISION
Granting Institution of *Inter Partes* Review
35 U.S.C. § 314

I. INTRODUCTION

A. Background

Tesla, Inc. (“Petitioner”) filed a Petition for *inter partes* review of claims 1–18 (“the challenged claims”) of U.S. Patent No. 8,972,161 B1 (Ex. 1001, “the ’161 patent”). Paper 2 (“Pet.”), 1. iQar, Inc. (“Patent Owner”) filed a Preliminary Response. Paper 6 (“Prelim. Resp.”).

Institution of an *inter partes* review is authorized by statute only when “the information presented in the petition . . . and any response . . . 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). A decision to institute may not institute on fewer than all claims challenged in the petition. *SAS Inst. Inc. v. Iancu*, 138 S. Ct. 1348, 1354, 1359–60 (2018). If the Board institutes a trial, the Board will institute on all challenges raised in the petition. *See* 37 C.F.R. § 42.108(a) (“When instituting . . . review, the Board will authorize the review to proceed on all of the challenged claims and on all grounds of unpatentability asserted for each claim.”).

We have authority, acting on the designation of the Director, to determine whether to institute an *inter partes* review under 35 U.S.C. § 314 and 37 C.F.R. § 42.4(a). For the reasons set forth below, upon considering the parties’ briefs and evidence of record, we conclude that the information presented shows that there is a reasonable likelihood that Petitioner would prevail in establishing the unpatentability of at least one of the challenged claims. Thus, we institute *inter partes* review of all challenged claims based on all asserted grounds.

B. Real Parties in Interest

Petitioner identifies itself as the sole real party in interest. Pet. 100.

Patent Owner identifies itself (stating that it is “formerly known as Invently Automotive, Inc.”) as the sole real party in interest. Paper 4, 1.

The parties are reminded of their continuing obligation to update their mandatory notice information “within 21 days of a change of the information.” 37 C.F.R. § 42.8(a)(3).

C. Related Matters

The parties indicate that the ’161 patent is the subject of the following district court proceeding:

iQar Inc. v. Tesla, Inc., No. 1-23-cv-00694 (W.D. Tex. filed June 20, 2023).

Pet. 100; Paper 4, 1. It appears that this proceeding has been transferred to the Northern District of California under the caption:

iQar Inc. v. Tesla, Inc., No. 3-24-cv-01337 (N.D. Cal. filed March 6, 2024).

D. The Challenged Patent

The ’161 patent discloses methods and systems for controlling power applied to a vehicle engine. Ex. 1001, 1:11–12. The ’161 patent purports that, currently, fuel consumption cannot be precisely controlled by a driver, and operational assisting devices typically do not optimize power consumption of the vehicle. *Id.* at 1:16–20, 1:45–49. The ’161 patent purports to improve upon optimization of power consumption of a vehicle via “power management logic that can calculate an applied power for the vehicle engine based on information provided from the external environment

of the vehicle, the operational status of the vehicle, one or more command inputs from a driver, and one or more operational parameters of the vehicle.” *Id.* at 2:15–24.

The ’161 patent describes “steps that may be followed to optimize the energy supplied to an engine so that the vehicle travels at a fuel-efficient speed.” Ex. 1001, 11:11–13; *see also id.* at Fig. 2 (illustrating a flowchart of steps to optimize power).

To determine an optimally efficient speed for the optimal power to be supplied to the engine), a route is determined 201 from the starting position and an actual or estimated ending position, the route is segmented 203 into one or more segments, a model optimal speed (or power) is calculated 205, statistical data from previous trips along the same segment of the route are retrieved 207, and an overall efficiency applied power is calculated from at least the model power and the statistical data 209. Finally, the overall efficient applied power is provided to the engine.

Id. at 11:13–23. “The route is determined based on the current position of the vehicle and a final destination position.” *Id.* at 11:31–32. The destination may be input by the driver before or during the trip (*id.* at 11:38–40), or the destination may be derived from information about the driver, current location, time of day, and past trips (*id.* at 13:51–14:12). “In some variations, the route may be broken up into segments that may be used by a power management device to optimize the power needed to travel this segment.” *Id.* at 13:44–47. Accuracy of the model increases as the number of segments increases. *Id.* at 14:7–9. “The route may be continuously re-segmented” as the vehicle moves. *Id.* at 13:65–66. “The power required by the vehicle to travel along a route, or a segment of the route, may be estimated or calculated, and this calculation may be used to determine a

calculated speed for the vehicle so that the power usage is optimized or minimized.” *Id.* at 14:14–18. The optimal speed for each segment may be calculated by any appropriate method, and may include the use of energy calculating logic. *Id.* at 14:47–51.

E. The Challenged Claims

Petitioner challenges claims 1–18 of the ’161 patent. Pet. 1. Claims 1 and 10 are independent. Claim 1 is illustrative of the challenged claims and is reproduced below.

1. A method of managing a power consumption of a vehicle, comprising the steps of:
 - (a) receiving a route at a computer of said vehicle;
 - (b) segmenting said route into a plurality of segment destinations;
 - (c) calculating a plurality of energy values consumed by said vehicle to travel said route based on a plurality of variations in a target speed of said vehicle between pairs of said segment destinations;
 - (d) determining a plurality of efficient speeds that achieve a best summation of said energy values; and
 - (e) notifying an operator of said vehicle about said efficient speeds to travel between each of said segment destinations.

Ex. 1001, 26:15–28.

F. Asserted Grounds of Unpatentability

The Petition relies on the following prior art references:

Name	Reference	Exhibit
Neiss	US 2004/0068359 A1, published April 8, 2004	1005
Clapper	US 6,161,072, issued December 12, 2000	1006

Name	Reference	Exhibit
Hirasago	US 6,658,344 B2, issued December 2, 2003	1008
Schramm	US 6,005,494, issued December 21, 1999	1009

Petitioner asserts the following grounds of unpatentability:

Claim(s) Challenged	35 U.S.C. §	Reference(s)/Basis
1–3, 5, 6, 8–15, 17, 18	103(a) ¹	Neiss
4	103(a)	Neiss, Hirasago
1, 3, 6–10, 12, 13, 15–18	103(a)	Schramm, Clapper

Pet. 1. Petitioner submits a declaration of Nikolaos P. Papanikolopoulos, Ph.D. (Ex. 1003, “Papanikolopoulos Declaration”) in support of its contentions. Patent Owner does not submit any witness testimony with its Preliminary Response.

II. ANALYSIS

A. Principles of Law

A patent claim is unpatentable under 35 U.S.C. § 103(a) if the differences between the claimed subject matter and the prior art are such that the subject matter, as a whole, would have been obvious at the time the invention was made to a person having ordinary skill in the art to which the subject matter pertains. *KSR Int’l Co. v. Teleflex Inc.*, 550 U.S. 398, 406 (2007). The question of obviousness is resolved on the basis of underlying

¹ The application resulting in the ’161 patent claims priority to a date prior to the date when the Leahy-Smith America Invents Act (“AIA”), Pub. L. No. 112–29, 125 Stat. 284 (2011), took effect. Thus, we refer to the pre-AIA version of section 103.

factual determinations including (1) the scope and content of the prior art, (2) any differences between the claimed subject matter and the prior art, (3) the level of skill in the art, and (4) when in evidence, any objective evidence of nonobviousness.² *Graham v. John Deere Co.*, 383 U.S. 1, 17–18 (1966).

B. Level of Ordinary Skill in the Art

The level of ordinary skill in the art is “a prism or lens” through which we view the prior art and the claimed invention. *Okajima v. Bourdeau*, 261 F.3d 1350, 1355 (Fed. Cir. 2001). The person of ordinary skill in the art is a hypothetical person presumed to have known the relevant art at the time of the invention. *In re GPAC Inc.*, 57 F.3d 1573, 1579 (Fed. Cir. 1995). In determining the level of ordinary skill in the art, we may consider certain factors, including: “(1) the educational level of the inventor; (2) type of problems encountered in the art; (3) prior art solutions to those problems; (4) rapidity with which innovations are made; (5) sophistication of the technology; and (6) educational level of active workers in the field.” *Best Med. Int’l, Inc. v. Elekta Inc.*, 46 F.4th 1346, 1353 (Fed. Cir. 2022) (quoting *Daiichi Sankyo Co. v. Apotex, Inc.*, 501 F.3d 1254, 1256 (Fed. Cir. 2007)). “The patent’s purpose can also be informative.” *Id.*

Petitioner contends that a person having ordinary skill in the art at the time of the invention (“POSITA”) would have had “a bachelor’s degree in electrical engineering, computer engineering, mechanical engineering (including automotive engineering), civil engineering (transportation

² At this stage of the proceeding, the parties have not directed us to any such objective evidence.

systems), physics, or a related field, and at least four years of experience (or the academic equivalent) in the field of transportation systems.” Pet. 2–3. Petitioner contends that “[a]dditional education could substitute for professional experience, and *vice versa*.” *Id.* at 3 (citing Ex. 1003 ¶¶ 1–19, 24–26; Ex. 1004).

Patent Owner “does not dispute” Petitioner’s definition of the level of ordinary skill. Prelim. Resp. 5.

We find Petitioner’s definition to be consistent with the problems and solutions disclosed in the patent and prior art of record, and adopt it as our own for purposes of this Decision. *See, e.g., In re GPAC*, 57 F.3d at 1579 (approving the determination of the level of ordinary skill in the art by appeal to the references of record).

C. Claim Construction

In an *inter partes* review, claims are construed using the same claim construction standard that would be used to construe the claims in a civil action under 35 U.S.C. § 282(b), including construing the claims in accordance with the ordinary and customary meaning of such claims as understood by one of ordinary skill in the art and the prosecution history pertaining to the patent. 37 C.F.R. § 42.100(b). “[T]he ordinary and customary meaning of a claim term is the meaning that the term would have to a person of ordinary skill in the art in question at the time of the invention” and “after reading the entire patent.” *Phillips v. AWH Corp.*, 415 F.3d 1303, 1313, 1321 (Fed. Cir. 2005) (en banc). In addition to the specification and prosecution history, we also consider use of the terms in other claims and extrinsic evidence including expert and inventor testimony,

dictionaries, and learned treatises, although extrinsic evidence is less significant than the intrinsic record. *Id.* at 1312–17. Usually, the specification is dispositive, and it is the single best guide to the meaning of a disputed term. *Id.* at 1315.

“The Board is required to construe ‘only those terms . . . that are in controversy, and only to the extent necessary to resolve the controversy.’” *Realtime Data, LLC v. Iancu*, 912 F.3d 1368, 1375 (Fed. Cir. 2019) (alteration in original) (quoting *Vivid Techs., Inc. v. Am. Sci. & Eng’g, Inc.*, 200 F.3d 795, 803 (Fed. Cir. 1999)).

Both parties assert that no interpretation of any claim terms is required. *See* Pet. 2 (“No claim constructions are necessary”); Prelim. Resp. 5 (“Patent Owner does not believe that any specialized constructions are necessary”). However, both parties interpret various claim terms in their arguments. *See, e.g.*, Pet. 18 (interpreting “segment destination” to “encompass[] segmenting a route into a plurality of segments, each having an endpoint/destination”); Prelim. Resp. 16 (interpreting “route” to mean “the path from the vehicle’s starting position to a final destination”). We address certain ones of these claim interpretations below. No further claim interpretation is needed for this Decision.

D. Asserted Obviousness Based on Neiss

Petitioner argues that claims 1–3, 5, 6, 8–15, 17, and 18 would have been obvious in view of Neiss. Pet. 4–48. In support of its showing, Petitioner relies upon the Papanikolopoulos Declaration. *Id.* (citing Ex. 1003). We have reviewed Petitioner’s assertions and supporting evidence. For the reasons discussed below, and based on the record before

us, we determine that Petitioner demonstrates a reasonable likelihood of prevailing in showing that at least one challenged claim would have been obvious in view of Neiss.

1. Overview of Neiss

Neiss discloses a “predictive cruise control system [that] utilizes information about the current vehicle position, as well as upcoming terrain[,] in order to save fuel.” Ex. 1005, code (57). Neiss’s cruise control system “minimizes vehicle operating costs, based on an analysis of vehicle operating parameters and route information regarding a route section ahead of the vehicle.” *Id.* ¶ 1. A “vehicle operating cost function” is used and is “defined[] based on a plurality of environmental parameters, vehicle parameters, vehicle operating parameters and route parameters.” *Id.* ¶ 15. “As the vehicle proceeds, an onboard computer iteratively calculates and stores in a memory vehicle control parameters that optimize the vehicle operating cost function for a predetermined distance (referred to as a ‘Prediction Horizon’) along the route ahead of the vehicle.” *Id.* “The vehicle is then controlled by reading the optimized vehicle control parameters from the memory, corresponding to the current position of the vehicle.” *Id.*

In particular, Neiss discloses a “Predictive Cruise Control (PCC)” that “is used to determine, as a function of position, a desired speed inside [a] speed band . . . in order to maximize fuel savings.” *Id.* ¶ 31; *see also id.* at Fig. 1 (illustrating the speed band). The PCC can slow down the vehicle as it moves uphill until it reaches a minimum speed on top of the hill and regains speed on the downhill part to “completely convert[] the potential

energy into kinetic energy.” *Id.* ¶ 31, Fig. 2. The PCC can also slow down the vehicle when the vehicle approaches a curve to avoid high lateral acceleration. *Id.* ¶ 32, Fig. 3. The PCC operates by receiving inputs from a Global Position System (GPS) and the current velocity to generate a desired velocity, a desired throttle position, and a desired controller gain, all to control “the vehicle to follow the calculated velocity trajectory.” *Id.*

¶¶ 34–41, Fig. 4.

The overall cost function is a summation of costs associated with travel time, fuel consumption, velocity, lateral acceleration, and a penalty for traveling at velocities outside of the speed band. Ex. 1005 ¶¶ 126–127. The PCC retrieves optimal velocity, throttle positions, and controller gain from a look-up table for the prediction horizon. *Id.* ¶ 162. The values in the look-up table “are calculated online, in real time as the vehicle proceeds along the traveled route.” *Id.* ¶ 163. The PCC iteratively employs an optimization algorithm each time the vehicle has covered a specified distance, referred to as a “frame,” with multiple frames occurring over the prediction horizon. *Id.* ¶¶ 169–170, Fig. 10. The optimization algorithm starts by obtaining road grade angles and curve radii for the first several frames of the prediction horizon and computing velocity and throttle positions. *Id.* ¶ 178–179, Figs. 12a, 12b. The algorithm then performs several optimization iterations to obtain optimal values for all frames of the prediction horizon. *Id.* ¶¶ 180–191, Figs. 12c, 13a–13d. The optimal values are then input into the PCC. *Id.* ¶¶ 37–41.

2. Independent Claim 1

a. The Preamble

Claim 1 recites “[a] method of managing a power consumption of a vehicle.” Ex. 1001, 26:15–16. Petitioner argues that “Neiss’s predictive cruise control (PCC) system uses ‘information about the current vehicle position’ and ‘upcoming terrain . . . to save fuel’ by minimizing a vehicle operating cost function.” Pet. 10 (citing Ex. 1005, ¶¶ 1, 15, 81–82, code (57); Ex. 1003 ¶ 52).

Patent Owner does not contest this aspect of the Petition. *See generally* Prelim. Resp.

Neiss discloses a PCC vehicle control system that seeks to minimize the cost of operating a vehicle. Ex. 1005 ¶¶ 34, 81–87.

Accordingly, for the foregoing reasons and on this preliminary record, to the extent the preamble is limiting, Neiss supports Petitioner’s contentions.

b. The Receiving Recitation

Claim 1 recites “receiving a route at a computer of said vehicle.” Ex. 1001, 26:17. Petitioner maps Neiss’s vehicle computer to the recited computer and prediction horizon to the recited route. Pet. 12–14 (citing Ex. 1005 ¶¶ 1, 15, 34, 37–41, 44, 49, code (57), Figs. 4, 10, 15; Ex. 1003 ¶¶ 57–61). Petitioner argues that Neiss’s PCC uses the vehicle’s current position to query a 3D digital road map to identify and access information about the prediction horizon. *Id.* at 14–16 (citing Ex. 1005³ ¶¶ 4–5, 12,

³ Although Petitioner sometimes cites to Exhibit 1004 (*see, e.g.*, Pet. 14, 15), we understand Petitioner’s intent was to cite to Neiss, Exhibit 1005.

14–15, 31, 45–49, 162–163, 167, 179, 181, 186, 190, code (57), Figs. 6, 12a–12c; Ex. 1003 ¶¶ 62–67).

Alternatively, Petitioner argues that it would have been obvious “to modify Neiss so that its onboard computer receives the entire route at once, instead of receiving it iteratively.” Pet. 16 (citing Ex. 1003 ¶¶ 68–72).

Patent Owner argues that Neiss’s prediction horizon is not a route. Prelim. Resp. 15–22. Patent Owner argues that “[t]he ’161 [p]atent repeatedly explains that a ‘route’ is the path from the vehicle’s starting position to a final destination.” *Id.* at 16 (citing Ex. 1001, 11:13–17, 11:31–32, 12:15–26, 12:44–13:38, Fig. 8). According to Patent Owner, “Neiss’s Prediction Horizon is not a route from the starting position and an actual or estimated ending position.” *Id.* at 17 (citing Ex. 1005 ¶¶ 48, 162). Patent Owner argues that Petitioner’s mapping of Neiss’s “overall route” also fails because “[s]imply traveling over a route is not the same as ‘receiving a route.’” *Id.* at 18. Patent Owner argues that Petitioner’s argument that it would have been obvious to modify Neiss’s system to receive the entire route fails because “Neiss fails to disclose any relevant ‘route,’ and so clearly does not and cannot teach an ‘entire route’ for the same reasons” and “Petitioner presents no evidence in support of its conclusion.” *Id.* at 19.

On this preliminary record, we do not agree with Patent Owner’s interpretation of “route.” Although we acknowledge that the ’161 patent states that “[t]he route is determined based on the current position of the vehicle and a final destination position” (Ex. 1001, 11:31–32), elsewhere the ’161 patent appears to allow for variability in the definition of “route.” To the contrary of Patent Owner’s assertion, the ’161 patent explains that “[t]he

route used by the power management device *typically* includes a starting position . . . , an ending position, . . . , and any intermediate positions between the initial and the final positions.” *Id.* at 13:40–44 (emphasis added). Therefore, we preliminarily find that the ’161 patent contemplates routes that, although not typical, do not include an ending position. Thus, Neiss’s prediction horizon appears to qualify as a “route” as the term is used in the ’161 patent.⁴ We encourage the parties to provide further briefing on the construction of “route” during the trial.

Moreover, even if we were to adopt it, it appears that Neiss’s last prediction horizon of a journey would satisfy Patent Owner’s proposed interpretation. Neiss discloses,

As the vehicle proceeds, an onboard computer iteratively calculates and stores in a memory vehicle control parameters that optimize the vehicle operating cost function for a predetermined distance (referred to as a “Prediction Horizon”) along the route ahead of the vehicle. The optimal vehicle control parameters for the Prediction Horizon are then stored in a memory and *continuously updated and replaced by new data as the vehicle (and hence the Prediction Horizon) moves along*, thereby adjusting the “optimal” control parameters to reflect actual vehicle historical operating experience during the journey.

Ex. 1005 ¶ 15 (emphasis added). As the prediction horizon shifts as the vehicle travels along its journey, the last prediction horizon of the journey

⁴ We also note again that this is a preliminary finding, as the Petition acknowledges (“[a]lternatively/additionally) that Neiss’s prediction horizon relates to “portions of an overall route ahead of the vehicle as the vehicle travels the overall *route* between a starting point and a final destination.” Pet. 14 (citing Ex. 1005 ¶¶ 1, 15, code (57); Ex. 1003 ¶ 61).

would include the final destination and, thus, qualify as a “route” according to Patent Owner’s proposed interpretation.

Neiss’s PCC includes: position estimator 25 that determines the current position of the vehicle; look-up table 26 that includes velocity, throttle pedal, and controller gain values for an area (the prediction horizon) around the current vehicle position; 3D digital road map 28 that includes gradient angles and curve radii of the upcoming road; and optimization algorithm module 27 that calculates velocity trajectory, optimal throttle pedal positions, and controller gains for the prediction horizon and stores the calculations in the look-up table. *Id.* ¶¶ 45–49, Fig. 6. “The look-up table values are calculated online, in real time as the vehicle proceeds along the traveled route.” *Id.* ¶ 163. Dr. Papanikolopoulos testifies that the PCC’s use of the 3D digital road map to identify each prediction horizon constitutes receiving the prediction horizon. Ex. 1003 ¶ 67.

We are also persuaded, on this preliminary record, that it would have been obvious to modify Neiss’s system to receive the entire route. *See* Pet. 16–18. Contrary to Patent Owner’s assertion (*see* Prelim. Resp. 19) and as discussed above, Neiss discloses that its prediction horizon is a predetermined distance of a route along which the vehicle travels. *See, e.g.*, Ex. 1005 ¶ 15. Additionally, Dr. Papanikolopoulos testifies that modifying Neiss’s system to receive an entire route “would be computationally efficient” and “receiving an entire end-to-end route (e.g., from external map applications) was well-known in the context of vehicle control systems and enabled receipt of accurate routes that, e.g., account for real-time events, such as road and/or traffic conditions.” Ex. 1003 ¶¶ 70–71.

Accordingly, for the foregoing reasons and on this preliminary record, Neiss supports Petitioner's contentions.

c. The Segmenting Recitation

Claim 1 recites "segmenting said route into a plurality of segment destinations." Ex. 1001, 26:18–19. Petitioner argues that, although the '161 patent "does not use the phrase 'segment destination,'" this recitation "encompasses segmenting a route into a plurality of segments, each having an endpoint/destination." Pet. 18 (citing Ex. 1001, 13:44–50; Ex. 1003 ¶¶ 73–74). Petitioner maps Neiss's frames having endpoints to the recited plurality of segment destinations. *Id.* (citing Ex. 1005 ¶ 170, Fig. 10; Ex. 1003 ¶ 75). Petitioner argues that Neiss's prediction horizon is separated into frames having a specified distance and an endpoint. *Id.* at 19–21 (citing Ex. 1005 ¶¶ 162, 169–171, 192, Fig. 10; Ex. 1003 ¶¶ 78–80).

Patent Owner argues that Petitioner improperly interprets "segment destination" to mean "segment." Prelim. Resp. 22. Patent Owner notes that the '161 patent discusses segment destinations. *Id.* at 22–23 (citing Ex. 1001, 5:9–14, 9:33–39, 14:19–23, 20:13–16).

Neiss discloses that each prediction horizon is separated into frames, with each frame having an endpoint. Ex. 1005 ¶ 170, Fig. 10. Neiss's PCC calculates the optimal velocity, throttle position, and controller gain, and these optimizations are updated iteratively multiple times for each frame. *Id.* ¶¶ 162–163, 169–170.

We agree with Patent Owner that the '161 patent discusses segment destinations in the cited portion of column five, but Patent Owner does not

address Petitioner’s mapping of Neiss’s frame endpoints to the recited segment destinations. Patent Owner’s arguments, therefore, are unavailing.

Accordingly, for the foregoing reasons and on this preliminary record, Neiss supports Petitioner’s contentions.

d. The Calculating Recitation

Claim 1 recites “calculating a plurality of energy values consumed by said vehicle to travel said route based on a plurality of variations in a target speed of said vehicle between pairs of said segment destinations.” Ex. 1001, 26:20–23. Petitioner maps the resulting velocity values of Neiss’s iterative updating steps to the recited variations in target speed. Pet. 21–23 (citing Ex. 1005 ¶¶ 180, 190–191, Figs. 12c, 13b–13d; Ex. 1003 ¶¶ 81–87). Petitioner argues that Neiss’s calculation of fuel consumption cost J_{fuel} in each iteration constitutes calculating a plurality of energy values consumed by the vehicle to travel the prediction horizon. *Id.* at 26–28 (citing Ex. 1005 ¶¶ 80–87, 93–98, 126–132; Ex. 1003 ¶¶ 88–94).

Parent Owner argues that claim 1 requires receiving a route that extends from a starting position to a final ending position. Prelim. Resp. 23–26. Patent Owner argues that “Neiss does not calculate or optimize energy values for the route as a whole.” *Id.* at 26. Rather, Patent Owner argues, “Neiss . . . only optimizes across the Prediction Horizon and never the route.” *Id.* at 27. Patent Owner argues that Neiss teaches away from the ’161 patent. *Id.* at 28.

As explained above, on this preliminary record, the ’161 patent does not support Patent Owner’s proposed interpretation of “route.” Patent

Owner's arguments, which are premised on its incorrect interpretation, are therefore unavailing.

Neiss's PCC calculates the optimal velocity, throttle position, and controller gain, and these optimizations are updated iteratively multiple times for each frame of the prediction horizon. Ex. 1005 ¶¶ 162–163, 169–170. These optimizations minimize the cost function, which includes fuel cost as a factor and outputs vehicle velocity. *Id.* ¶¶ 37–38, 81–82, 93–94.

Accordingly, for the foregoing reasons and on this preliminary record, Neiss supports Petitioner's contentions.

e. The Determining Recitation

Claim 1 recites “determining a plurality of efficient speeds that achieve a best summation of said energy values.” Ex. 1001, 26:24–25. Petitioner argues that Neiss's “cost function, J ,” is a summation of energy values because it “is a summation, over the N locations along the Prediction Horizon, of the [fuel consumption cost] values.” Pet. 31 (citing Ex. 1005 ¶ 132; Ex. 1003 ¶¶ 101–102). Petitioner argues that “Neiss's iterative optimization calculates ‘optimal velocity, throttle pedal positions, and controller gain series’ for each location along the Prediction Horizon,” and, “[a]fter one or more iterations, the calculated values ‘approach closer to the optimal values,’ *e.g.*, minimize the overall cost function J .” *Id.* at 34 (quoting Ex. 1005 ¶¶ 162, 191) (citing Ex. 1005 ¶¶ 162–163, 171, 185–186, 190; Ex. 1003 ¶ 105).

Patent Owner does not contest this aspect of the Petition. *See generally* Prelim. Resp.

Neiss’s PCC calculates the optimal velocity, throttle position, and controller gain, and these optimizations are updated iteratively multiple times for each frame of the prediction horizon. Ex. 1005 ¶¶ 162–163, 169–170. These optimizations minimize the cost function, which includes fuel cost as a factor. *Id.* ¶¶ 81–82, 93–94. The optimization iterations continue “until the algorithm has converged and thus the values are optimal.” *Id.* ¶ 180.

Accordingly, for the foregoing reasons and on this preliminary record, Neiss supports Petitioner’s contentions.

f. The Notifying Recitation

Claim 1 recites “notifying an operator of said vehicle about said efficient speeds to travel between each of said segment destinations.” Ex. 1001, 26:26–28. Petitioner argues that Neiss’s “vehicle is controlled to drive the identified optimized speed . . . for each current location of the vehicle.” Pet. 36 (citing Ex. 1005 ¶ 15; Ex. 1003 ¶¶ 109–110). Petitioner argues that it would have been obvious to include a speedometer to display the vehicle’s current speed. *Id.* at 36 (citing Ex. 1003 ¶¶ 111–113). Alternatively, Petitioner argues that it would have been obvious “to display the determined efficient speed for an upcoming location as the vehicle travels along the Prediction Horizon.” *Id.* at 37–38 (citing Ex. 1003 ¶ 118).

Patent Owner does not contest this aspect of the Petition. *See generally* Prelim. Resp.

Neiss discloses that, after determining the “optimal vehicle control parameters for the Prediction Horizon,” “[t]he vehicle is then controlled by reading the optimized vehicle control parameters from the memory,

corresponding to the current position of the vehicle.” Ex. 1005 ¶ 15. We are persuaded that it would have been obvious to include a speedometer with Neiss’s vehicle to display the vehicle’s speed. *See* Pet. 36–37 (citing *KSR*, 550 U.S. at 415–21; Ex. 1003 ¶¶ 113–116) (arguing that including a speedometer with Neiss’s vehicle “is merely the application of known techniques . . . to a known system . . . to yield predictable results” and would “provide[] the driver with valuable information about vehicle operation”).

Accordingly, for the foregoing reasons and on this preliminary record, Neiss supports Petitioner’s contentions. We determine that, on this preliminary record, Petitioner sets forth reasoning with rational underpinning as to why a person having ordinary skill in the art would have included a speedometer with Neiss’s vehicle. *See, e.g.*, Pet. 36–37.

g. Conclusion

Accordingly, at this stage of the proceeding, we determine that Petitioner has established a reasonable likelihood of prevailing on its assertion that claim 1 would have been obvious in view of Neiss.

3. *Independent Claim 10*

Independent claim 10 recites a method of managing a power consumption of a vehicle that contains the same first four steps as independent claim 1. *Compare* Ex. 1001, 26:15–25, *with id.* at 26:57–67. Petitioner relies on its showing made for claim 1 regarding the similar recitations (*see* Pet. 46), and Patent Owner does not challenge Petitioner’s showing for these recitations apart from its arguments made for claim 1 (*see* Prelim. Resp. 15–29). Our above analysis regarding these similar elements

applies to claim 10, and we focus our analysis below on the distinct recitation of claim 10.

a. The Applying Recitation

Claim 10 recites “applying power corresponding to said efficient speeds to an engine of said vehicle to travel between each of said segment destinations.” Ex. 1001, 27:1–3. Petitioner argues that “Neiss’s system controls the vehicle to travel at the optimized speed corresponding to the vehicle’s current position . . . as the vehicle traverses the Prediction Horizon.” Pet. 47 (citing Ex. 1005 ¶¶ 14–15, 42, Figs. 4, 15; Ex. 1003 ¶¶ 153–154).

Patent Owner does not contest this aspect of the Petition. *See generally* Prelim. Resp.

Neiss discloses that, after determining the “optimal vehicle control parameters for the Prediction Horizon,” “[t]he vehicle is then controlled by reading the optimized vehicle control parameters from the memory, corresponding to the current position of the vehicle.” Ex. 1005 ¶ 15. This control includes converting “the desired vehicle speed . . . to a desired engine speed” and sending a “command signal . . . to the engine so that it attempts to achieve the desired [engine] speed.” *Id.* ¶ 42.

Accordingly, for the foregoing reasons and on this preliminary record, Neiss supports Petitioner’s contentions.

b. Conclusion

Accordingly, at this stage of the proceeding, we determine that Petitioner has established a reasonable likelihood of prevailing on its assertion that claim 10 would have been obvious in view of Neiss.

E. Asserted Obviousness Based on Neiss and Hirasago

Petitioner argues that claim 4 would have been obvious in view of Neiss and Hirasago. Pet. 48–52. Because we have determined that Petitioner has set forth a reasonable likelihood of prevailing on its challenges to independent claim 1 from which this challenged claim depends, we need not and do not separately address this challenge.

F. Asserted Obviousness Based on Schramm and Clapper

Petitioner argues that claims 1, 3, 6–10, 12, 13, and 15–18 would have been obvious in view of Schramm and Clapper. Pet. 52–95. In support of its showing, Petitioner relies upon the Papanikolopoulos Declaration. *Id.* (citing Ex. 1003). We have reviewed Petitioner’s assertions and supporting evidence. For the reasons discussed below, and based on the record before us, we determine that Petitioner demonstrates a reasonable likelihood of prevailing in showing that at least one challenged claim would have been obvious in view of the combination of Schramm and Clapper.

1. Overview of the Asserted References

a. Schramm

Schramm discloses a “system for determining an energy-optimum route for a vehicle to take between an origin and a destination” using “a computer onboard the vehicle” that “access[es] a database containing both topographical map information and vehicle energy consumption data, and based thereon the computer determines and displays an energy-optimum route.” Ex. 1009, code (57).

Schramm provides a flow chart that exemplifies steps implemented by the computer. Ex. 1009, 3:25–27; Fig. 3. In first step 56, a routing module retrieves from topographical map electronic database 36 “a route between the origination point ‘A’ and the destination point ‘B,’” in which “each route retrieved is regarded . . . as a series of contiguous route segments.” *Id.* at 5:21–24, 5:32–34. Next, in step 58, the computer “determines, starting with the first route segment of a first route, the average elevation change . . . as indicated by the topographical map contained in the database 36.” *Id.* at 5:41–44. Then, in step 60, the computer “accesses the energy consumption module . . . to determine the energy consumption that would be required for the vehicle 12 to traverse the route segment under test at the speed that was input” previously. *Id.* at 5:44–48. Next, in step 62, “routing module 42 sets a variable ‘consumption_{route}’ (initialized at zero) to be equal to ‘consumption_{route}’ plus the energy consumption (‘consumption_{segment}’)” determined at step 60. *Id.* at 6:11–15. Then, steps 64–70 provide “a so-called ‘DO’ loop for each segment of each possible screened route, and for each route.” *Id.* at 6:15–18. The DO loop includes step 64, determining “whether the segment under test is the last segment of the route, and if not the logic retrieves the next segment” at step 66 and loops back to step 58. *Id.* at 6:19–23. If it is determined that the last segment of the current route has been analyzed, the computer determines whether there are additional routes to analyze and, if so, the computer analyzes the segments of the next route. *Id.* at 6:22–27. After all of the routes have been analyzed, “the logic returns the route with the lowest overall energy consumption” at final step 72. *Id.* at 6:27–31.

b. Clapper

Clapper discloses “[a]n automatic cruise control [that] uses stored information about speeds which the vehicle used at given positions in the past to control the speed of the vehicle at a current position” and, if prior driving history is unavailable, “the system can consult a database of given speeds at given locations and those speeds may be used to control the vehicular speed.” Ex. 1006, code (57). The automatic cruise control includes a display that can be used to display the current actual speed, a previously used speed, and a suggested speed from a database. *Id.* at 3:27–42, Fig. 4. The user can select one of these speeds via buttons on the display. *Id.* at 3:42–44.

2. Independent Claim 1

Petitioner relies on Schramm to disclose a method of managing a power consumption of a vehicle substantially as recited in claim 1, and relies on Clapper to teach operating the vehicle at varying speeds and notifying the operator of efficient speeds. Pet. 52–86.

a. The Preamble

Claim 1 recites “[a] method of managing a power consumption of a vehicle.” Ex. 1001, 26:15–16. Petitioner argues that Schramm discloses a “route optimization algorithm [that] ‘minimiz[es] the energy consumption of vehicles’ by ‘determining energy-optimizing routing of vehicles.’” Pet. 68 (second alteration in original) (quoting Ex. 1009, 1:9–12) (citing Ex. 1009, 1:32–65, 2:19–21; Ex. 1003 ¶ 235).

Patent Owner does not contest this aspect of the Petition. *See generally* Prelim. Resp.

Schramm discloses “methods for minimizing the energy consumption of vehicles” that “determin[e] energy-optimizing routing of vehicles.” Ex. 1009, 1:9–12.

Accordingly, for the foregoing reasons and on this preliminary record, to the extent the preamble is limiting, Schramm supports Petitioner’s contentions.

b. The Receiving Recitation

Claim 1 recites “receiving a route at a computer of said vehicle.” Ex. 1001, 26:17. Petitioner maps Schramm’s vehicle computer to the recited computer and a possible route to the recited route. Pet. 69–71 (citing Ex. 1009, 2:14–17, 2:55–59, 3:5–7, 3:42–43, 4:22–27, 5:1–6:32, code (57), Figs. 1, 3; Ex. 1003 ¶¶ 239–243). Petitioner argues that routing module 42 of Schramm’s vehicle computer receives the possible route by retrieving it from a database. *Id.* at 70 (citing Ex. 1009, 2:14–17, 2:55–59, 3:5–7, 4:22–27, 5:21–32; Ex. 1003 ¶¶ 241–243).

Patent Owner does not contest this aspect of the Petition. *See generally* Prelim. Resp.

Schramm discloses vehicle 12 having computer 14 onboard the vehicle. Ex. 1009, 3:40–43, Fig. 1. “[T]he computer 14 is associated with a topographical map electronic database 36” and “includes a routing module 42 and an energy consumption module 44.” *Id.* at 4:11–13, 4:22–24. “[T]he routing module 42 retrieves from the database 36 (FIG. 1) a route between the origination point ‘A’ and the destination point ‘B’.” *Id.* at 5:22–24.

Accordingly, for the foregoing reasons and on this preliminary record, Schramm supports Petitioner's contentions.

c. The Segmenting Recitation

Claim 1 recites "segmenting said route into a plurality of segment destinations." Ex. 1001, 26:18–19. Petitioner argues that Schramm's routing logic divides the route into segments, each segment having an endpoint that corresponds to the recited segment destinations. Pet. 71–72 (citing Ex. 1009, 2:33–35, 5:32–33, 7:33, Fig. 3; Ex. 1003 ¶¶ 244–248).

Patent Owner does not contest this aspect of the Petition. *See generally* Prelim. Resp.

Schramm discloses that each route retrieved from the map database is regarded by the logic of the routing module to be "a series of contiguous route segments" that are, for example, one mile long. Ex. 1009, 5:32–35.

Accordingly, for the foregoing reasons and on this preliminary record, Schramm supports Petitioner's contentions.

d. The Calculating Recitation

Claim 1 recites "calculating a plurality of energy values consumed by said vehicle to travel said route based on a plurality of variations in a target speed of said vehicle between pairs of said segment destinations." Ex. 1001, 26:20–23. Petitioner maps the values in Schramm's energy consumption table illustrated in Figure 6 to the recited energy values consumed by said vehicle to travel said route. Pet. 72–74 (citing Ex. 1009, 2:33–35, 5:32–33, 5:56–6:6, Fig. 6; Ex. 1003 ¶¶ 249–252). Petitioner argues that these values are calculated because they are updated by energy consumption module 44 during vehicle operation. *Id.* at 75–77 (citing Ex. 1009, 2:38–41, 6:8–10,

7:13–50, code (57), Fig. 5; Ex. 1003 ¶¶ 258–260). Petitioner relies on Clapper to teach using a set speed that can vary for each segment. *Id.* at 74–75 (citing Ex. 1006, 1:50–67, 2:37–44, 2:52–57, 3:13–23; Ex. 1009, 5:47–49, 5:62–6:6; Ex. 1003 ¶¶ 253–257).

Patent Owner argues that Schramm’s system operates at a constant speed. Prelim. Resp. 30–31, 35–37. Patent Owner acknowledges that Clapper’s system uses variable speeds, but argues that “Clapper’s incidental change in speed as a vehicle travels, however, is fundamentally incompatible with Schramm’s disclosure of traversing a route, as Schramm makes explicitly clear that the speed should never change during a route.” *Id.* at 31–32 (citing Ex. 1009, 5:14–20, 5:45–49, 5:61–6:7, 6:44–49, 7:18–25, 7:40–42, 7:47–50, Figs. 2, 6). Patent Owner argues that “[t]he modification Petitioner proposes is . . . expressly rejected by Schramm” because Schramm only discloses one speed. *Id.* at 33 (citing Ex. 1009, 5:14–24).

Patent Owner’s argument that Clapper’s teachings are “incompatible” with Schramm appears to be an improper non-analogous art argument, for which Patent Owner does not address the well-established tests. *See In re Bigio*, 381 F.3d 1320, 1325 (Fed. Cir. 2004). Patent Owner’s arguments also appear to suggest that it would not be obvious to modify Schramm’s system to operate at various speeds because Schramm does not disclose operating at multiple speeds. Patent Owner’s arguments are not in-line with obviousness, which asks “what the *combined teachings* of the references would have suggested to those of ordinary skill in the art.” *In re GPAC Inc.*, 57 F.3d at 1581 (emphasis added) (internal quotations omitted). Moreover, Schramm discloses that the operator inputs the desired *average* speed, at

least suggesting that the speed of Schramm's vehicle does vary. Ex. 1009, 5:14–16, 7:24–26.

Next, Patent Owner argues that, although Clapper discloses multiple speeds, “the mere disclosure of a speed that ‘may vary’ is not a disclosure of calculating a plurality of energy values based on a plurality of speeds as required by the challenged claims.” Prelim. Resp. 37–38 (emphasis omitted). Patent Owner argues that the values in Schramm's table of energy values “are simply stored for future reference and could be used in calculating future routes, not that a plurality of energy values are calculated for segments of the currently calculated route.” *Id.* at 38.

Patent Owner's arguments do not address the challenge set forth in the Petition. As discussed above, Petitioner relies on Schramm to disclose calculating the values in its energy-consumption table illustrated in Figure 6. Pet. 75–77. Petitioner's contentions are supported by Schramm, which discloses updating the values in the energy-consumption table based on measured actual energy consumption of the vehicle. Ex. 1009, 7:23–29, 7:40–51. Petitioner relies on Clapper to teach using a set speed that can vary for each segment. Pet. 74–75. Petitioner's contentions are supported by Clapper, which teaches a software control cycle that uses the vehicle's current position to set speed according to values stored in a database based on speeds from prior trips or speed limits. Ex. 1006, 2:50–60, 3:14–18, Fig. 3.

Accordingly, for the foregoing reasons and on this preliminary record, Schramm and Clapper support Petitioner's contentions. We determine that, on this preliminary record, Petitioner sets forth reasoning with rational underpinning as to why a person having ordinary skill in the art would have

combined the teachings of Schramm and Clapper such that Schramm's system uses variable speed on a per-segment basis. *See, e.g.*, Pet. 59–63 (arguing that the modification would “enhance[e] the optimization's accuracy” and would be “merely the application of known techniques . . . to a known system . . . that is ready for improvement . . . to yield predictable results”).

e. The Determining Recitation

Claim 1 recites “determining a plurality of efficient speeds that achieve a best summation of said energy values.” Ex. 1001, 26:24–25. Petitioner argues that Schramm's route with the lowest overall energy consumption, comprising a plurality of efficient speeds for each segment, is the best summation of energy values. Pet. 77–81 (citing Ex. 1006, 1:50–67, 2:12–14, 2:37–44, 2:52–57, 3:13–23, 6:29–31; Ex. 1009, 2:19–21, 2:35–37, 2:60–63, 4:25–28, 5:14–20, 5:41–49, 5:66–6:2, 6:11–15, 6:17–31, code (57), Figs. 3, 6; Ex. 1003 ¶¶ 261–270). Petitioner argues that, by identifying “the segments that constitute that energy-optimum route,” Schramm determines the efficient speeds. *Id.* at 81 (citing Ex. 1009, 5:33–35; Ex. 2003 ¶ 271); *see also id.* at 82–84 (presenting additional arguments as to why the efficient speeds are determined).

Patent Owner argues that Schramm only uses a single speed. Prelim. Resp. 39. Patent Owner argues that Clapper does not disclose a route or segment destinations and, therefore, Clapper does not disclose a plurality of speeds for a plurality of segments of a route. *Id.* 39–40.

Patent Owner's arguments attack the asserted references individually, but do not address the combined teachings of both of the asserted references

as discussed above. Furthermore, Petitioner relies on Schramm, rather than Clapper, to disclose a segmented route. *See* Pet. 71–72. Thus, Patent Owner’s arguments are unavailing.

Schramm discloses that its routing module 42 retrieves a route comprising a series of contiguous route segments from topographical map electronic database 36. Ex. 1009, 5:22–24, 5:32–35. The routing module determines the energy consumption that would be required for the vehicle to traverse each route segment and sums the energy-consumption values. *Id.* at 5:45–49, 6:11–18. This process is performed for each route retrieved from the map database. *Id.* at 5:24–31, 6:15–18, 6:22–27, Fig. 3. Once summation values for all of the routes have been calculated, the routing module selects the route with the lowest overall energy consumption. *Id.* at 6:27–31.

Accordingly, for the foregoing reasons and on this preliminary record, Schramm supports Petitioner’s contentions.

f. The Notifying Recitation

Claim 1 recites “notifying an operator of said vehicle about said efficient speeds to travel between each of said segment destinations.” Ex. 1001, 26:26–28. Petitioner relies on Clapper to teach displaying speed information, including previously driven speeds and speed limits, to the vehicle operator. Pet. 84–86 (citing Ex. 1006, 2:52–57, 3:13–41, 3:37–45, Fig. 4; Ex. 1009, 2:33–35, 5:32–33; Ex. 1003 ¶¶ 275–281).

Patent Owner does not contest this aspect of the Petition. *See generally* Prelim. Resp.

Clapper discloses display 25 that provides speed information to the user and enables the user to input information via key pad 26. Ex. 1006, 2:17–18, Fig. 4. The display displays the current speed, speeds from the user’s previous trips, and speed limits. *Id.* at 3:38–42, Fig. 4.

Accordingly, for the foregoing reasons and on this preliminary record, Clapper supports Petitioner’s contentions. We determine that, on this preliminary record, Petitioner sets forth reasoning with rational underpinning as to why a person having ordinary skill in the art would have included Clapper’s teaching of displaying speeds in Schramm’s vehicle. *See, e.g.*, Pet. 65–68 (arguing that “displaying these speeds notifies the driver of suggested or typical location-specific driving conditions and provides a mechanism to control a vehicle otherwise operated by ACC” and would be “merely the application of known techniques . . . to a known system . . . to yield predictable results . . . and to improve that known, similar system in the same way”).

g. Conclusion

Accordingly, at this stage of the proceeding, we determine that Petitioner has established a reasonable likelihood of prevailing on its assertion that claim 1 would have been obvious in view of the combination of Schramm and Clapper.

3. *Independent Claim 10*

As with the challenge based on Neiss, Petitioner relies on its showing made for claim 1 regarding the similar recitations (*see* Pet. 93), and Patent Owner does not challenge Petitioner’s showing for these recitations apart from its arguments made for claim 1 (*see* Prelim. Resp. 29–41). Our above

analysis regarding these similar elements applies to claim 10, and we focus our analysis below on the distinct recitation of claim 10.

a. The Applying Recitation

Claim 10 recites “applying power corresponding to said efficient speeds to an engine of said vehicle to travel between each of said segment destinations.” Ex. 1001, 27:1–3. Petitioner argues that Schramm discloses an engine and Clapper teaches “an ‘automatic cruise control’ [that] ‘automatically control[s] the speed of [the] vehicle based on the vehicle’s current position’ along the identified route.” Pet. 93 (second and third alterations in original) (citing Ex. 1006, 1:42–53, 2:52–60, 3:13–20; Ex. 1009, 1:57–63; Ex. 1003 ¶¶ 306–308).

Patent Owner does not contest this aspect of the Petition. *See generally* Prelim. Resp.

Schramm discloses that its vehicle energy conservation system can be used with various types of vehicles, including gasoline-powered vehicles and hybrid vehicles. *See* Ex. 1009, 1:16–30, 3:57–63. We agree that such vehicles include an engine. *See* Pet. 93. Clapper teaches automatic cruise control 20 that “automatically control[s] the speed of a vehicle based on the vehicle's current position.” Ex. 1006, 1:42–44.

Accordingly, for the foregoing reasons and on this preliminary record, Schramm and Clapper support Petitioner’s contentions. We determine that, on this preliminary record, Petitioner sets forth reasoning with rational underpinning as to why a person having ordinary skill in the art would have combined the teachings of Schramm and Clapper such that Schramm’s vehicle uses an automatic cruise control system. *See, e.g.*, Pet. 64–65

(arguing that the modification would “improve[] driver experience, comfort, and safety,” “facilitate[] optimized fuel consumption,” and “provide[] energy efficiencies”).

b. Conclusion

Accordingly, at this stage of the proceeding, we determine that Petitioner has established a reasonable likelihood of prevailing on its assertion that claim 10 would have been obvious in view of the combination of Schramm and Clapper.

III. CONCLUSION

For the foregoing reasons, we determine that the information presented establishes a reasonable likelihood that Petitioner would prevail in showing that at least one of the challenged claims is unpatentable. At this preliminary stage, we have not made a final determination with respect to the patentability of the challenged claims or any underlying factual and legal issues. *See TriVascular, Inc. v. Samuels*, 812 F.3d 1056, 1068 (Fed. Cir. 2016) (noting that “there is a significant difference between a petitioner’s burden to establish a ‘reasonable likelihood of success’ at institution, and actually proving invalidity by a preponderance of the evidence at trial”).

Accordingly, *inter partes* review is instituted as to all challenged claims and all proposed grounds of unpatentability. *See* 37 C.F.R. § 42.108(a).

IV. ORDER

Accordingly, it is:

ORDERED that pursuant to 35 U.S.C. § 314(a), an *inter partes* review of claims 1–18 of the '161 patent is instituted with respect to all grounds set forth in the Petition; and

FURTHER ORDERED that, pursuant to 35 U.S.C. § 314(c) and 37 C.F.R. § 42.4, notice is hereby given of the institution of a trial, which commences on the entry date of this decision.

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Patent 8,972,161 B1

For PETITIONER:

W. Karl Renner
Karan Jhurani
Gretchen A. DeVries
FISH & RICHARDSON P.C.
IPR49649-0019IP1@fr.com

Ashraf Fawzy
TESLA, INC.
afawzy@tesla.com

For PATENT OWNER:

K. Patrick Herman
Bas de Blank
ORRICK, HERRINGTON & SUTCLIFFE LLP
P52PTABDocket@orrick.com
M2BPTABDocket@orrick.com