UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

UNITED SERVICES AUTOMOBILE ASSOCIATION,
Petitioner,

v.

AUTO TELEMATICS LTD.,
Patent Owner.

Case IPR2023-00768
Patent No. 10,192,369 B2

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DECLARATION OF CHRISTOPHER K. WILSON

I hereby declare that all statements made of my own knowledge are true and that all statements made on information and belief are believed to be true. I further declare that these statements are made with the knowledge that willful false statements so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code.

Dated: January 30, 2023 By:_____
Christopher K. Wilson

AT-2001

I, Christopher K. Wilson, am over the age of 18 years and competent to testify to the matters set forth in this Declaration.

I. INTRODUCTION

1. I have been retained by the Owner of United States Patent Nos. 9,633,487 B2 ("the '487 patent") and 10,192,369 B2 ("the '369 patent"), Auto Telematics, LTD. ("Auto Telematics" or "Patent Owner"), to offer certain opinions as set forth below in response to the Petitions for *Inter Partes* Review of each of U.S. Patent Nos. 9,633,487 B2 (IPR2023-00518, hereinafter "the 518 Petition") and 10,192,369 B2 (IPR2023-00768, hereinafter "the 768 Petition") filed by United States Automobile Association ("USAA" or "Petitioner").

2. I am not, and never have been, an employee of USAA or Auto Telematics. I received no compensation for this declaration beyond my normal hourly compensation based on my time actually spent analyzing certain issues related to the '487 patent and the '369 patent, the prior art publications cited below, and any other documents referenced herein. I will not receive any added compensation based on the outcome of any IPR or other proceeding related to the '487 patent or the '369 patent.

II. EDUCATION AND EXPERIENCE

3. I earned a BA degree in 1981 in Physics from Princeton University. I was then a PhD candidate at the University of California, San Diego in Astrophysics. I have taken and passed numerous business, strategy, and technology courses at Harvard University, Stanford University, University of California, Berkeley, and the Massachusetts Institute of Technology.

4. I have significant experience in automobile telematics obtained while working as a Senior Research Scientist, Group Manager (Telematics and Safety), and Vice President for ITS Strategy & Programs at DaimlerChrysler Research and Technology North America, Inc. from 1996 – 2008. I was also a Director at TomTom BV from 2008 through 2011. TomTom BV was one of the original developers of sophisticated mapping and location technology.

5. I was the CEO of Vehicle Data Science Corporation from 2013 – 2016 which built kinematic maps for automated vehicle applications.

6. I am currently a consultant advising companies on connected vehicle technology, automobile telematics, and advanced safety applications, as well as a testifying expert witness for related legal matters.

7. I have participated in the early development of key connected vehicle telematics and safety technologies utilizing radar, lidar, cameras, and other vehicle

positioning technologies, vehicle-to-vehicle communication technologies, GPS positioning technologies, and vehicle diagnostic technologies.

8. I have approximately forty (40) years of experience in the development, maintenance and use of vehicle telematics systems (including for missiles and spacecraft, as well as ground vehicles) and have been qualified by courts as an expert in numerous patent cases. A more extensive listing of my experience and qualifications may be found in my current *curriculum vitae* attached hereto as ***Appendix A***.

III. LEVEL OF ORDINARY SKILL IN THE ART

9. I have been informed that a person of ordinary skill in the art ("POSITA") is a hypothetical person who is presumed to have the skill and experience of an ordinary person in the relevant field at the time of the alleged invention.

10. It is my understanding that William R. Michalson ("Dr. Michalson"), USAA's expert offered in support of its Petitions, has offered an opinion that a person of ordinary skill in the art in these matters would have at least a Bachelor's of Science Degree (or equivalent) in an academic area emphasizing electrical engineering, computer engineering, computer science, or a related technical field, and about 2-3 years of experience in the field of telematics systems (*e.g*., familiarity

with control and diagnostic systems, navigation systems, and wireless communication technology).

11. I would add that a POSITA would also include individuals with a Bachelor of Science degree (or equivalent) in other fields, including physics, and that the particular educational experience becomes less relevant as the individual's experience in the telematics field increases. In this regard, a POSITA would include individuals with a Bachelor's of Science Degree in any discipline and 3-5 years of experience in the field of telematics systems.

12. Based on my experiences, I have a good understanding of the understandings and capabilities of a POSITA in the field related to the inventions claimed in the '487 patent and the '369 patent. Indeed, I have worked closely with many such individuals over the course of my career. I was also a POSITA myself during the early parts of my career.

IV. MY UNDERSTANDING OF CERTAIN LEGAL PRINCIPLES

13. I am not a lawyer and will not provide any legal opinions in these IPRs. I have, however, been advised of certain relevant legal principles and will apply those legal principles when offering my opinions in these matters.

14. I understand that claim terms are generally given their plain and ordinary meaning based on the patent's specification and file history as understood

by a POSITA. I further understand that the words of the claims should be given their plain meaning unless that meaning is inconsistent with the patent specification or file history. I also understand that the claims should be interpreted as they would have been interpreted by a POSITA at the time the invention was conceived.

15. I understand that a continuation application is a later-filed application that has the same inventors and claims subject matter described or disclosed in an earlier filed application to which the later-filed application claims priority. I also understand that a continuation application is generally entitled to the same priority date as the earlier-filed application to which it claims priority. I also understand that, as the '369 patent is a continuation of the '467 patent, they have common specifications.

16. I understand that, at the time of the applications that led to each of the '487 patent and the '369 patent, one of the requirements for a claim to be patentable is that the claimed invention be novel, meaning (among other requirements) that the invention was not known or used by others in the United States, or patented or described in a printed publication in the United States or a foreign country, before the invention thereof by the applicant for patent, and was not patented or described in a printed publication in the United States or a foreign country or in public use or

on sale in the United States, more than one year prior to the date of the application for patent in the United States

17. I also understand that, at the time of the applications that led to each of the '487 patent and the '369 patent, another requirement for a claim to be patentable is that the claimed invention be unobvious over the prior art. I further understand that "obvious" in this context means that the differences between the claimed invention and the prior art are such that the claimed invention as a whole would have been obvious before the effective filing date of the claimed invention to a person having ordinary skill in the art to which the claimed invention pertains.

18. I understand that, for a proposed combination of multiple references to show obviousness of a claimed invention, a POSITA must have had a reasonable expectation that the combination would be successful, and that evidence showing that there is no reasonable expectation of success may support a conclusion of nonobviousness.

V. THE '487 PATENT

19. The '487 patent is directed to methods and systems for logging driving information associated with a vehicle when driven. In one embodiment, a mobile telecommunications device is provided that is adapted for installation to a vehicle and is configured to log driving information associated with the vehicle when driven.

The mobile device is arranged to register the start of a driving period during which the mobile device is installed to the vehicle and the vehicle is being driven by a driver. The mobile device is also arranged to process sensor data during the driving period to derive driving information associated with how the vehicle is driven. That driving information is used to generate a driving score used to determine a driver's risk profile.

VI. THE '369 PATENT

20. The '369 patent is a continuation of the '487 patent, and thus is likewise directed to methods and systems for logging driving information associated with a vehicle when driven. In one embodiment, a mobile telecommunications device is provided that is adapted for installation to a vehicle and is configured to log driving information associated with the vehicle when driven. The mobile device is arranged to register the start of a driving period during which the mobile device is installed to the vehicle and the vehicle is being driven by a driver. The mobile device is also arranged to process sensor data during the driving period to derive driving information associated with how the vehicle is driven. A selection of that driving information is then stored to the mobile device.

VII. STATE OF THE ART

21. I have reviewed the 518 Petition and the 768 Petition, in addition to the declarations of Dr. Michalson that were submitted with those Petitions. In the "Technology Overview" section, both the Petitions and Dr. Michalson state conclusions that are not supported by evidence.

22. Neither the Petitions nor Dr. Michalson are clear on which technologies that they reference in such "Technology Overview" were incorporated into cars and which were incorporated into mobile devices, such as cell phones, at the time of the invention. These systems have different requirements; certain technologies suitable for a car (e.g., power-demanding applications such as early continuous GPS positioning) were not suitable for cell phones at the time of the invention. Petitioner's Exhibit USAA-1005 (common to both Petitions) confirms this at 14:28-33, where it states "[t]o reduce the power consumption, the embedded GPS receiver 314 in a mobile phone is typically turned off by default when a mobile phone is in standby mode or not is not charged. Otherwise, if the GPS receiver is always on, the battery of a GPS-enabled phone can only last a very short time period, e.g., 4-5 hours. To reduce the battery consumption, the GPS receiver is re-activated only right after a phone call is made or received."

23. Dr. Michalson states that Conover "recognized the need to include [various technologies] in automotive systems." USAA-1003, ¶32 in both Petitions, citing USAA-0047 (common to both Petitions), 1. However, based on my personal knowledge and experience in the field of vehicle telematics, several of the technologies identified by Conover are not in U.S. production vehicles today, or only in a few high-end vehicles, almost 20 years later, e.g., at least "vehicle-to-vehicle and vehicle-to-roadside communications" (USAA-1047, Abstract); "Vehicle Infrastructure Integration" (*id*. at 8); "Intelligent Speed Adaptation" and "Intersection Collision Warning" (*id*. at 9). Several others are only sparsely deployed, such as "Rear Impact Warning and Protection" (*id*. at 5) and "Drowsy Driver Warning" (*id*. at 6). I was working on several of these systems at the time of the invention, and while they were very much desired by automotive companies, my colleagues and I did not know (and in some cases still do not know) how to make these systems workable.

24. Dr. Michalson's discussion of the alleged state of the art also does not address "driving incidents" or cite to references referring or directed to "driving incidents." *See, generally*, USAA-1003, ¶¶27-40 in both Petitions. For example, Mohan is directed to traffic information. *See, generally*, USAA-1032 (common to both Petitions). Specifically, Dr. Michalson cites to Mohan's system that "could be

used for traffic sensing functions" as an example of "detecting driving incidents." USAA-1003, ¶46 in both Petitions, *citing* USAA-1032, 1. However, road and traffic conditions, as addressed by Mohan, do not include "driving incidents," but "focus specifically on … detecting[ing] potholes, bumps, braking, and honking" (USAA-1032, Abstract), that is, "the quality of the road or the noisiness of traffic" (*id.*, 2). Dr. Michalson provides no support for the suggestion that Mohan detects "driving incidents." As another example, Reddy2008 is directed to mode determination and does not discuss driving incidents. *See, generally*, USAA-1052 (common to both Petitions). Dr. Michalson's assertion that the proffered state-of-the-art technology detects "driving incidents" has no basis in the cited art.

25. Regarding "accident detection," Dr. Michalson states that "several systems were known to detect vehicular accidents based on data from mobile phones." USAA-1003, ¶51. Dr. Michalson then cites to three references, only one of which even remotely addresses accident detection from mobile phones, and that one (Thompson) is seriously flawed, as discussed further below.

26. Dr. Michalson states that "Liutkauskas2004 described a number of location-based services that could be provided by mobile phones." USAA-1003, ¶51 in both Petitions, *citing, generally*, USAA-1056 (common to both Petitions). At the time of the invention, such location-based services were generally not related to

accident detection. In addition, at the time of the invention, many location-based services could be offered through the phone, (e.g., using the phones communications abilities), but not directly *by* mobile phones. Liutkauskas is clear that "automatic accident detection" is not a service provided by the phone; rather it merely uses the phone for communications. *See* USAA-1056, 5:

> Automatic accident detection is another important service. It allows *vehicle equipped with crash sensors, air-bag deployment detectors* to automatic raise an accident alarm towards the service centre whenever these events occur, without any action by the driver that could have fainted. The service control centre is able to precisely locate the vehicle and dispatches an ambulance, tow truck, or other appropriate emergency response services to the accident.

USAA-1056, 5 (emphasis added).

27. Dr. Michalson glosses over the distinction between the mobile phone as a communications conduit for a vehicle and the mobile phone generating data as a sensor, which is an important distinction between the cited art and both the '487 patent and the '369 patent. *See* USAA-1003, §§51-54 in both Petitions. For example, Liutkauskas does not disclose mobile phones providing accident detection "based

on data from mobile phones" as Michalson asserts. USAA-1003, §51; *see, generally*, USAA-1056.

28. Dr. Michalson further cites to Cheng2010, which relates to an Android implementation for telematics services. USAA-1003, §51; *see, generally*, USAA-1011 (common to both Petitions). Dr. Michalson refers to Cheng's "other examples" in several pages and figures, but Dr. Michalson provides no further discussion in his declaration. *See* USAA-1003, §51. Cheng provides no relevant information regarding accident detection. See, generally, USAA-1011.

29. Dr. Michalson also cites to Thompson2010 for "other examples." USAA-1003, §51. Unlike Liutkauskas2004 and Cheng2010, Thompson2010 addresses the topic of accident detection based on data from mobile phones, but Thompson's analysis is problematic. *See, generally*, USAA-1008 (common to both Petitions). A POSITA in the field of vehicle crashes would immediately recognize significant problems with Thompson.

30. For example, Thompson states that "[t]he required acceleration to trigger airbag deployment is 60G's [10, 11]." USAA-1008, 9. A POSITA would understand that 60G acceleration corresponds to a very severe crash with almost certain injuries and likely fatalities. However, airbags may deploy at levels of

acceleration around 4G.[1] In addition to this exaggeration of trigger levels, Thompson determined that his "acceleration filter prevents drops … from triggering accident notifications." USAA-1008, 8. Thompson's acceleration filter was set to ignore accelerations below 4G, which was determined by a single test where the cell phone was "dropped from ear height in the driver's seat of a car. The device bounced off the seat and wedged between the seat and center console." USAA-1008, 9. In my opinion, a phone landing on the floor of the vehicle would experience significantly higher accelerations than the accelerations measured by the '487 patent and the '369 patent for determining accident detection, which Thompson apparently filters out. The limitations of Thompson's acceleration measurement would not provide the range needed by the '487 patent and the '369 patent for detecting accidents by the mobile telecommunications device.

31. Thompson also makes general observations regarding the accelerations the phone may experience: It may be "stationary relative to the vehicle during the

[1] The sensors used for airbags may be located in various locations around a vehicle. Those in the region of the collision will experience higher accelerations than those that are remote. For most analyses, the acceleration of the user's cell phone is irrelevant to the analysis.

collision" or "carried in some form of pocket [and would] experience the same forces as vehicle occupants." USAA-1008, 7. In my opinion, a POSITA would understand that the accelerations experienced in a breast pocket versus a pants pocket versus sitting on a seat versus mounted to the vehicle are different and need to be accounted for, which Thompson does not do. Nor is it a good assumption from Michalson that the cell phones of the cited art will reliably capture "the same forces as vehicle occupants."

VIII. THE DRIVING INFORMATION LOGGING AND PROCESSING PROBLEM ADDRESSED BY THE '487 PATENT AND THE '369 PATENT

32. Before the inventions of the '487 and'369 patents, data logging devices for road vehicles, commonly known as "black boxes," were used to log data about events associated with the behavior of a vehicle using the sensors of the vehicle to determine the cause of problems affecting the vehicle, such as events causing a vehicle crash or other vehicle-related events.

33. Such an automotive "black box" is formally known as an "Event Data Recorder" or "EDR." EDR's were optional at the time of the inventions of the '487 and '369 patents, but, if installed, the data collected was regulated by the National Highway Transportation Safety Administration (NHTSA). In an EDR, a few seconds of data are continuously recorded in a loop. If an accident (e.g., such as indicated by an airbag deployment) is reported to the EDR, it writes the information to

"permanent" storage, along with a snapshot of the vehicle state and information about the incident. *See*, *e.g.*, 49 C.F.R. Part 563, which mandates that certain data be collected in a vehicle EDR. *See also* https://www.nhtsa.gov/sites/nhtsa.gov/files/edr_qas_11aug2006.pdf, which is a 2006 NHTSA document describing EDRs and their regulation.

34. Such vehicle-related events could stem from a vehicle malfunction or driver negligence, and causes of such events could be estimated from analysis of the logged vehicle sensor data. Taking data from vehicle-integrated sensors, these black boxes could be integrated with the car data network. The data logged by these black boxes could then be analyzed and used as evidence to determine fault for insurance claims and to subsequently set insurance premiums.

35. However, such black boxes that integrate with vehicle sensors can be difficult and costly to install for the vehicle purchaser. In fact, while a manufacturer could install such a black box, tailored for each individual vehicle, this was not possible for the vehicle owner who did not have access to the various vehicle sensors. While other black boxes having their own internal sensor set could be more readily retrofitted to a vehicle, such data logging devices for road vehicles had been less prevalent due to their unjustifiable expense. Thus, mobile data logging devices for logging driving information (1) having their own sensors that (2) could be easily and

inexpensively retrofitted to road vehicles and (3) that could perform event detection and analysis during entire driving periods from the driving information, while (4) managing data storage applicable to the storage capabilities of the mobile device were not known in the art at the time of the invention.

IX. THE '487 AND '369 PATENTS' SOLUTION TO THE DRIVING INFORMAITON LOGGING AND PROCESSING PROBLEM

36. The '487 and '369 patents are directed to methods and systems for logging driving information associated with how and when a vehicle is being driven by a driver. USAA-1001[2], Abstract. A mobile device including a sensor set is adapted for installation (e.g., removable physical and/or electronic attachment) to the vehicle and configured to log such driving information to the mobile device and process the driving information to detect driving incidents, maintaining only the driving information on the mobile phone that relates to the driving incident during a driving period. *Id.*, Abstract, 3:18-33, 4:49—5:21, 8:8-17. For example, location,

[2] As the '487 patent and the '369 patent share a common specification, each of which is identified as Exhibit USAA-1001 in the respective Petitions, ongoing citations herein to the specifications of those patents will be simply be to "USAA-1001," and citations to the claims of those patents will be to "'487 patent" and "'369 patent" as appropriate.

speed, and acceleration of the vehicle associated with how the vehicle is driven at the time of an incident can be captured and processed, using only the sensor data from the mobile device's sensors and processing capabilities of the mobile device. *Id.*, 5:12—6:15. The driving information from the mobile device may subsequently be utilized to determine the cause of an event such as an accident, to modify driver behavior, and/or to determine insurance premiums. *Id.*, Abstract.

37. The '487 and '369 patents note that "the use of a mobile telecommunication device enables a data logging device to be conveniently and inexpensively retrofitted to a vehicle… A generic mobile telecommunication device already owned by a driver of the vehicle can be loaded with the application to provide such data logging functionality that would otherwise necessitate a dedicated black-box. Thus, the functionality of a black-box can be realised without additional expense." *Id.*, 2:12-24. However, as black-box functionality is applied to a mobile phone, storage concerns arise.[3] The inventions of the '487 and '369 patents can limit the storage of data to a subset or selection of important data as the important data

[3] A vehicle's black box must store certain data for the lifetime of the vehicle or until the data is downloaded and the memory unlocked, as required by law. See 49 C.F.R. Part 563.9.

occurs, providing focused recording on the mobile telecommunications device of data corresponding to detected events involving the physical driving of the vehicle (e.g., "driving information").

38. The mobile telecommunications device of the '487 and '369 patents can process sensor data from its own sensor set to determine from the sensor data what data is most important. In other words, the mobile telecommunications device can detect real-time driving events by analyzing the sensor data from the mobile telecommunications device in real-time, without need for sensor data from the vehicle's sensors or analysis of the data from an entity outside of the mobile telecommunications device. When a driving event is detected and considered by the mobile telecommunications device to be important, important data is determined from the sensor data and stored to long-term storage on the mobile telecommunications device. *Id.* at 18:5-10. The sensor data thus may include driving anomalies in its driving information (*see*, *e.g.*, *id.* at 19:23-64), and image and audio sensor data can also be recorded to provide simultaneous video data of images and audio of the vehicle's environment surrounding the vehicle as the detected event occurred (*id.* at 17:53—18:4; 22:42-54).

39. The inventions of the '487 and '369 patents are not necessarily meant to replace a vehicle's traditional black box, but to supplement the vehicle with a

readily accessible application on a portable device for real-time, continuous situational awareness of a vehicle's environment during entire driving periods of the vehicle, determining what data is important, and storing and providing important data that is immediately viewable by a vehicle user and actionable by an insurance provider. *Id.* at 2:12-30; 4:49—5:60; 6:11-65.

40. One goal of the invention is to enable monitoring of a child or employee's driving whenever they are driving, not just when they feel like being monitored. To meet this end, it is important to have the system operational whenever the user is driving (or as close to this as practicable). A system that only monitors when the user chooses (e.g. when they are being "good") will not meet the stated goals of the invention, which include that the "driving information may subsequently be utilised to determine the cause of an event such as an accident, to modify driver behaviour and/or to determine insurance premiums." *Id.* at1:24-27. Of course, accidents do not solely occur when the user chooses, and insurance companies have little interest in basing premiums solely on a driver's "good" behaviors. Moreover, insurance companies are not insuring only the times the user chooses.

41. To achieve these goals of the invention, and as the claims recite, in part, the mobile telecommunications device of the '487 patent must (1) determine a start of a driving period to determine when to start recording, (2) process the sensor data

(3) from the vehicle's sensor set (4) during the driving period (5) to derive driving information associated with (6) how the vehicle is driven, (7) store a selection of the driving information to the memory (of the mobile telecommunications device), (8) wherein the driving information is derived without data from vehicle sensors, and (9) the mobile telecommunications device is controlled by a downloaded application (on the mobile telecommunications device) to (10) control the mobile telecommunications device to (11) detect occurrence of a predetermined event and in response (12) take at least one pre-determined action. '487 patent at 31:42-67 (claim 1).

42. According to the claims, the invention of the '487 patent is novel and non-obvious over the prior art.

43. Likewise to achieve these goals of the invention, and as the claims recite, in part, the mobile telecommunications device of the '369 patent must (1) determine a start of a driving period to determine when to start recording, (2) process the sensor data (3) from the vehicle's sensor set (4) during the driving period (5) to derive driving information associated with (6) how the vehicle is driven, (7) store a selection of the driving information to the memory (of the mobile telecommunications device), (8) wherein the driving information is derived without data from vehicle sensors, and the memory comprises (9) a long term memory for

persistently storing driving information, and (10) a short term memory for transiently storing driving information, (11) wherein the short term memory receives driving information at a higher update rate than the long term memory, and the telecommunications device (12) writes driving information to the short term memory at a predetermined update rate during the driving period in a predetermined sequence, and (13) overwrites the driving information previously written to the short term memory in accordance with the predetermined sequence. '369 patent at 31:41-32:10 (claim 1).

44. According to the claims, the invention of the '369 patent is likewise novel and non-obvious over the prior art.

X. CLAIM LANGUAGE OF THE '487 AND '369 PATENTS

45. I understand that in a currently pending Federal District Court proceeding involving the '487 and '369 patents, the term "driving period" was deemed to not require any special definition or construction, but rather the term "driving period" should be construed according to its plain and ordinary meaning. Thus, in my opinion a POSITA would understand the term "driving period" to refer simply to the period of time when the vehicle is being driven.

46. Claim 1 of each of the '487 and '369 patents requires that the mobile telecommunications device be configured to determine, based on "inputs received

by the user interface and sensor data from the devices sensor set, ***a start of a driving period***." '487 patent at 31:52-54; '369 patent at 31:52-54 (emphasis added). Critical to the functionality of the invention is that the mobile telecommunications device determines the start of a driving period to initialize its logging functionality on the mobile telecommunications device, and that the "driving period" represent a fair representation of the user's actual driving.

47. Claim 1 of each of the '487 and '369 patents also requires that the mobile telecommunications device "***process the sensor data from the sensor set during the driving period to derive driving information associated with how the vehicle is driven***." '487 patent at 31:57-59; '369 patent at 31:58-60 (emphasis added). The mobile telecommunication device thus must be able to identify the driving period during which to process sensor data and during which to derive driving information associated with how the vehicle is driven.

48. Once the start of a driving period is determined, the mobile telecommunications device processes sensor data from its sensor set (on the mobile telecommunications device), from the start of the driving period and during the driving period (for the duration of the driving period), to derive driving information associated with how a vehicle is driven during (for the duration of) the driving period and to store this derived driving information on the mobile telecommunications

device. According to the Claim 1 of each of the ’487 and ’369 patents, all of this functionality is performed on the claimed mobile telecommunications device.

XI. SPECIFICATION OF THE ’487 AND ’369 PATENTS

49. According to the specification of each the ’487 and ’369 patents, at the time of the invention, automotive aftermarket black boxes integrated with vehicle sensors were difficult and costly to install. USAA-1001 at 1:44-55. Further, automotive black boxes having their own sensors were prohibitively expensive. *Id.* at 1:50-55. As an alternative, the ’487 and ’369 patents note that use of a mobile telecommunications device for automotive black box functions would provide a convenient and inexpensive retrofit to a vehicle. *Id.* at 2:12-24. The mobile communications device may be a commercially available smartphone utilizing its own power supply with capabilities of interfacing with external devices, as is known for such devices. *See id.* at 9:57—10:14; 14:54-56; ’487 patent at 32:47-53 (claim 8) and 33:1-6 (claims 12 and 13); ’369 patent at 33:16-22 (claim 16) and 33:31-36 (claims 19 and 20). Further, “a mobile telecommunications device presents additional advantages over known dedicated black-box systems,” including easier software upgrades “without physically upgrading the hardware of the device.” USAA-1001 at 2:32-37.

50. To this end, "[a] main purpose of the mobile telecommunications device, when arranged within a vehicle in motion, … is to monitor and process sensor data captured by the mobile device, to derive driving information associated with the moving automobile 3. … [T]his driving information is subsequently used by the mobile device to determine if a driving incident or event has occurred. The term 'driving incident' … may relate to an event such as a collision, a near-miss, dangerous driving, erratic driving or similar. Similarly, the driving information may be used as a means for monitoring the driver's driving performance, and determining a driving characteristic, or user profile for the subject driver. …[T]he sensor data and/or the driving information may be used to determine for example, if the driver is a cautious driver, or a reckless driver. This information may be used, for example by an insurance provider, to conduct a risk assessment and to tailor an insurance premium to the subject driver on the basis of a determined driving characteristic." *Id.* at 13:36-55. Based on the foregoing, in my opinion a POSITA would understand that the '487 and '369 patents describe cost-effective automotive black box functionality for efficiently capturing significant driving events while also providing accessible data for driver assessment and insurance rate setting.

51. The '487 and '369 patents provide that the use of "a generic mobile device" in the context of logging driving information associated with the vehicle

when driven "may be counter-intuitive to a person skilled in the art — such generic devices are not designed to withstand events such as catastrophic crashes. Furthermore, such generic devices are usually not necessarily configured to appropriately detect conditions that may need to be recorded. Such devices are usually kept in a user's pocket or bag, and so are not best placed to generate sensor data associated with the behaviour of a vehicle." *Id.* at 2:56-62. Thus, in my opinion the invention was ahead of its time in using a mobile device to provide real-time assessments of driver behavior that can provide an insurance company desirable data during a driving period while avoiding use of costly vehicle sensor technology and not relying on a traditional automotive black box to access driving information.

52. In addition to these environmental and cost concerns, the '487 and '369 patents note a number of other concerns regarding using a mobile telecommunications device for black box functionality in a vehicle, concerns that the inventor has alleviated via what is, in my opinion, an inventive combination and integration of technological features.

53. For example, recognizing memory limitations of mobile telecommunications devices, the '487 and '369 patents note the need to "register[] the start of a driving period during which the mobile telecommunications device is installed to the vehicle and the vehicle is being driven by the driver," which

"prevents driving information from being needlessly recorded" and "minimis(es) the unnecessary usage of memory." *Id.* at 3:20-27; *see also* '487 patent at 31:51-56 (claim 1); '369 patent at 31:51-57 (claim 1). For a mobile telecommunications device, "installed to a vehicle" was understood as being physically and/or electronically attached or affixed to the vehicle, due to the device's mobility and wireless communications capabilities. *See* USAA-1001 at 3:44-61; 10:5-14; 31:1-14.

54. Further, the '487 and '369 patents recognized the need to make utilization of the "finite storage capacity" on the mobile telecommunications device more efficient. *See id.* at 3:20-27. To that end, the mobile telecommunications device of the '487 and '369 patents "store only selected driving information for the purpose of logging how the vehicle is driven during a driving period." *Id.* at 4:49-51, 57-58; *see also* '487 patent at 31:60-61 (claim 1); '369 patent at 31:62-63 (claim 1).

55. Regardless of storage limitations of a mobile telecommunications device, to act like an automotive black box, the '487 patent noted that the mobile telecommunications device needed to be able to record sensor data during an entire driving period and to "process the sensor data during the driving period to derive driving information associated with how the vehicle is driven." *Id.* at Abstract, 20:23-38; *see also* '487 patent at 31:57-59 (claim 1); '369 patent at 31:58-60 (claim

1). Thus, while the mobile telecommunications device collects and/or samples raw sensor data, the mobile telecommunications device also processes this raw sensor data to generate, or derive, driving information that is more than just raw sensor data.

56. The specification defines "sensor data *and* driving information" as two different things. *See*, *e.g.*, USAA-1001 at 19:17-28. The specification defines "driving information" as "any data which may be derived from raw sensor data captured by any one of the … modules 21, 23, 25, 27. For example, g-force data is driving information which is derived from the sensor data sampled by the accelerometer 23." *Id.* at 16:51-56. "The processor module 33 is also configured to analyze sampled sensor data and generate[] driving information to determine if a driving incident has occurred." *Id.* at 16:62-64; *see also* '487 patent at 31:57-59 (claim 1); '369 patent at 31:58-60 (claim 1).

57. Thus, in my opinion a POSITA would understand that "driving information" as set forth in claim 1 of each of the '487 and '369 patents is the result of analyzing sampled sensor data during the driving period, although both driving information and sampled sensor data can be stored in the mobile telecommunications device: "The sampled data, along with any derived driving information, is preferably stored in the storage buffer 34a, unless a driving incident has been identified, in which case the associated sensor data and driving information is stored in the

permanent storage component 34b to avoid undesirable overwriting." *Id.* at 17:8-14; *see also* '487 patent at 32:26-40 (claim 6); '369 patent at 31:64-32:10 (claim 1). "Sampled sensor data and derived driving information is also continuously analysed by the processor module 33 for the purposes of detecting a driving incident" by the mobile telecommunications device. *Id.* at 17:53-57; *see also* '487 patent at 31:65-66 (claim 1); '369 patent at 32:14-15 (claim 1). "Derived driving information" may be acceleration, velocity, g-force, pitch, roll, yaw data, etc. USAA-1001 at 19:46-47. For example, "[a]ccelerometer sensor data is … used for deriving driving information such as g-forces. Analysis of g-force data is … used to determine if a driving incident has occurred." *Id.* at 21:30-32. Driving information may also include a driving score. *Id.* at 12:15-16; *see also* '487 patent at 32:54-58 (claim 9); '369 patent at 33:26-30 (claim 18).

58. Thus, the processor of the mobile telecommunications device provides a large suite of processing features similar to the features of an automotive black box system, with additional features enabled by the technology of a mobile telecommunications device. *See, e.g.,* USAA-1001 at FIG. 3, "processor module 33," 2:2-4; 2:46-51; 13:57-61 (processor executes the downloaded application); 13:64—14:41 (processor's execution of application includes forwarding data related to a driving incident to an insurance server and/or emergency services and/or a

personal contact of the driver); 18:63—19:10 (processor determines, registers, and initiates the start of a driving period); 17:53-55, 19:17-22 (processor continuously samples, processes, and analyzes sensor data); 16:48-56 (processor generates driving information); 16:62-64, 19:23-25, 19:29-64 (processor determines whether a driving incident has occurred); 17:27—18:10 (processor facilitates a data recording strategy to log data by data file periods); 19:25-28 (processor stores driving information of data file period(s) associated with a driving incident to protected storage); 20:29-38 (processor determines the end of a driving period and the expiration of a data file period, and initiates a new data file period if the driving period has not ended); 18:33-39 (processor encrypts stored data files); 23:18-40 (processor performs benchmarking); 6:33-38 (processor pairs mobile device with driver and/or vehicle); 22:9-11 (processor monitors driving performance and generates a user profile); 10:27-30 (processor processes driving information to generate a driving score); 10:42-45 (processor facilitates data/video feedback/display). These are all activities performed by the processor of the mobile telecommunications device of the ’487 and ’369 patents.

59. Further, the mobile telecommunications device can pass, to a remote server, important driving information that the mobile telecommunications device has processed itself to indicate a detected event, including at the request of the remote

server. *Id.* at 7:42-49; 30:3-14; '487 patent at 32:19-25 (claim 5); '369 patent at 32:47-53 (claim 9). To prevent false driving incidents from being reported to the server, the mobile telecommunications device can allow a driver to confirm or deny the indication of a detected event, for example, before the data is passed to the server and/or emergency services are needlessly notified. *See id.* at 7:10-31; '487 patent at 32:4-11 (claim 3); '369 patent at 32:33-39 (claim 7).

60. The '487 and '369 patents confirmed that a mobile telecommunications device used and performing as an automotive black box still needed to be able to accept and/or make phone calls as a standard feature of the mobile telecommunications device (such as a smartphone), or otherwise manage such phone calls while driving. As such, "the mobile device [can] selectively disable and/or divert voice-calls incoming to the mobile device." USAA-1001 at 3:62—4:35. Additionally, call handling can "run in the background" so that the mobile telecommunications device can be used for "making or receiving a telephone call." *Id.* at 4:45-48. However, such call handling was not contemplated to indicate the start of a driving period or to otherwise determine a driving period and, in my opinion, would have frustrated the purpose of recording driving information while the vehicle is being driven for detecting a driving incident during the driving period. *See id.* at 19:29—20:38.

61. To implement the functions of an automotive black box in a mobile telecommunications device, the ’487 and ’369 patents further confirm that the mobile telecommunications device must detect such driving incident, e.g., “detect occurrence of a predetermined event of significance (such as a crash) and in response store driving information associated with that event to the memory” of the mobile telecommunications device. *Id.* at 5:11-15; *see also* ’487 patent at 31:65—32:3 (claims 1 and 2); ’369 patent at 32:14-15 and 22-24 (claims 2 and 4). This focuses the device’s data logging on specific data, because “it is more important to have detailed information associated with the behaviour of a vehicle during a crash than when the vehicle is being driven normally.” USAA-1001 at 5:7-10. It is thus likewise important that the driving period include the full period in which the operator is driving, as the crash may well not occur during the limited monitored phone call period of Curry.

62. Accordingly, like an automotive system in which an airbag control module sends a message to a black box EDR that an event is in progress, with the EDR responding by grabbing and recording data, the mobile telecommunications device includes an event detector for detecting occurrence of the “predetermined event of significance.” *Id.* at 5:27-43; *see also* ’487 patent at 31:65-66 (claim 1); ’369 patent at 32:14-15 (claim 2). The specification defines this predetermined event

as a "serious accident event" (USAA-1001 at 5:64-65), such as a "serious crash" represented by "a sustained vehicle deceleration beyond a threshold level" (*id.* at 5:39-43), or a "serious impact, and overturn[]" "corresponding to both the deceleration… and the orientation of the vehicle" (*id.* at 5:67—6:2), for example. However, the specification does not define the predetermined event of significance to be a phone call. While phone calls may be managed by the mobile telecommunications device implementing the black box functionality, a phone call alone would not rise to a "predetermined event of significance." *See id.* at 3:36—4:48.

63. When the mobile telecommunications device performs its own processing to detect a predetermined event (such as occurrence of a crash), it can take a predetermined action. *See* '487 patent at 31:66-67 (claim 1); '369 patent at 32:14-15 (claim 2). Such "predetermined action" can be one or more of "transmitting driving information and/or sensor data to a remote system" to alert emergency services (USAA-1001 at 6:41-53; *see also* '487 patent at 32:63-67 (claim 11); '369 patent at 32:29-32 (claim 6); "storing data captured at a higher … sampling rate than when an event is not detected" to prevent down-sampling and loss of detail or to prevent overwriting of the detailed event data (USAA-1001 at 7:4-9; *see also* '487 patent at 32:59-62 (claim 10); '369 patent at 32:25-28 (claim 5); "providing feedback

to a user to indicate that an event has been detected," such that a user can confirm or deny the event for user feedback to improve event models (USAA-1001 at 7:10-16), to notify the user of a future emergency services contact (*id.* at 7:20-26), or for user guidance for collecting crash data (*id.* at 7:32-41) (*see also* '487 patent at 32:4-18 (claims 3-4); '369 patent at 32:33-46 (claims 7-8) and "transferring data from … short term memory to long term memory" to prevent important event data from being overwritten (USAA-1001 at 8:12-17; *see also* '487 patent at 32:41-46 (claim 7) and '369 patent at 32:16-21 (claim 3)), for example.

64. Additionally, understanding the mobility of a mobile telecommunications device as well as the differences in device users, the '487 and '369 patents recognize the opportunity to use the mobile telecommunications device to associate driving behavior with a "driver-vehicle pair" to "ensure[] that different drivers and vehicles do not disrupt the accurate event detecting capabilities of the event detector" of the mobile telecommunications device. USAA-1001 at 6:30-38. This is useful because the mobile telecommunications device is not integrated to a specific vehicle like an automotive black box would be, so accounting for variations in users, user devices, and the use and handling of such devices provides for more reliable "black box-like" data collection. *See id.* at 10:21-26. Such functionality also allows the mobile telecommunications device to evaluate each driver individually

and generate a user profile (*id.* at 13:46-51) and driving score (*id.* at 10:27-30) associated with the driver or user of the mobile telecommunications device. In this additional way, in my opinion the invention is an advancement over a traditional automotive black box.

65. Realizing the processing and memory capabilities of mobile devices at the time of the invention, as well as the likely advancement of those capabilities over time, the ’487 and ’369 patents recognized the benefits of deriving, processing, and storing driving information on the mobile device to provide features similar to an automotive black box with additional benefits provided by smartphone technology. These features and benefits include: (i) faster and more reliable derivation of driving information; (ii) no need to transmit large volumes of sensor data from the mobile device to a server for subsequent analysis; (iii) no storage required on the vehicle itself; (iv) a user-friendly interface for control, viewing, and action related to driving period recording, for verifying detected triggering events and focusing data collection on those triggering events; (v) more efficient storage of important driving information on the mobile device; and (vi) greater accessibility by the user and third parties to the driving Information, e.g., in the case of a driving incident such as a crash, when the crash happens. In my opinion, this is dramatically different than the state-of-the-art at the time, including the prior art references relied on by Petitioner.

XII. PETITIONER'S CITED REFERENCES

A. INTERNATIONAL PUBLICATION NO. WO 201042545 TO CURRY et al ("CURRY")

66. Curry discloses "[a] system for monitoring and controlling the use of a mobile computing device." USAA-1005 at 3:2-3; FIG. 1, mobile phone 106. "A computing device [other than the mobile computing device] in communication with the data server can be used to select timing and location information in which use of the [mobile computing] device is permitted or restricted." *Id.* at 3:16-18; FIG. 1 (data input device [via user control website] 102 in communication with server 104).

67. As illustrated in Curry FIG. 1, while Curry's mobile phone client 110 can determine from raw sensor data of accelerometer 116 and GPS receiver 114 in motion data cache 118 that a user is driving at a moment in time, use permission data (from data input device 102) is required from server 104 to permit or restrict use of mobile phone 106 for calling or texting. *Id.* at 8:30—9:20; FIG. 1. As such, Curry's mobile phone 106 is disclosed to perform "dynamic call handling" based on estimated activity mode (e.g., standing, walking, or driving) at the time of a phone call. *Id.* at 4:16-24; FIG. 1 (Dynamic Call Handling 122).

68. As further shown in FIG. 1, raw sensor data 114, 116 from the motion data cache 118 is uploaded in raw form as "driving safety performance data" to a remote, centrally-managed server 104 for further processing, evaluation, statistical

analysis, and scoring by server 104. *Id.* at 7:8-10; 11:15-18. *See also id.*, FIG. 2 (208, 212, 218); 13:1-2; FIG. 3 (324); 14:19-21. Other than sending the raw motion data to the server, Curry's mobile phone uses the raw data to estimate context (e.g., standing, walking, driving) of mobile phone use using pre-set permissions from the server as stored locally on the phone. *See id.* at 9:1-3, 5-11, 31-33. Curry's mobile phone does not perform further processing, evaluation, statistical analysis, or scoring, especially as concerns how the user is driving the vehicle or for detecting a driving incident. A phone call is not a driving incident, as previously discussed.

69. FIG. 2 of Curry makes clear that any processing, evaluation, statistical analysis, or scoring, especially as concerns how the user is driving the vehicle or for detecting a driving incident, is performed at Curry's remote, centrally-managed server. *See id.* at FIG. 2; *see also id.* at 3:24-4:6 (server receives data from motion data cache to compare against user permission data for calculating safety statistic; server uses model in server to determine speeding, abnormal acceleration and deceleration, taking sharp turns; Curry does not disclose that the model is shared with the mobile phone for evaluating the user's driving); 7:8-17 (driving safety evaluation module on server performs statistical analysis); 8:5-18 (server uses its own interface to collect use permission data); 9:23—10:5 (raw motion data and activity mode estimation sent from mobile phone to server for safety score

evaluation and safety data sharing); 11:3-18 (system, not mobile phone, post-processes based on previously collected motion data and penalizes unsafe behavior after the fact, using motion data, i.e., driving safety performance data, sent to central data server); 13:1-19 (motion data sent to external server for calculating safety score); 14:17-26 ("driving safety information" is defined as collected data from motion data cache and activity mode recognition module, which is sent to the external server); 16:7-22 (risky, unsafe driving is determined and penalized by the server, after the fact); 17:24—18:3 (driving safety data including acceleration data, speed data, and phone usage data are communicated to server, external to mobile phone, to allow usage of the phone to be monitored).

70. There is no disclosure in Curry of any processing of data performed on the phone, other than the real-time determination of the activity state.

71. Curry's mobile phone, handling only raw motion data from accelerometer and GPS sensors and pre-set user permission data from an external server, and determining only an estimate of whether a vehicle is driving (versus standing or walking), thus in my opinion does not disclose, teach, or suggest a mobile telecommunications device (1) determining a start (or duration or end) of an actual driving period, (2) processing sensor data from a sensor set on the mobile telecommunications device to derive driving information associated with how the

vehicle is driven throughout that driving period, or (3) storing specifically a selection of such driving information to memory on the mobile telecommunications device.

72. Rather, Curry discloses a system and method that collect speed and location information at a time at which, and for a period after which, the user's mobile device has been triggered to collect such speed and location data after a phone call is initiated by or received at the mobile device. Specifically, "[w]hen a call is made or received using a mobile phone 106, the mobile phone client 110 can record location, speed, and acceleration data from sensors embedded in the wireless device," *id.* at 8:30-32, and then store that raw data "for an extended time period … in order to provide sufficient information for a user activity mode recognition program 120," *id.* at 9:1-3, which program "estimates the context of mobile phone use … [and] can be used to determine if the use of a mobile phone in the related context violates the pre-set permission policies." *Id.* at 9:6-11. Thus, the amount of raw data recorded may be limited to that needed to perform the estimation. *See, e.g.*, FIG. 4.

73. In Curry, an external server performs any analysis regarding how the vehicle is driving. For example, Curry FIG. 4 illustrates collection of raw sensor data over a pre-determined amount of time after a phone call. The collected data is sent to the server and used retroactively to "determine the context [activity mode] of

a phone call" and penalize talking/texting, after the fact. *Id.* at 11:7-14. The recording continues "even after a phone call or text messages ends," which allows the system to catch short calls (where the GPS may not have achieved a fix during the call time, or activity mode is unknown at the time of the start of the call/text for any reason) after the fact, and regardless of whether the car stops driving during the pre-determined amount of time. *See id.* at 11:6-14; 16:7-22; FIG. 4.

74. Because Curry addresses the problem and dangers associated with distracted driving caused by mobile device usage, it need not (and does not) disclose monitoring how a vehicle is being driven at all times. Curry does not disclose any data collection unrelated to a phone call, and specifically does not disclose any time period for data collection, other than a period starting with a phone call. Rather than tracking a user's driving information from the start of and throughout a driving period, the Curry system triggers all motion data collection upon the initiation or receipt of a call at the mobile device.

75. Further, while Curry's mobile device transmits certain collected raw data to a remote server, the Curry mobile device does not derive any driving information from the data collected from sensors on the mobile device, much less driving information that is "associated with how the vehicle is driven," and likewise

does not store a selection of any such derived driving information in memory on the device, all as required by claim 1 of each of the ’487 and ‘369 patents.

76. Curry’s mobile device merely stores raw sensor data and estimates, based on the raw sensor data, a context or activity mode of mobile phone use, e.g., simply whether a user is driving, walking, or standing still, and whether a user is permitted to operate the mobile phone in that context. *Id.* at 9:1-11.

77. I understand that during the prosecution of the application that led to the ‘487 patent, US Patent Application Pub. No. US 2007/0135979 to Plante was distinguished from the claims of the ‘487 patent for its failure to show, among other features, “the mobile telecommunications device being configured to determine, based on the inputs from the user interface and the sensor data, a start of a driving period when the vehicle is in use,” and based on the fact that “the data recorder of Plante only records data and then transfers it to a server once it is in a download space. It is the server that carries out analysis of that data. . . . There is absolutely no processing carried out as such on the data recorder of Plante, and therefore there can, by definition, be no determination of the start of a driving period by data recorder.” USAA-1002 of IPR2023-00518, 32.

78. I understand that Plante was further distinguished from the claims of the ‘487 patent because “there is no driving information derived from sensor data by

Plante on the mobile device itself" because "all that Plante does is to record data from the sensors. This is not processed driving information that is derived from sensor data…" *Id.* at 34. Thus, Plante was found to not disclose "the mobile telecommunications device being configured to process the sensor data during the driving period to derive driving information associated with how the vehicle is driven[, because] as there is no processing of data on the data recorder, there can be no determination of this driving information." *Id.*, 32-33 (emphasis in original). Plante "automate[s] transfer of recorded data to a server for processing (analysis and statistical services)…" *Id.*, 33.

79. As applied to the claims of the '487 patent, Curry suffers from similar shortcomings as were found for Plante in prosecution: (1) Curry's mobile device does not determine a start of a driving period, or a driving period, as required by the claims; (2) Curry's mobile device only records raw sensor data, and does not process driving information during the driving period as required by the claims, but merely transfers the raw sensor data to a remote server for further statistical analysis; (3) any analysis that Curry's mobile device performs regards phone call handling that depends only on *whether* (not how) a vehicle is driving, as estimated from raw sensor data, and a preset permission, both untethered from driving information (e.g., Curry's mobile device derives no driving information from the raw sensor data); (4)

Curry's mobile device does not detect a predetermined event as required by the claims nor provide instantaneous feedback to the driver regarding the predetermined event or the manner in which the driver is driving; and (5) the phone call of Curry is not a predetermined event as required by the claims.

B. U.S. PATENT NO. 8,682,399 TO RABU ("RABU")

80. Rabu provides a method for determining an orientation angle and movement of a portable media device ("PMD") and determines differing "modes of operation" of that device based on a frequency spectrum associated with the device's motion. USAA-1013 (common to both Petitions), Abstract, 2:61—3:4. However, in my opinion Rabu fails to disclose, teach, or suggest the determination of the start of a driving period, the processing at the PMD of sensor data to derive driving information associated with how the vehicle is driven throughout such a driving period, or storing a selection of such driving information into memory on the PMD, as required by the claims.

81. Rabu describes determining a "holder status" that indicates "whether the PMD is docked, resting on a surface, or being held," *id.* at 1:60-62, and determining a "holder motion status" that includes "determining whether the PMD is in a moving vehicle, in a stationary vehicle, being held by a moving person, or being held by a stationary person." *Id.* at 1:62-65.

82. Rabu determines holder status by measuring orientation angle of a PMD in a holder. *Id.* at 5:5-9. Once the measured orientation angle indicates a docked position, Rabu determines a frequency spectrum associated with the holder motion, determines the motion status of the PMD from such frequency spectrum (*id.* at 4:29-33), and thereafter implements a "mode of operation" for the PMD based on that motion status. *Id.* at 5:53-55; FIG. 5. Rabu discloses frequency analysis to determine small movements of a PMD for distinguishing motion status of the PMD while the PMD is docked in a holder. *Id.* at 2:65—3:1.

83. While Rabu is concerned with "the difference between the first location and the second location [being] more than a threshold" to determine movement differences between a moving vehicle or walking person (USAA-1013 at 4:52-58), Rabu is not concerned with initializing a driving period based on these differences and does not identify the driving period for processing sensor data during the driving period. Rabu goes no further than identifying that a vehicle is moving at a time that a PMD is docked, and does not disclose any driving periods, let alone periods where the device is docked and driving, as required by the claims of the '487 and '369 patents.

84. Although Rabu's PMD analyzes raw sensor data, Rabu's PMD does not process the raw sensor data to identify driving information as required by the claims

of the ’487 and ’369 patents, e.g., to “detect occurrence of a predetermined event.” Rabu is not concerned with distinguishing and logging driving information within a specific driving period, and in my opinion Rabu does not cure any shortcomings of Curry with regard to meeting claim features for logging such driving information.

85. Specifically, even though Rabu discloses identifying modes by determining a type of motion based on frequency (*id.* at 3:1-4), including when a docked phone is being used at a time of driving or being used at a time of being stationary (*id.* at 3:5-10; *see also id.* at 4:43-58), Rabu does not disclose how frequency spectra are compared to determine a start of a driving mode, including determining or analyzing any characteristic of the spectra that would determine a start of a driving period.

86. Rabu determines a mode of movement using its accelerometer. *Id.* at 7:31-54. Samples of accelerometer data are taken over time and converted via a fast Fourier transform into a frequency spectrum (pattern), which is then compared to stored patterns to determine a type of movement. *See id.* Rabu describes the generation of one frequency spectrum from multiple samples over time as relating to one type of movement. There is no explicit disclosure of detecting a change of movement and using this to determine the start of a driving period. Further, there is no explicit disclosure of comparing sequential frequency spectrums that change and

accordingly indicate a change of motion from a "no driving" to a "driving" state/mode. Still further, there is no explicit disclosure of determining how a vehicle is being driven based on comparisons of "driving" frequency spectra.

87. Rabu determines a motion *status* at a point in time, or "after a certain period of time." *Id.* at 4:25-33, 47-54. Holder status, which is required to determine Rabu's modes, is even determined at a "current" time based on when a match to a stored orientation angle is found. *Id.* at 8:25-37. Similarly, holder motion status is determined at a point in time that a frequency spectrum was captured to determine, by comparing the frequency spectrum to a known stored spectrum, that the PMD "*is* docked in a moving vehicle" (mode D). *Id.* at 9:35-49 (emphasis added).

88. Rabu merely takes snapshots of frequency spectra and compares them to limited stored frequency spectra. Using only snapshots in time, Rabu cannot, and does not, disclose determining a start to a mode, such as when a holder started driving. Rabu's "modes" simply identify whether a PMD is in a vehicle and whether the vehicle is moving. *See id.* at 5:53—6:17. This is useful for Rabu, because when Rabu's PMD has phone features, Rabu can place the PMD on speaker phone when in the driving mode, for example. *See id.* at 6:34-48. However, this feature of Rabu does not associate any of Rabu's driving modes with "how the vehicle is being driven," as required by claim 1 of both the '467 and '369 patents.

89. Rabu lacks reliability in determining holder status and holder motion status and, thus, has difficulties in determining its modes. This is because Rabu's determination of both holder status and holder motion status is based only on a comparison to stored data at a particular time. *See*, *e.g.*, *id.* at 8:27-37; 9:14-24; 9:35—10:7. Because Rabu merely determines status of the holder at a particular time, it does not determine an exact time when status changes, only that it had changed between two points in time. For example:

> "In some embodiments, once the PMD determines that it is located on a stationary surface at block 905, the PMD can further determine whether the stationary surface [is] located in a vehicle or otherwise. In this embodiment, the PMD can continually analyze the frequency spectrum of the holder motion over a period of time to determine a holder status. For instance, suppose that the PMD determines that it is resting on a surface in a moving vehicle. After some time if the vehicle stops, there will likely be no change in the orientation angle and GPS coordinates of the PMD if the PMD is left resting in the vehicle. However, the frequency spectrum of motion will change since the vehicle is now stopped. In this instance, the PMD can conclude that it is still in the vehicle but that the vehicle has stopped moving. If the

> user has assigned a particular mode of operation for that instance, the PMD may select that mode of operation." *Id.* at 11:25-40.

Everything in Rabu assumes that a status snapshot is taken, for example, to determine the status of a holder driving, but nowhere does Rabu disclose that it can determine a start of a driving period in real time, or how a vehicle is driving over time (during a driving period).

90. Rabu's determinations of mode based on holder status and holder motion status are also unreliable and inconsistent. For example, even before determining holder motion status, Rabu's system may not be able to determine holder status, and Rabu's PMD may be placed in a default mode. *Id.* at 8:66-67. Further, in determining holder motion status, it is "unlikely that two frequency spectra will be an exact match." *Id.* at 10:14-18. GPS may be used instead to determine holder motion status, but such an option only determines "whether [the holder] is *more likely* in a moving car or being carried by a walking person." *Id.* at 10:35-42 (emphasis added). This provides even less disclosure than Curry, such that in my opinion a POSITA would not be motivated to look to Rabu to modify Curry's activity mode determination.

91. Further, in my opinion the determination of Rabu's snapshot of holder motion status is unreliable to determine a particular motion, at least because there is

no way that Rabu's storage can store enough frequency spectra to match the spectra of different PMDs, drivers, vehicles, roadways, and situations so that each distinct activity experienced by a PMD holder would have a distinct frequency spectrum for comparison.

92. Although Rabu cites to Ogawa et al. (*id.* at 7:54-60) for "examples of motion spectra associated with different types of motion," Ogawa's disclosure presents limited experimentation (e.g., few trials, few subjects) and limited disclosure of determining differences between types of motion with like spectra. *See*, *generally*, Ex. AT-2003. Thus, in my opinion the overall accuracy of correctly determining motion status would be very limited for different mobile devices, drivers, vehicles, roadways, and situations, and the expectation of success in combining Rabu with Curry for improved mode determination would have been low for a POSITA attempting to implement the features of the claims of the '487 and '369 patents.

C. U.S. PATENT PUBLICATION NO. 20060005975 TO FORSTALL ("FORSTALL")

93. Forstall describes an early phone system for aiding a user in map-assisted navigation using a mobile device and estimating physical position on the map based on sensed data, particularly where and when positioning data is unavailable, through the use of "dead reckoning" – i.e., using sensor data to measure

movement of the device from a previously fixed location to determine its current location. USAA-1028 (common to both Petitions), [0062].

94. Forstall provides no disclosure, teaching, or suggestion of the determination of the start of a driving period or deriving driving information associated with how a vehicle is driven from the start of and throughout a driving period, or the storing of a selection of any such driving information, or the processing of driving information to generate a driving score associated with a particular driver, or detecting the occurrence of any predetermined event, or taking any action in response to the detection of any such predetermined event.

D. LANGLE et al. PUBLICATION TITLED "ARE YOU A SAFE DRIVER" ("LANGLE")

95. Langle posits that accelerometers/compasses on a mobile phone may be used in general to classify driving habits as safe or unsafe. USAA-1029 (common to both Petitions) at 1. However, Langle provides no disclosure, teaching, or suggestion of any system, device, or application of such classifications, much less of any system, device, or application for logging driving information from the start of a driving period or of taking any action in response to detection of any predetermined event. Langle merely identifies various graphed curves showing measured g-forces over time, positing that various characteristics of those graphs may reveal instances of "unsafe" acceleration or deceleration to make a binary

assessment of driving as either safe or unsafe. *See id.* at 2-3. Langle recognizes that "'safe' is a relative term, so Langle only assumes that 'safe' driving and 'unsafe' driving have measurable differences in acceleration." *Id.* at 2.

96. Further, Langle discloses its own shortcomings as not providing for "calibration of braking distance, lane changes, and reliable transformation of phone orientation with respect to trajectory of the vehicle" (*id.* at 1), where "using this data…, [the distinction between safe and unsafe] is not so clear for accelerations" and a "second integration [of acceleration] yields [only] a rough estimate of distance" (*id.* at 2).

XIII. THE CLAIMS OF EACH OF THE '487 AND '369 PATENTS ARE PATENTABLE OVER PETITIONER'S CITED REFERENCES

A. Claim 1 Of Each Of The '487 And '369 Patents Is Patentable Over The Combination Of Curry And Rabu At Least Because The References, Alone Or In Combination, Does/Do Not Teach, Suggest, Or Render Obvious All Elements Of Claim 1

97. In my opinion, Curry and Rabu, whether alone or in combination, does / do not teach, suggest, or render obvious all of the elements of claim element [1.1] of both the '487 patent and '369 patent. Petitioner cites to a "mobile telecommunications device configured to log driving information associated with a vehicle" in several locations of Curry's specification, but none of the citations

discuss logging driving information as required by the claims of both the '487 and '369 patents.

98. Petitioner states that "[t]he Curry-Rabu phone includes client 110 (downloaded from server 104), which enables determination of *whether* an associated vehicle is being driven." *See* 518 Petition at 20 (emphasis added); *see also* 768 Petition at 28. Yet, "whether an associated vehicle is being driven" is not "*how* a vehicle is being driven," which is what serves to provide the derived "driving information" of the claims. *See* USAA-1001, claim element 1.7. Further, Petitioner cites to Curry to erroneously purport that "Client 110 additionally enables Curry-Rabu phone to process 'raw data' from a driving period to derive driving information associated with a user's driving behavior." 518 Petition at 20; *see also* 768 Petition at 28.

99. However, while Petitioner is correct that Curry only discloses generating "raw data," there is nothing in Petitioner's cited portions of Curry that indicates that this raw data is "from a driving period to derive driving information associated with a user's driving behavior," as Petitioner alleges, and certainly not according to the claims. While Petitioner cites to 8:20-9:33 of Curry, this section of Curry does not indicate that Curry's phone "derives driving information associated with a user's driving behavior." Rather, this section relates only to collecting raw

data to determine "user activity mode recognition," that is, the "context of mobile phone use," e.g., whether a phone is being used "while driving, walking or remaining still" at the time of a phone call, and whether this violates a pre-determined user permission, to determine how to handle a phone call." *Id.* at 8:20—9:20. *See also id.* at 11:15-18 ("Driving safety performance data" is merely raw GPS and accelerometer data).

100. Petitioner asserts that Curry discloses using the derived driving information to generate a driving safety score for the user, but it does not. Rather, Curry's phone at best "store[s] raw data … for a user activity mode recognition program," while Curry's "driving safety data server 104" (off the phone; see USAA-1005, FIG. 1) displays data "through an interactive user control website" (off the phone; see *id.* at FIG. 1, element 102) "to enable visualization of possible violations of mobile phone use or unsafe driving behavior such as speeding, abnormal acceleration and sharp turns." *Id.* at 9:23-28. Even if "speeding, abnormal acceleration and sharp turns" can be said to be "driving information," this determination is clearly done off of Curry's phone at Curry's "Driving Safety Data Server 104" and "Driving Safety User Control and Monitoring Website 102." *See id.*, FIG. 1; *see also* FIG. 2 (illustrating "Driving Safety User Control and Monitoring

Website" with "Driving Safety Score Evaluation 212" being completely separate from "Mobile Phone Client 210").

101. Further, regarding logging driving information, because no driving information is determined by Curry's mobile phone and instead is determined by Curry's remote server processing raw data sent to it by Curry's mobile phone (*see* USAA-1005, FIG. 1, "Uploading" raw data from "Motion Data Cache 118" and transmitting raw data as "Driving Safety Performance Data" to Driving Safety Data Server 104;" *see also id.*, FIG. 2), it is Curry's server that would actually log driving information, not Curry's mobile phone. *See* USAA-1005, FIG. 2, 13:1-19.

102. Petitioner asserts that Curry's mobile phone calculates a score (518 Petition At 20; 369 Petition at 7). However, Curry never discloses its mobile phone calculating a score, but makes clear that Curry's server does all post-processing related to scoring and assessing raw data for any purported "driving information." *See* USAA-1005 at 9:23-28; 11:7-10; 12:19—13:19; 14:17-23; FIG. 2. Curry states, "The risky behaviors of talking while driving or texting while driving may not be identified in real-time due to limited data, but the post-processing technique can deliver high-confidence estimation results. In this manner, any unsafe driving behaviors can be penalized after the fact by deducting the driving safety score in the data server…." *Id.* at 16:13-18.

103. Neither Petitioner's citations to Curry, nor Curry in any other part of its disclosure, disclose "[a] mobile telecommunications device *configured to log driving information associated with a vehicle*," which is the basis of claim 1 of both the '487 and '369 patents, and in my opinion Petitioner's arguments do not sufficiently demonstrate such.

104. Claim element [1.3] of both the '487 and the '369 patents requires "a user interface" of the mobile phone. '487 patent at 31:43-48; '369 patent at 31:43-48. Petitioner, however, repeatedly cites to the user interface of the server, not the phone. For example, Petitioner cites to Curry at 8:5-18, which references a "graphical user interface" of "data input device," which is the remote server. See *id.* at 8:5-18, FIG. 1. Further, Petitioner cites to Curry at 21:2-25 which again refers to the "graphical user interface" of server 104. See also *id.* at 9:23-28; 10:2-5.

105. In my opinion, Curry and Rabu, whether alone or in combination, does / do not teach, suggest, or render obvious all of the elements of claim element [1.6] of either the '487 or the '369 patents. Curry discloses a "system and method for preventing cell phone use while driving." USAA-1005 at Title. At no point does Curry disclose or suggest the determination of "a start of driving period." Rather, as Petitioner concedes, Curry merely describes two modes: (i) a <u>*communication*</u> mode that allows for normal phone usage, and (ii) a <u>*monitoring*</u> mode that restricts calling,

texting, and or software use on the phone to promote driving safety. 518 Petition At 12; 768 Petition at 12. Curry's phone switches between these operating modes in response to sensor data.

106. The sole input on which Curry relies, however, is the receipt (or attempted placement) of a phone call or text message, as shown in Curry FIG. 4 in which the start of an outgoing or incoming phone call starts recording raw data from the mobile device's sensors, which raw data is recorded for some pre-set time. USAA-1005 at 16:7-13. Based on this raw data, Curry's mobile phone may estimate the activity status of the mobile phone as "driving, walking, remaining still, or unknown due to insufficient data." *Id.* at 10:16-26; *see also id.* at 16:13-22. "If the status of the mobile phone user is recognized as driving, the mobile phone can automatically switch to the GPS navigation mode to prevent the use of communication capabilities … [while] if the mobile phone user is recognized as not driving, the mobile phone can [operate in] the communication mode." *Id*. If Curry's activity status cannot be sufficiently estimated due to insufficient data or a change in activity, Curry turns to its server (outside of the mobile phone) to post-process data for higher confidence in the estimation results. *See id.* at 16:13-22.

107. Because the data recording period in Curry is initiated by the start of an outgoing or incoming phone call (or text message), in my opinion a POSITA would

have understood that Curry does not determine the "start of a driving period," because the triggering event (the phone call or text) almost certainly will not occur at the start of the period in which the vehicle is being driven, or, in other words, at the start of the driving period according to the claims and specification of the '487 patent. *See*, *e.g.*, USAA-1001 at 2:6-8 (defining the driving period as the period in which the vehicle is being driven by a driver); 3:20-22 (same); and Fig. 4a (requiring registration of the start of a driving period).

108. Instead, Curry, at most, discloses a call handling program that is limited to handling a call/text at the time the call/text is received or made. It is clear from the disclosure of Curry that the role of the recording is to record data for later processing off the phone to analyze driver safety at the server, not on the phone. In my opinion, the recording period of Curry does not start a driving period as claimed; it merely discloses the start of a recording period, not the start of the period in which the vehicle is being driven. USAA-1005 at 11:3-7; 16:8-12; FIG. 2.

109. Further, because Curry's recording period is a finite time period with no association to a driving period (*see*, *e.g.*, USAA-1005 at 16:10-13 and Fig. 4, each defining the recording period beginning with the phone call or text message as a finite period of time, *e.g.*, 6 minutes), in my opinion a POSITA would understand that Curry does not disclose the recording of sensor data during the entirety of the

driving period. Instead, Curry, as made clear in Fig. 4, simply records raw sensor data for some arbitrary period of time that is unrelated to a driving period as claimed. *See also id.* at 16:7-13. As such, not only does Curry not determine or recognize the start of a driving period, Curry discloses no way to determine or recognize the entirety of the driving period.

110. Combining Curry with Rabu fails to solve these problems. As discussed above, Rabu has nothing to do with the determination of the start of a driving period. Rather, Rabu determines a holder status and a holder motion status for a mobile device, using the device's orientation angle and frequency spectrum while in a holder, respectively, and from those statuses, the mode the device may be in (e.g., standing still, walking, or driving). USAA-1013 at 7:31-60; FIG. 5. Rabu's unreliable methodology of relying on a device's frequency spectrum to determine whether the device is located in a moving vehicle does not determine when a driving period began; instead, it simply determines whether the device is held in a moving vehicle. *See*, *e.g.*, *id.*, FIGs. 8 and 9 (determining whether the device is in a moving vehicle and operating the device in accordance with that determination). As such, in my opinion Rabu fails to address the deficiencies in Curry.

111. In my opinion, Curry and Rabu, whether alone or in combination, also does / do not teach, suggest, or render obvious all of the elements of claim element

[1.7] of either the ’487 or the ’369 patents. Claim element [1.7] requires the mobile device to process raw data from its sensor set to derive driving information associated with how the vehicle is being driven. ’487 patent at 31:57-59; ’369 patent at 31:58-60.. “Driving information” includes “location, speed, and acceleration of the vehicle associated with how the vehicle is driven,” including detected driving events and anomalies. USAA-1001 at 17:53-57. Petitioner, however, attempts to meet this claim element in Curry by focusing on the mobile device’s determination of “whether” a vehicle is being driven, not *how* the vehicle is being driven. 518 Petition at 20; 768 Petition at 28. Nowhere in Curry is the derivation of “driving information” as claimed by the ’487 patent disclosed or suggested.

112. Further, Curry does not disclose or suggest that processing according to the claims is performed on the mobile device itself. Curry’s processing on its mobile phone merely determines whether to allow a phone call based on a pre-set user permission and an estimated activity mode. *See* USAA-1005 at 3:2-23.

113. Dr. Michalson opines that a POSITA would have found it obvious that Curry’s “client application 110 causes Curry’s phone to process sensor data from [the] phone’s sensor set during the determined driving period to derive ‘possible violations of mobile phone use or unsafe driving behavior’ (driving information associated with how the vehicle is driven).” USAA-1003 of 518 Petition, ¶144;

USAA-1003 of 768 Petition, ¶150 (emphasis omitted). However, contrary to Michalson's assertion, to the extent that any processing is disclosed in Curry, a remote server processes raw data sent to it by Curry's mobile phone. *See*, *e.g.*, USAA-1005, FIG. 1 (showing the uploading of raw data from the motion data cache 118 and transmitting raw data as driving safety performance data to driving safety data server 104); FIG. 2 (same); 3:24—4:5 (explaining that the mobile device's mobile data cache can transmit raw sensor data to a remote data server so that the server can determine a driver safety statistic dependent on certain user behaviors). This claim element clearly requires that the phone process data to derive "driving information." As that is done only on a remote server in Curry, in my opinion Curry does not teach or suggest this element.

114. Combining Curry with Rabu fails to solve these problems. As described above, Rabu has nothing to do with processing of raw sensor data to derive information about how a vehicle is being driven. Rather, Rabu determines a holder status and a holder motion status for a mobile device, using the device's orientation angle and frequency spectrum while in a holder, respectively, and from those statuses, the mode the device may be in (e.g., standing still, walking, or driving). USAA-1013 at 7:31-60; FIG. 5.

115. Rabu's unreliable methodology of relying on a device's frequency spectrum to determine whether the device is located in a moving vehicle does not determine when a driving period began; instead, it simply determines whether the device is held in a moving vehicle. *See*, *e.g.*, *id.*, FIGs. 8 and 9 (determining whether the device is in a moving vehicle and operating the device in accordance with that determination). As such, in my opinion Rabu fails to address the deficiencies in Curry.

116. In my opinion, Curry and Rabu, whether alone or in combination, also does / do not teach, suggest, or render obvious all of the elements of claim element [1.8] of either the '487 or '369 patents. Claim element [1.8] requires that the mobile device store a selection of the derived driving information to the memory of the phone. '487 patent at 31:60-61; '369 patent at 61-62. Petitioner contends that Curry stores information derived from processed sensor data ("selection of driving information") to memory (e.g., motion data cache 118, local memory) ("memory") prior to transmission (e.g., to driving safety data server 104). 518 Petition 31, *citing* USAA-1003, ¶146; USAA-1005, 7:5–22, 8:29–10:12, 13:20–16:6, FIGs. 1, 3; *see also* 768 Petition 38,. To the extent that Curry stores sensor information, it is solely raw data that is stored, not "information derived from processed sensor data" (in

Petitioner's words), and not "driving information" as required by claim element [1.8].

117. Specifically, to the extent that Curry discloses storing data to Curry's motion data cache 118, Curry discloses storing all raw sensor data from GPS receiver 114 and accelerometer 116 temporarily, without thought to a particular selection of data, for user activity mode recognition and dynamic call handling, and passing this raw data to a remote server for further processing. *See* USAA-1005, FIG. 1; 8:30—9:33; 11:15-18.

118. Curry states "Data from the motion data cache 304 and the activity mode recognition module 306 can be transmitted to a local driving safety performance database 324. The collected driving safety information [i.e., here, only raw data] can be sent back to the server 322 through mobile communication links 320." *Id.* at 14:19-23.

119. Further, as discussed above, to the extent that Curry discloses the derivation of driving information, Curry describes this as post-processing by the remote server, not by the mobile device. *See id.* at 11:15-18; 16:7-18. Moreover, in my opinion combining Rabu with Curry does not further disclose the storage of a selection of driving information to the memory of the mobile device for the reasons stated above.

120. In my opinion, Curry and Rabu, whether alone or in combination, also does / do not teach, suggest, or render obvious all of the elements of claim element [1.10] of the ''487 patent. Petitioner incorrectly argues that "Client 110… enables the phone to process sensor data from a driving period *to derive information associated with a user's driving behavior*." 518 Petition at 34. However, Curry does not disclose that Client 110 of Curry's phone has features that allow it to "derive information associated with a user's driving behavior." Petitioner cites to Curry at 7:5-29, but that portion of Curry makes clear that "[a] driving safety evaluation module [on Curry's server] can be used to perform a statistical analysis on collected raw driving data." USAA-1005 at 7:13-14; see also *id.*, FIG. 2, 212. This "collected raw driving data" to which Curry refers is the "driving safety data [that] can be transmitted to a centrally managed data server through wireless communication links" that Curry introduces at 7:8-10.

121. Curry limits its definition of "unsafe driving behavior" as "talking on or texting with mobile phones while driving" (*id.* at 7:7-8), which itself is not "driving behavior" (i.e., what the vehicle in use is doing). Client 110 runs an activity mode recognition program 120, 306 to determine the user's activity (e.g., driving, walking, standing still) at a moment in time. *Id*. at 9:5-11; *see also id.* at FIG. 1, FIG. 3. Curry's client 110 uses that activity determination to handle phone calls by

dynamic call handling program 122, 308. See *id.*, FIG. 1, FIG. 3. Client 110 can receive data from sensors 114, 116, 314, 316 and save raw data from those sensors into motion data cache 118, 304. *Id.* at 13:27-31, FIG. 1, FIG. 3. It can then estimate the user's activity from that raw data. *Id.* at 13:31-33. It can then combine the sensor data from motion data cache 118, 304 with permission data from use permission database 112, 318 to determine whether to allow a call to be made or answered. *Id.* at FIG. 1, 112, 120, 122; FIG. 3, 306, 308, 318. *See also id.* at 8:21—9:33.

122. Petitioner also states that "[d]erived driving behavior information is stored in the Curry-Rabu phone." Pet. at 34. However, in any of Petitioner's citations to Curry, there is no disclosure that "derived driving behavior information" is stored on the phone. Because anything akin to the driving information of the claims is derived on Curry's server, storage of this information is only on Curry's server. *See* USAA-1005 at FIG. 2, 208, 212, 214. *See also id.* at 9:22-33; 13:1-14.

123. Curry notes that "[t]he use of the mobile device client 110 that includes the motion data cache 118, the activity mode recognition 120, the use permission database 112, and the dynamic call handling module 122 provides a reliable method to detect and prevent talking while driving." *Id.* at 10:27-30. While Curry's phone determines a mode (e.g., walking, driving, standing still) for context of phone use to perform dynamic call handling, it is Curry's server that determines any unsafe

driving behaviors from raw data sent to the server by Curry's phone. *Id.* at 13:1-19; FIG. 2 (the left side of the drawing is performed by a web server outside of the phone).

124. Thus, if Curry can "detect occurrence of a predetermined event" at all, according to claim element [1.10], it is Curry's server that detects a predetermined event from the raw sensor data, not Curry's phone.

B. Claim 1 In Each Of The '487 And '369 Patents Is Patentable Over The Combination Of Curry And Rabu Additionally Because Petitioner Lacks Sufficient Motivation To Combine The References

125. In my opinion, Petitioner's proposed combination of Curry and Rabu ignores what any POSITA would have readily recognized as fundamental flaws in Rabu that would have made its use, whether alone or in combination with Curry, impracticable, if not impossible, such that a POSITA would have had no reasonable expectation of success in combining Rabu with Curry at the time of the invention.

126. In my opinion, a POSITA would have recognized that attempting such a combination at the time of the invention would have been too time consuming, would have required significant resources with a fairly low probability of success, and would have encountered significant technical hurdles, the solutions to which are nowhere evidenced in either Curry or Rabu.

127. In attempting such a combination, a first issue would be to address what "success" would mean in the context of a combined Curry-Rabu system. Curry discloses a very specific method for preventing cell phone use while driving, and in my opinion a POSITA would have understood that the method must be able to provide an accurate assessment of the activity modes of walking, running, driving, and stationary. USAA-1005 at 17:1-23. Curry discloses, and in my opinion a POSITA would have understood, that selecting the wrong activity mode "can result in incorrect disruption of cell phone service which can lead to unpleasant user experiences and further limit system deployment." USAA-1005 at 10:32-11:2. Thus, in my opinion a POSITA would have understood that the cost of choosing the incorrect activity mode may have been significant, and the more modes one introduced, the more opportunities there would have been for failure. There would have been a fairly high cost to choosing "driving" when the vehicle was not, in fact, being driven.

128. In my opinion, the most problematic issue in the Rabu process is step 802/902/1002 of "compar[ing] determined frequency spectra to one or more frequency spectra." Rabu states that "[i]n general, different types of motion have different acceleration characteristics, e.g., high frequency vibration of a car, low frequency vibration when handheld. A frequency spectrum for each type of motion

can be generated using the acceleration characteristics." USAA-1013 at 7:32-37. While this may be true in theory, Curry's activity mode selection needs to occur in a large variety of very specific situations, and in my opinion there is far too little data provided in Rabu that would have given a POSITA a reasonable expectation that this technique would have worked across the range of conditions typically encountered by a phone being held or in a moving vehicle.

129. In particular, Rabu requires that the "determination [of activity mode is] made based on determining a frequency spectrum associated with the holder motion and comparing that to frequency spectra of known motions." USAA-1013 at 7:26-28. Rabu continues: "[f]or example, a motion spectrum associated with a car does not show a marked peak at any frequency values, but the amplitude gets larger at around 6-9 Hz and 11-14 Hz." *Id.* at 7:45-47, citing Ex. AT-2003 (Ogawa) at 4. However, this observation appears to be based on a single sample "measured taking a seat to a passenger" and with the sensor attached "by the belt on a subject's waist." *Id.* at 1-2.

130. For a POSITA to have achieved success incorporating these teachings into Curry's system and avoiding "unpleasant user experiences," in my opinion this characterization of the "driving spectra" would have been required to be precisely

quantified and evaluated across many different factors. A few of these factors to consider include:

- **Location of the Phone** – Whether the phone is "attached to the belt," loose in a shirt pocket, on a seat or the vehicle's dash, in a purse, or on some sort of mounting device.
- **Mounting Type** – Whether the phone is attached to a stalk that would introduce additional spectral features, sitting on a flat surface (dash, console) that would provide vertical but not horizontal stability, on a car seat, on the steering wheel (introducing rotational motions), in a cup holder, or in a mount attached to the windshield, dash, or something relatively flexible like an air vent or the glove box. In my opinion, each of these mountings would amplify certain frequencies while dissipating others.
- **Vehicle Type** – A luxury car with a large wheelbase has a very different spectrum than a sports car, a small car, or a truck. Tires and wheels are also important, including allowing for winter or summer tires, and the presence of tire chains would also need to be considered.

- **Maintenance Status of Vehicle** – Inadequate defective or worn shock absorbers or other suspension components will change spectral elements to the motion spectra, as will varying tire pressure.
- **Vehicle Load** – Additional weight can modify the motion spectra of a vehicle, while trailers are especially apt to modify motion spectra.
- **Road Surface** – A car on a smooth road feels very different from a car on a road with cracks and potholes. Cement slab roads introduce a lot of energy at very specific frequencies, while the spectrum from a dirt or gravel road will be very different, especially if washboards have developed. Raised markings in the roads (e.g., Bott's dots at lane boundaries and rumble strips on shoulders) would also need to be considered.

131. Each of these characteristics (and ideally all combinations) would have needed to be considered in order to successfully implement the system of Rabu. This would, at best, have taken a great deal of experimentation and, in my opinion, at least some of these situations would have been very difficult to accommodate at the time of the invention, requiring further modifications to Curry.

132. Even if one could limit the "driving" reference spectra to a small set, in my opinion comparing the "current" spectra to the reference spectra is a difficult

problem. This is essentially an image processing problem, and Rabu indicates that the actual spectra are compared, not a representation of the spectra. (See, for example, Rabu 7:42-45). To my knowledge, techniques for measuring image similarity that could run on a phone were not available in 2010. It would certainly not be obvious when starting this research program that a practical algorithm for judging similarity could be found, and, at any rate, in my opinion it would be well beyond the skill level of the identified POSITA.

133. Further, the '487 patent relies on the availability of continuous sensor data (including continuous positioning data and accelerometer data) to ensure that data regarding how a vehicle is being driven is captured. *See* USAA-1001 at 16:15-20; 16:48—18:32. In my opinion, a POSITA would not have been motivated to look to Curry to arrive at the '487 patent's claims because Curry intentionally limits the use of sensor data until a phone call is received or made. *See*, *e.g.*, USAA-1005 at 3:2-4:28; 16:7-13; FIG. 4; *see also id.* at 14:28—15:7 ("[I]f the GPS is always on, the battery of a GPS-enabled phone can only last a very short time period, e.g. 4-5 hours. To reduce battery consumption, the GPS receiver is re-activated only right after a phone call is made or received").

134. Although Petitioner proffers certain explanations for rationale to combine Curry and Rabu, in my opinion in no case does either reference support

such combination. For example, considering the cited art as a whole, and without the benefit of hindsight, a POSITA would never have picked up Rabu in the first place, let alone picked out sections of Rabu for its teaching of determining a frequency spectrum of a portable media device, comparing that frequency spectrum to a database of frequency spectra to determine a motion status and mode of operation of the portable media device, and further using such data to distinguish whether the portable media device is in a dock, resting on a surface, being handled by a person, located in a moving vehicle, or located in a stationary vehicle. *See* USAA-1013 at Abstract.

135. Contrary to the Petitioner's assertion that Curry would benefit from Rabu's "defined modes of operation includ[ing] appropriate levels of phone use restrictions" to arrive at the claims of the '487 patent, neither Curry nor the '487 patent would benefit from Rabu's various potentially inaccurate modes based on the use of Rabu's unreliable, processor-intensive frequency analysis, as discussed above. *See* 518 Petition at 15; USAA-1013 at 5:61—6:21.

136. Further, "a nuanced approach to phone restrictions" certainly would not have been a motivating factor, because Curry intentionally allows another entity at the server (external to the Curry's phone) to set user permissions as a condition of its dynamic call handling. *See* Pet. at 14-15, 28; USAA-1005 at 8:4—9:20.

137. Further, nothing in Curry suggests that using Rabu's frequency analysis to determine holder status and holder motion status would instead be better than using GPS and accelerometer data at the time of a phone call such that it would make technical sense to put Curry and Rabu together to arrive at the '487 Patent.

138. Thus, in my opinion there is insufficient explanation in the Petition or Petitioner's expert declaration as to why a POSITA would have combined the teachings of Curry and Rabu in the manner Petitioner proposes.

C. Claims 6-8 Of The '487 Patent Are Patentable Over The Combination Of Curry, Rabu, And Katayama

139. Katayama et al. (Exhibit USAA-1024) is directed to "a vehicle-mounted driving recorder that can facilitate an after-the-fact analysis on not only situation data at a time of an accident but also situation data at a time of [a risk incident]." USAA-1024, Abstract, [0009]. Katayama is prohibitively different from both the '487 patent and the '369 patent: (1) Katayama does not disclose a mobile telecommunications device (e.g., mobile phone); (2) Katayama is akin to a black box data recorder that is required to be electrically connected to the sensors of a vehicle; and (3) Katayama requires data from the vehicle sensors. *See id.*, Abstract, [0038], FIGs. 4-6. For example, Katayama's device derives situation data from the vehicle sensors, where "[t]he situation data is vehicle speed data transmitted from a vehicle speed sensor." *Id.*, [0038].

140. In my opinion, these characteristics of Katayama are all in direct conflict with the requirements of the ’487 patent. For example, Katayama is not a mobile telecommunications device as required by claim element [1.1], does not have a downloadable application as required by claim element [1.10], and requires vehicle sensors, in conflict with claim element [1.9]. *See*, *e.g.*, USAA-1024, Abstract, [0038], [0042]-[0044]. Additionally, Katayama’s device is powered by “electric power supplied from a vehicle battery,” further illustrating that Katayama’s device is not mobile. *Id.* at. [0039]. Katayama’s device features are similarly incompatible with the use of Petitioner’s Curry-Rabu phone.

141. Because of Katayama’s stark differences from Curry and Rabu, in my opinion a POSITA simply would not have looked to Katayama or have been motivated to combine Katayama with the combination of Curry and Rabu for data storage details.

142. Further, neither Curry nor Rabu disclose the need for distinguishing long-term versus short-term storage, as required by claims 6 and 7 of the ‘487 patent.

D. Claim 1 Of The ’369 Patent Is Likewise Patentable Over The Combination Of Curry, Rabu, And Katayama

143. In addition to the reasons provided above for the patentability of claim 1 of both the ‘487 and the ‘369 patents, the ‘369 patent includes additional memory-related elements for which Petitioner relies on Katayama. Katayama’s characteristics

and features are in direct conflict with the requirements of claim 1 of the ’369 patent. The hardware configuration of the ’369 patent specifically avoids Katayama’s “black-box-like” hardware configuration for data logging. USAA-1001 at 2:15-26. The ’369 patent reviews data logging devices such as Katayama’s driving recorder: “Some of these data logging devices can be integrated with the car data network, and so may take inputs from sensors integrated with the vehicle. However, these can be difficult and costly to install.” *Id.* at 1:49-53.

144. The ’369 patent mitigates Katayama’s vehicle sensor integration complexity because the ’369 patent derives driving information “without data from the vehicle sensors.” *Id.* at 31:63-64. In my opinion, this requirement of the ’369 patent would not have led a POSITA to Katayama at least because (1) Katayama did not contemplate integration with the vehicle sensors as being an issue that required mitigation; and (2) Katayama is a hardware-based configuration, not a mobile software-defined communications platform such as a smart phone, as demonstrated below.

145. As to point (1), in my opinion Katayama’s integration with many of its vehicle sensors would have been considered by a POSITA to be critical to Katayama’s identification and categorization/classification of an accident or risk incident. *See*, *e.g.*, USAA-1024, [0012]-[0015], FIGs. 4-6 (disclosing vehicle sensor

data, e.g., "speed data indicating a speed of the vehicle, brake data indicating whether or not a brake of the vehicle is activated, door open/close data indicating whether a door is open or closed and main electric power supply state data indicating whether or not electric power is supplied from an electric power supply at a side of the vehicle," and classifying such data, e.g., as "most important" data indicated by, e.g., "a quick stop without brakes").

146. Katayama discloses that the "situation data" that it records and classifies "is vehicle speed data transmitted from a vehicle speed sensor…of the motor vehicle V, door open/close data…, or brake data…, and the data is received through a connector CN. Furthermore, the driving recorder 1 is generally activated by the electric power supplied from a vehicle battery…through the connector CN." *Id.* at [0038]-[0039]. *See also id.*, [0063] (second embodiment). In my opinion, Katayama's driving recorder is not meant to be a mobile device that is removably attached or affixed to a vehicle for purposes of data logging without using vehicle sensors, as is required by the claims of the '369 patent.

147. Further as to point (1), Katayama states that "in order to judge whether or not the event is an accident or a…risk incident…more accurately it is preferable that the situation data further includes at least one of or all of speed data indicating speed of the vehicle, brake data indicating whether a brake is applied to the vehicle

or not, door open/close data indicating whether a door is open or closed and main electric power supply state data indicating whether or not electric power is supplied from a power supply at a side of the vehicle." USAA-1024, [0020]. In my opinion, Katayama simply did not contemplate the efficacy of running its driving recorder without vehicle sensor data. *See generally id.* Further, a POSITA would have understood that Katayama did not contemplate *not* using this vehicle sensor data *at all*.

148. Katayama discloses using its vehicle sensors "to select and to store the situation data of the vehicle before and after the selection signal is generated in case that the data administration section determines the signal is generated. The selection signal generated by operating the vehicle by the driver after the occurrence of an accident is a signal generated by an action such as opening or closing a door, yanking an emergency brake or turning off an ignition switch." *Id.*, [0021]. Katayama thus requires vehicle sensors to initiate selection and storage of data in its data recorder. Further, Katayama's vehicle sensors are used to classify accidents, e.g., as minor. *Id.*, [0022]-[0024].

149. As to point (2), Katayama discloses that a "communications device 6 is hardware for wireless LAN that is built-in the casing 2 and that sends and receives various data by means of a center computer…arranged in a vehicle allocating

center…." *Id.*, [0042]. In my opinion, a POSITA would not have looked to Katayama for combination with Curry and Rabu additionally because Katayama's hardware was not configured for telecommunications. Katayama's "hardware for wireless LAN" depends on being within a short distance of a vehicle allocating computer to communicate its recorded data.[4] In my opinion, this is very different from the mobile telecommunications device of the claims of the '369 patent (or Curry, for that matter) that can directly communicate data to a remote server through telecommunications without relying on a wireless LAN for those communications.

150. Further as to point (2), Katayama discloses a removable CompactFlash (CF) memory card to store situation data. *Id.*, [0044]. Although Katayama suggests that its removable CF memory card is optional (*id.*), such a storage configuration is akin to a vehicle black box and unknown for an iPhone, such as the 3G iPhone disclosed by Curry. *See* USAA-1005 at 2:25-27. An iPhone cannot be opened by a user to physically access or remove its solid-state memory device, and to my

[4] A wireless local area network (LAN) typically covers 10 meters-10 kilometers in radius, which is approximately 6 miles maximum. While it is not clear whether Katayama could have used a wide area network (WAN) instead, Katayama's hardware was not configured for it.

knowledge there is no (and never has been any) user-removable storage card on any version of an iPhone.

151. Petitioner has also not explained how a POSITA would or could have configured the internal storage in Curry's mobile device to have the specific configuration disclosed in Katayama. *See* 768 Petition 23-25; USAA-1024, FIG. 5 (having temporary data storage section 802, judgment criterion parameter storage section 805, and situation data storage section 803 managed by data administration section 804); *see also* USAA-1024, [0045]-[0046]).

152. Petitioner asserts that "configuring the Curry-Rabu phone to leverage Katayama's teachings would have required only routine knowledge of programming and common electronic components." 768 Petition at 27, *citing* USAA-1003, ¶119. Further, Petitioner asserts that "the changes would have amounted to nothing more than the use of known techniques to improve similar devices," and "the elements of the resulting combination would each perform functions they had been known to perform prior to the combination." 768 Petition at 27, *citing* USAA-1003, ¶¶ 119-120. However, the disclosed hardware of the Curry and Katayama devices are far from similar, and the functions each performed prior to the purported combination, having different hardware and software configurations, in my opinion could not be expected to perform similarly in a Curry-Rabu-Katayama phone.

153. Neither Petitioner nor Dr. Michalson explains the differences or what activities would need to be performed to make the different types of hardware work together, or why those differences and activities would require only "routine knowledge of programming and common electronic components."

154. With respect to the claims of the '369 patent, in my opinion Katayama (a.) is not a mobile telecommunications device as required by claim element [1.1] and claim 20; (b.) does not have a downloadable application as required by claims 2, 3, 10, 11, 13, 14, and 18; and (c.) requires vehicle sensors, in conflict with claim element [1.9]. *See*, *e.g.*, USAA-1024, Abstract, [0038], [0042]-[0044]. Additionally, in conflict with claim 19, Katayama's device is powered by "electric power supplied from a vehicle battery," further illustrating that Katayama's device is not mobile (e.g., not self-powered).[5] *Id.* at. [0039]. In my further opinion, a POSITA would have viewed Katayama as undesirable when considering the '369 patent's claims as a

[5] Although Katayama discloses as "auxiliary electric power supply 9 held by the casing 2" (*id.*, [0031]), this power supply is meant to only "drive the driving recorder 1 at the minimum during at least the certain period," "[i]n case that an electric power supply from the vehicle battery becomes scarce due to some cause (in case that the battery gets damaged due to a crash accident or the like)." *Id.*, [0039].

whole, and Katayama's device features are incompatible with the use of Petitioner's Curry-Rabu phone.

155. Katayama's features also do not read on claim elements [1.10]-[1.13] of the '369 patent. First, in my opinion, Petitioner's argument for the necessity of Katayama's storage configuration is based on a flawed premise of what the purported Curry-Rabu phone might require for storage, or from which storage the Curry-Rabu phone could benefit. The Curry-Rabu phone merely records raw data in Curry's motion data cache before transmitting it to Curry's server for additional analysis, including detection of driving incidents. USAA-1005, 7:8-10; 11:15-18. *See also id.*, FIG. 2 (208, 212, 218); 13:1-2; FIG. 3 (324); 14:19-21. The Curry-Rabu phone does not detect driving incidents, but merely handles phone calls based on raw sensor data. As indicated by Petitioner's combination, an incoming phone call, for example, would start recording of raw sensor data in the motion data cache. *Id.* at 16:7-13. That raw sensor data is then analyzed by Curry's activity mode recognition program 120 merely to estimate the context of the phone call, that is, to determine whether the Curry-Rabu phone was held in an activity mode of driving, walking, standing still, or unknown at the time of the phone call. *Id.* at 10:16-26. Further, the Curry-Rabu phone does not process raw sensor data to determine

"driving information." As discussed above, driving information and raw sensor data are not the same thing.

156. In contrast, the mobile device of the '369 patent has a specific storage configuration so that it stores some driving information in long term storage (protected storage 34b) and some driving information in short term storage (buffer 34a). *See* USAA-1001, FIG. 3, 17:8-14. The reason for this storage configuration is clearly set forth in the specification of the '369 patent:

> "It is advantageous to store only selected driving information for the purpose of logging how a vehicle is being driven during the driving period…By being selective about the driving information that is being stored, storage utilisation can be made more efficient." USAA-1001 at 4:50-59.
>
> "[T]he executed application may be arranged to control the mobile device to detect the occurrence of a predetermined event of significance (such as a crash) in in response store driving information associated with that event to the memory." *Id.* at 5:12-16.
>
> "[T]he mobile device may comprise an event detector for detecting the occurrence of an event." *Id.* at 5:27-28.

"[T]he executed application may be arranged to control the mobile device to take at least one predetermined action in response to a detected event." *Id.* at 6:41-44.

"Preferably the memory comprises a long term memory for persistently storing driving information and/or sensor data. Preferably the memory comprises a buffer. The buffer may comprise a short term memory for transiently storing driving information and/or sensor data. Preferably, the short term memory is arranged to receive driving information and/or sensor data at a higher update rate than the long term memory. Preferably, the long term memory has a larger capacity than the short term memory." *Id.* at 7:53-61.

"Preferably, the executed application controls the mobile device to write driving information and/or sensor data to the short term memory at a predetermined update rate during the driving period. Ideally, the driving information and/or sensor data is written to the short term memory in a predetermined sequence, ideally a chronological sequence. Preferably, the executed application controls the mobile device to overwrite driving information and/or sensor data previously written to the short term memory. Advantageously, this ensures that

recording of sensor data and/or driving information, especially data that is recorded at a relatively high update rate, is not prevented during the driving period due to the short term memory becoming full." *Id.* at 7:62—8:7.

"Preferably, the driving information and/or sensor data is overwritten in accordance with the predetermined sequence. Advantageously, this can ensure that the most relevant, up-to-date data is retained in the short term memory." *Id.* at 8:8-11.

"Preferably, the action taken in response to a detected event comprises transferring data from the short term memory to the long term memory. Advantageously, this can ensure that the most recent information associated with an event is persistently stored in the long term memory, and is not overwritten." *Id.* at 8:12-17.

157. Because the Curry-Rabu phone does not detect the occurrence of a predetermined event of significance (such as a crash or other driving incident), in my opinion the Curry-Rabu phone does not store driving information as discussed above. Instead, if one were to compare the combination of Curry-Rabu to the claims of the '369 patent, an appropriate mapping would be such that the server of the Curry-Rabu phone processes the raw sensor data, determines driving information,

detects a driving incident from the driving information, and stores driving information and/or sensor data. However, Petitioner did not map (and should not have mapped) features of Curry's server to the claims because Curry's server is not a mobile telecommunications device, which performs the steps in the claims.

158. Thus, in my opinion, the combination of Curry-Rabu-Katayama does not disclose "a long term memory for persistently storing driving information and a short term memory for transiently storing driving information" according to claim element [1.10] of the '369 patent because Petitioner has not cited to aspects of the combination that disclose this claim element, and none are evident. Further, no part of the combination discloses the claim element regardless of how the references are combined. For example, the memory of Curry's server cannot meet this requirement.

159. Dr. Michalson is wrong in asserting that "[Curry's] phone includes all of the necessary sensors, processing, and memory to derive driving information." USAA-1003 of 768 Petition, ¶ 161 (citing USAA-1005, Abstract, 2:1-27, 3:24-4:11, 7:5-22, 8:29—10:12, 13:20—16:6, FIGs. 1, 3). Regardless of Curry's sensors, as discussed above, Curry does not disclose processing by the Curry phone to derive driving information or memory of the Curry phone to store driving information according to claim element [1.10]. Further, Petitioner is wrong in asserting that Curry's phone, modified by Katayama, would retain "important situation data" to

enable "after-the-fact analysis" of, for example, accidents and risk incidents, and would for at least that reason be understood as being persistently storing such data. 768 Petition at 42-43 (citing USAA-1024, ¶¶ 1, 27, 46-52). Because Curry's phone does not detect incidents, "important situation data" would not be determined by Curry's phone and there would be no reason, according to the claims, to persistently store such data. In my opinion, no proposed combination with Curry can cure these deficiencies.

160. For reasons similar to those provided above for claim element [1.10] of the '369 patent, in my opinion the combination of Curry-Rabu-Katayama does not disclose "wherein the short term memory receives driving information at a higher update rate than the long term memory" according to claim element [1.11] because Petitioner has not cited to aspects of the combination that disclose this claim element. Further, no part of the combination discloses all aspects of this claim element regardless of how the references are combined. For example, the memory of Curry's server cannot meet this requirement.

161. For reasons similar to those provided for claim element [1.10], the combination of Curry-Rabu-Katayama also does not disclose "the mobile telecommunications device being further configured to: write driving information to the short term memory at a predetermined update rate during the driving period in a

predetermined sequence" according to claim element [1.12] because Petitioner has not cited to aspects of the combination that disclose this claim element. Further, no part of the combination discloses all aspects of this claim element regardless of how the references are combined. For example, the memory of Curry's server cannot meet this requirement.

162. Likewise, for reasons similar to those provided for claim element [1.10], the combination of Curry-Rabu-Katayama also does not disclose "the mobile telecommunications device being further configured to: overwrite the driving information previously written to the short term memory in accordance with the pre-determined sequence" according to claim element [1.13] because Petitioner has not cited to aspects of the combination that disclose this claim element. Further, no part of the combination discloses all aspects of this claim element regardless of how the references are combined. For example, the memory of Curry's server cannot meet this requirement.

E. Claims 13 And 14 Of The '369 Patent Are Patentable Over The Combination Of Curry, Rabu, Katayama, And Thompson2010

163. Petitioner asserts Thompson2010 in combination with Curry-Rabu-Katayama as meeting the limitations of claims 13 and 14 of the '369 patent. Petitioner and Michalson acknowledge that "while Curry contemplates emergency scenarios (e.g., accidents) may occur, it does not disclose specific embodiments

focused on detecting an emergency or actions performed by phone 106 in response to a detected emergency." 768 Petition at 75 (citing USAA-1005, 3:16-28, 9:16-26, cl. 9.); USAA-1003 of 768 Petition, ¶233. Petitioner thus asserts that a POSITA would have modified Curry with Thompson2010's accident detection technique to "advance[] Curry's overall motivation to reduce casualties resulting from vehicular accidents." 768 Petition at 76. However, in my opinion Thompson2010 is a rudimentary experimental study limited to significant crashes and filters out and/or ignores certain sensor data that the '369 patent would depend on for event detection. *See* USAA-1008 at 8-9.

164. Thompson2010 discloses a system for collecting certain sensor data from a phone's sensors in a vehicle and utilizing that data to contact emergency personnel in the event of an accident. USAA-1008, FIG. 2. Thompson2010's system analyzes that data for purposes of accident reconstruction. *Id.*, Abstract. However, in my opinion Thompson2010 presents several shortcomings that would discourage a POSITA from using Thompson2010 in the asserted combination.

165. First, Thompson2010's system is enabled only when its cell phone device is plugged into a vehicle power source because "GPS receivers consume a substantial amount of power and sampling them at the rate necessary to accurately determine speed would…limit the lifetime of the device to several hours." USAA-

1008 at 8. Thompson2010 captures data related to an accident, but Thompson2010 does not collect data related to acceptable or unacceptable driving behaviors or patterns that do not result in an accident because Thompson2010 mitigates "false positives" by filtering out what could otherwise be useful data. *See id.* at 4 (section 2.2).

166. Thus, in my opinion a POSITA in the field of vehicle crashes would immediately recognize significant problems with Thompson2010. For example, Thompson states that "[t]he required acceleration to trigger airbag deployment is 60G's [10, 11]." USAA-1008 at 9. A POSITA would have understood that 60G acceleration corresponds to a very severe crash with almost certain injuries and likely fatalities.

167. In addition to its exaggeration of trigger levels, Thompson2010 determined that its "acceleration filter prevents drops … from triggering accident notifications." USAA-1008 at 8. Thompson2010's acceleration filter thus was set to ignore accelerometer data below 4G to prevent false positives (such as might be experienced from an inadvertent phone drop). *Id.* However, vehicle airbags may deploy at levels of acceleration around 4G, so a POSITA would have found it essential to *not* filter out data around this critical level.

168. In limiting its study to such experimental levels, Thompson2010 itself recognized that "[i]t may not be possible to detect all accidents with smartphones. Due to the filters utilized to prevent false positives, it may be possible to experience a low speed "fender-bender" without the application detecting it. More work is needed to enhance the filtering mechanisms to account for these types of collisions." USAA-1008 at 12-13. Although the '369 patent recognized the same potential issue (USAA-1001 at 19:65—20:4), the '369 patent went far further to solve challenges posed by Thompson2010. Given Thompson2010's many shortcomings, in my opinion Thompson2010 would not have provided motivation to combine it with Curry to arrive at the claims of the '369 patent. As defined by the '369 specification, although a crash is an example, predetermined events of significance include other events besides a crash (some more difficult to detect). *See* USAA-1001 at 5:12—6:10.

169. Thompson2010 also makes general observations regarding the accelerations the phone may experience: It may be "stationary relative to the vehicle during the collision" or "carried in some form of pocket [and would] experience the same forces as vehicle occupants." USAA-1008 at 7. In my opinion, a POSITA would have understood that the accelerations experienced in a breast pocket versus a pants pocket versus sitting on a seat versus mounted to the vehicle would have

been different and would have needed to be accounted for, which Thompson2010 does not do. Nor is it a proper assumption by Michalson, in my opinion, that the cell phones of the cited art will reliably capture "accelerations experienced by the driver." *See* USAA-1003, ¶82.

170. Thus, the limitations of Thompson2010's acceleration measurement would not provide the range needed by the '369 patent for detecting accidents by the mobile telecommunications device. Although a POSITA may have gained some direction from Thompson2010, the direction would have been severely limited due to Thompson2010's experimental shortcomings. In my opinion, a POSITA thus likely would not have looked to combine Thompson2010 with Curry to arrive at the subject matter of claims 13 and 14.

F. Claim 26 Of The '369 Patent Is Patentable Over The Combination Of Curry, Rabu, And Katayama

171. Claim 26 of the '369 patent recites nearly identical features as claim 1 of the '369 patent, with the exception that the term "attached" in claim 1 ('369 patent at 31:56) with the term "affixed" in claim 26 ('369 patent at 34:8). Thus, for all of the reasons set forth above with regard to claim 1 of the '369 patent, in my opinion claim 26 is likewise patentable over the combination of Curry, Rabu, and Katayama.

G. Claim 27 Of The '369 Patent Is Patentable Over The Combination Of Curry, Rabu, Katayama, And Berkobin

172. Claim 27 of the ’369 patent recites similar features as claims 1 and 26 of the ‘369 patent except that claim 27 adds the following feature (claim element [27.8]): <u>the processing involving the use of a neural network on the mobile telecommunication device to determine whether the driving information represents an acceptable or unacceptable driving pattern….</u> Petitioner asserts Berkobin (USAA-1010) in combination with Curry-Rabu-Katayama to meet this claim element. Pet. at 80-82.

173. Berkobin discloses techniques “for determining driver behavior based on vehicle operating parameters, adjusting insurance premiums, and preventing fraudulent manipulation.” USAA-1010, Abstract. In my opinion, Berkobin, as another “black-box-like” device integrated with a vehicle’s sensors, suffers from similar shortcomings as Katayama. *See id.*, [0021]. Berkobin relies on vehicle-embedded GPS and a cellular transceiver for vehicle performance metrics. *Id.* Berkobin’s apparatus “can interface and monitor various vehicle systems and sensors to determine vehicle systems” using standard “OBD (On Board Diagnostics) port, OBD-II port, CAN (Controller Area Network) port, and the like.” *Id.*, [0038].

174. Although Berkobin discloses interfacing with a PCS/cell phone/smartphone for communications and monitoring phone usage, Berkobin does not contemplate using a phone for performing the features of its apparatus. *See*, *e.g.*,

[0037], [0044], [0066], [0077]. Berkobin thus does not disclose or even contemplate any processing on a mobile phone as claimed.

175. Berkobin only generically suggests that its non-phone apparatus "can employ Artificial Intelligence techniques such as [a number of generic examples including a neural network]." *See*, *id.*, [0031]. Berkobin does not indicate how such AI functionality might be integrated into its apparatus for any purpose, much less the purposes identified in Claim 27.

176. As noted above, processing on the mobile device *as claimed* is not disclosed, taught, suggested, or rendered obvious by Curry, Rabu, and Katayama, alone or in combination; the addition of Berkobin to the combination similarly fails. In my opinion, Petitioner has not sufficiently demonstrated that any "techniques for artificial intelligence to evaluate driver information," 768 Petition at 80, are performed by a mobile device using its own processing functionality and sensors.

177. For example, Petitioner's statement that "Curry describes evaluating measured sensor data to identify unsafe driving behaviors" refers to Curry's server, not Curry's phone when it comes to driving behaviors other than receiving or placing a phone call during driving. *Id.* at 81 (*citing* USAA-1005, 7:5-22). In my opinion, there is a big difference between saying a "POSITA would have therefore been motivated to employ artificial intelligence to identify unsafe driving behaviors" in a

generic conclusory statement (768 Petition at 80-81) and actually demonstrating sufficient evidence of the application of AI on a mobile device for doing that specific activity. Thus, in my opinion the Curry-Rabu-Katayama-Berkobin combination does not render claim 27 obvious for the above reasons and additionally for the same reasons that claim 1 is non-obvious.

H. Claims 1, 2, 12, And 13 Of The '487 Patent Are Patentable Over The Combination Of Forstall, Rabu, And Langle

178. Forstall describes a navigational device, and particularly a mobile device with a GPS sensor used to determine the physical location of the mobile device and, in turn, display the position of the mobile device on a digital map to aid the mobile device user in navigating to a particular destination, USAA-1028 [0058], whether the user operates the navigational device in a "vehicle mode" or a "walking mode." USAA-1028 [0064].

179. Forstall is intended to address a challenge that existed with previous navigation systems. Specifically, "environmental factors can prevent the location of the device [from] being determined," such as loss of line-of-sight between the GPS receiver and the GPS satellites. USAA-1028 [0060]. In the event of such a loss of a GPS signal, Forstall employs sensors on the mobile device, such as an accelerometer, compass, and/or gyroscope, to measure movement of the mobile

device from a point of origin or a known location, which is referred to as a "fix," and thus to determine the current location of the mobile device with respect to that fix.

180. Forstall refers to the foregoing technique as "dead reckoning," and if the mobile device loses contact with the GPS signal, the Forstall mobile device "is configured to switch into a dead reckoning positioning mode." USAA-1028 [0062].

181. Petitioner loosely suggested (at Section III.E.1(c)(i)) that combining Forstall and Rabu would solve Forstall's "[lack of] implementation details relating to detecting a vehicle mode" because Rabu "is focused on mode detection" and Rabu "leverages a 'generally conventional accelerometer (also in Forstall's device)'." Pet. at 57. However, Petitioner provides no rational reason why a POSITA looking at Forstall would find Rabu to be appropriate for combining with Forstall, including, e.g., why Rabu's use of frequency analysis of device movements would be necessary. Petitioner instead generally states that "practical solutions relating to Forstall's vehicle mode detection . . . are found within Rabu" without considering what those "practical solutions" represent or why they would be needed or appropriate to arrive at the claimed invention. *See id.*

182. Even to "supplement the detection of a 'vehicle mode,'" a POSITA might find a solution in Rabu, but in my opinion not an appropriate solution for the claimed invention. *See id.* at 58. Additionally, use of an accelerometer as a generic

feature of both Forstall and Rabu does not sufficiently explain why a POSITA would have looked to combine those references.

183. Petitioner argues that "[a] POSITA would have also been motivated to seek practical solutions relating to Forstall's vehicle mode detection since its disclosure lacks implementation details relating to detecting a vehicle mode absent some explicit user indication." *Id.* at 57. This is incorrect. Forstall describes two movement modes, walking and driving- walking being identified by "the detection of periodic accelerations" USAA-1028 at [0071]. Vehicle mode would lack these accelerations.

184. Further, nothing in Forstall or Rabu would suggest to a POSITA that a "mode" of weighing acceleration data, as described in Forstall, might in any way benefit from Rabu's disclosure concerning modifying a mode of operation of a mobile device based on how it is being used when in a moving vehicle. Here, nothing in Rabu would have suggested any modification to the Forstall method of weighing acceleration data.

185. Petitioner also asserts that a POSITA would be motivated to combine the teachings of Langle with Forstall because, allegedly, navigation systems increase risk of accidents and would thus lead one to combine the vehicle driving classification aspects of Langle with the navigation system of Forstall. Pet. at 59.

However, the teachings of Langle have no bearing on the navigation system of Forstall, do not mitigate any shortcomings in Forstall, and in any case Petitioner never establishes with particularity how a POSITA would incorporate any of the teachings of Langle into Forstall's navigation system. Thus, in my opinion a POSITA would not be motivated to combine the Forstall navigation system (whether alone or in combination with Rabu) with Langle.

186. The subject matter of Forstall is enabling navigation systems on a mobile device to continue operation after loss of a GPS signal by "performing location estimation using dead reckoning." USAA-1028 Abstract. In contrast, the subject matter of Langle is classifying driving behavior through analysis of the shapes of curves of acceleration over time as measured by "a Google phone to classify safe versus unsafe driving," and more particularly to detect "safe verses unsafe braking . . . [and] safe and unsafe lane changes." USAA-1029, p. 1 (Abstract).

187. While Petitioner attempts to tie Forstall and Langle together under the guise of an alleged common theme of, or need for, "safety," there is simply nothing in Forstall that would motivate a POSITA to look to systems and/or methods for classifying acceleration curves as evidencing safe or unsafe braking or lane changes to somehow "improve safety" when using the Forstall navigation system, or improve or address any other purported shortcomings of the Forstall navigation system. Even

if there were some purported safety risk associated with Forstall, it is not evident, and Petitioner has not established, how evaluating vehicle acceleration, braking, and lane changing as discussed by Langle could address any proposed safety risk associated with using a navigation system as disclosed by Forstall, much less how a POSITA would particularly incorporate the teachings of Langle into Forstall's navigation system.

188. Langle discloses nothing more than the idea that graphed curves showing acceleration as measured by a mobile device's accelerometer over time may be used to classify that acceleration as "safe" or "unsafe" driving activity. Knowledge of whether a specific acceleration evidences "safe" or "unsafe" driving does nothing to improve upon a navigation application on a mobile device. A POSITA seeking to improve upon such a navigation application would have no need or inclination to look to systems or methods for classifying accelerations as "safe" or "unsafe," which is the specific teaching of Langle.

189. Petitioner never explained in detail and with particularity, nor is it evident, how a POSITA would modify Forstall with Langle, and specifically how the details of Langle's classification curves would somehow be applied to Forstall's navigation system or how those teachings of Langle would somehow improve safety in combination with Forstall's navigation system.

190. Petitioner notes from Langle that "[p]rogramming with accelerometers … is straightforward and supports three axes." Pet. at 59. However, Petitioner never explained in detail and with particularity, nor is it evident, what specific aspects, teachings, or safety techniques of Langle would be "straightforward" to incorporate into Forstall, or even that would have applied to Forstall, to allegedly improve the safety of a navigation application, much less how they might be incorporated or how they would have any effect on the safety of such a navigation application.

191. While Langle attempts to classify graphs of g-forces to model driving behaviors using specific mathematical calculations and classify them as safe versus unsafe driving, Langle itself notes the difficulties in making accurate estimations for various vehicle measurements, cautioning that the Langle methods are preliminary and that "[g]eneral classification is possible given [a mobile phone's] GPS speed sensor and triple-axis accelerometer, but the hardware may not be accurate enough to perform other measurements such as braking distance and lane change width reliably." USAA-1029 at 5. Petitioner offers nothing to explain how these processes, described by Langle as less than fully reliable in modeling safe or unsafe vehicle movement, might apply to or be programmed into Forstall's navigational tool to improve the safety of using that tool.

192. Petitioner states that Langle describes "a technique to predict accident-related risks." Petition, 59. While Langle does describe different efforts made (with differing results) to model data from mobile phone sensors as "safe versus unsafe" driving, Petitioner fails to show in any case and with particularity what particular aspects of Langle a POSITA would have incorporated into Forstall's navigation system that would predict any such accident-related risks.

193. Moreover, even if a POSITA were able to discern which aspects of Langle should be incorporated into Forstall's navigation system, Petitioner likewise fails to explain with particularity *how* Langle's techniques would improve safety in combination with Forstall's navigation system.

194. Petitioner argues here that "[m]obile-based navigation systems were known to increase the risk of accidents since they typically involve mounting a mobile device to a vehicle dashboard so that a user may view navigation information while driving." Pet., 59 (citing USAA-1003, ¶201; USAA-105, 1:3-8). First of all, this is not correct. Navigation systems have generally been shown to reduce accidents (as drivers are better oriented and don't need to manage a large paper map). In fact, the citation relied on by Petitioner's expert is directed to "mobile computing products … e.g., bar code readers, PDAs, laptops, two-way pagers, mobile phones, digital cameras, mobile optical readers, vehicle radio computers ('VRCs'), etc."

USAA-1031 at [0001], specifically not including navigation systems of any sort. Even here, Wulff only states distraction *may* result in accidents, with no evidence provided, and he does not assert that these distractions *increase* accidents, as Petitioner asserts. Id., [0002]. Secondly, Petitioner never explained how the classification of GPS speed sensor data and accelerometer data as indicating "safe" or "unsafe" driving would somehow improve navigation driving safety in Forstall's navigation system.

195. Given the self-described challenges in Langle to implement the mathematical modeling methods of Langle in a cell phone, and the inapplicability of the g-force acceleration factors that could be detected by Langle to some safety aspect associated with using a navigational tool, in my opinion a POSITA is left with no direction or motivation to integrate the methods of Langle into Forstall's navigational tool.

XIV. CONCLUSION

196. The findings and opinions set forth in this declaration are based on my work and examinations to date.

197. I may continue my examinations. I may also receive additional documentation and other factual evidence over the course of this IPR that will allow me to supplement, amend or modify my opinions set forth herein. I reserve the right

to supplement, amend, modify, or delete my opinions upon discovery of additional information.

198. In signing this declaration, I recognize that it will be filed as evidence in an IPR proceeding filed before the PTAB. I also recognize that I may be subject to cross-examination in the case. If cross examination is requested of me, I will appear at a mutually convenient time and place during the time allocated for expert discovery and cross examination.

APPENDIX A

CHRISTOPHER K. WILSON

Redwood City, CA 650.867.2621 Chris@CWcons.com http://www.linkedin.com/in/cwilson7

Connected Vehicle & Telematics Consultant – Testifying Expert

I have been developing vehicle telematics and safety systems since 1991, mostly for safety and Advanced Driver Assistance Applications (ADAS). I participated in the early development of key connected vehicle telematics and safety technologies, including radar, positioning, communications, and mapping, worked with many automakers, suppliers, and government agencies, and was involved in the deployment and assessment of many telematics systems from Automatic Collision Notification to systems for Stability Control and Driver Assistance. I also helped set requirements and requirement testing methodologies for many ADAS systems.

I currently work as a consultant for Connected and Automated Vehicle applications (vehicle and infrastructure), and map databases. I am also an expert witness and have written over 80 reports regarding intellectual property and vehicle injury matters and testified 16 times. I am an industry insider with a gift for explaining complicated ideas in a convincing and easy to understand manner.

Expertise in:

- Vehicle Safety & Safety Systems Assessment
- Navigation, Telematics, Data Science
- Radar, camera, & Lidar sensors
- Vehicle & infrastructure interaction
- Remote diagnostics, Sensor & Software Management (OTA updates)
- Vehicle data collection, analysis & applications
- Positioning, communications & mapping technology
- Vehicle & traffic technology and deployment
- Accident Reconstruction

AREAS OF EXPERTICE

(with representative dates)

Vehicle Telematics and Safety Systems

- Developed one of the first Automatic Collision Notification systems based on airbag deployment and biomechanical studies. Worked with first responders & ER physicians. 1994.
- Developed systems for the collection and processing of vehicle information for traffic assessment. 1995-2011.
- Algorithms for skid protection and dynamic vehicle control, braking & speed systems. 1999.
- Developed predictive safety systems based on map information, speed control. 1998.
- Developed metrics for regulatory evaluation of active safety systems including Forward Collision Warning, Blind Spot Monitoring, Stop Sign Warning, Curve Speed Warning. 2002.
- Litigation support for Various radar-based safety systems. 2016.
- Telemetry analysis (missiles, spacecraft, ground vehicles). 1981-Present.

Sensors

Radar

- Designed and operated Over-The-Horizon radar. 1984.
- Synthetic Aperture Radar assessment and evaluation. 1989.
- Evaluation of radar algorithms for F16 radar systems (MTI). 1987.

- Automotive radar development for ACC & FCW systems. 1995.
- Assessed various radar-based safety systems. 2002-2017.

Image sensors & algorithms (camera and video)

- Image recognition & processing algorithms for various reconnaissance assets. 1986.
- 3D scene reconstruction from imagery, photogrammetry. 1987, 2017.
- Assessment of image based FCW, AEB and lane following systems. 2002-2016.
- Photogrammetry for HD mapping applications. 2018.

Lidar

- Evaluated and utilized Lidar systems for Forward Collision Warning. 2003.
- Developed Lidar processing applications for mapping. 2008-2018

Communications

- Developed Vehicle-to-vehicle technologies (DSRC). 1999-2016.
- Extensive use and evaluation of cellular communications for vehicles. 1995-2018.
- Use of paging network for emergency services. 1993.
- Developed various vehicle telematics and infotainment systems. 1993-2016
- Evaluation and development of satellite communications systems. 1984-2016.

Positioning

- Evaluation and use of GPS and many high precision enhancements. 1984-2018
- Requirements specification for GPS III and Galileo. 2004.
- Developed precision location techniques for vehicles. 1996-2018.

Maps

- Responsible for 2nd generation map concepts and specifications for industry (HD Maps). 2000.
- Functional safety for map databases. 2016-2018.
- Developed high precision maps for automated vehicles. 1999-2018.
- Developed tools for incremental updates and quality management. 2000-2018.

Vehicle Diagnostics

- Remote diagnostics of powertrains for warranty and repair planning. 2001.
- Monitored infotainment systems to assess driver preferences and system functionality. 2002.
- Diagnostics of driving style for safety and efficiency evaluations. 2012.
- Telemetry diagnostics of air and space vehicles. 1985.

Cooperative Systems

Insurance- Developed methods and tools for peer comparisons to assess driver risk. 2015.

Transportation Operations- Understanding vehicle movements and implications for traffic and signals based on vehicle probes. 1994-2018.

Outreach

- I was the primary instigator and public advocate for vehicle-to-vehicle communications and grew this effort from “can’t be done” to deployment based on my advocacy.
- I have raised money for 4 startups selling a technical vision.
- Park docent leading trips on various nature topics.

PROFESSIONAL EXPERIENCE

Consultant, Intellectual Property and Connected Vehicles. **2012 – Present**

ATG Risk Solutions, Seattle, WA **2016 - 2016**

VP Bus Dev. *(Developing telematics-based risk assessment for Insurance)*

Vehicle Data Science Corporation, Redwood City, CA **2013 - 2016**

CEO (*Start-up building kinematic maps for automated vehicle applications.)*

TomTom BV, Redwood City, CA **2008 - 2011**

Director of Program & Product Mgmt., Advanced Driver Assistance Systems (2009 – 2011)
Director of R&D (2008 – 2009)

DaimlerChrysler Research and Technology North America Inc., Palo Alto, CA **1996 - 2008**

Vice President, ITS Strategy & Programs (2002 – 2007)
Group Manager, Telematics & Safety (1998 – 2002)
Senior Research Scientist (1996-1998)

Information Access Inc., San Francisco, CA **1995 - 1996**

Director of Product Development (1995-1996)

TRW Inc., Sunnyvale, CA **1986 - 1995**

Program Manager (1991 - 1995)
Senior Systems Engineer (1986 - 1991)

GTE Government Systems Inc., Mt. View, CA **1983 - 1986**

Systems Engineer (1983 - 1986)

EDUCATION/TRAINING

PhD Candidate (1982)**,** Astrophysics**,** University of California, San Diego
BA (1981), Physics, Princeton University, Princeton, NJ
Advanced courses in business, strategy, & technology @ Harvard, Stanford, Berkeley, MIT
Training in **Software Forensics** (copyright infringement, software theft).
Accident Reconstruction. Certificate from Society of Automotive Engineers. ACTAR certified #3846.

PROFESSIONAL ASSOCIATIONS

Member, Institute of Navigation (ION); Society of Automotive Engineers (SAE); Institute of Electrical and Electronics Engineers, Senior Member (IEEE); California Association of Accident Reconstruction Specialists (CA2RS); Accreditation Commission for Accident Reconstruction (ACTAR) #3846, National Association of Professional Accident Reconstruction Specialists.
Board Member, *Inside GNSS* magazine (advisory board); *IEEE Consultants Network of Silicon Valley* (former Chair); ITS California (former), Vehicle Infrastructure Integration Consortium (Founding Director, previous); Alliance of IEEE Consultants Network Coordinating Committee (AICNCC, former Chair).

PATENTS AND PUBLICATIONS

10 US patents in vehicle positioning and vehicle data processing and analytics and numerous foreign patents.

McGraw-Hill *AccessScience* article on “Intelligent Vehicles and Infrastructure”, 2017
Chapter on Probe Data in Springer-Verlag’s *Handbook of Intelligent Vehicles*, 2012
Widely quoted in publications such as Scientific American and Telematics Update
Many presentations to industry groups, often as a representative of the automotive industry.

LITIGATION EXPERIENCE

16 depositions, 30+ IPRs, 50+ expert reports, majority patent related (partial listing).

- Expert for BMW (Finnegan) against navigation system complaint. Few hours consulting. 2012
- Supported primary expert (for TomTom) in technology understanding for invalidity and non-infringement. 2013.
- Expert against OnStar in remote diagnostics case. Developed infringement arguments. Case settled in 2013.
- Expert for Hyundai (Finnegan) in remote diagnostics case. Prepared technology tutorial and multiple IPR declarations. Case settled, 2014.
- Expert for Honda (Jones Day) in remote diagnostics case. Multiple IPR declarations. 2014.
- Expert for Toyota in Telematics/ navigation case. IPR declaration. 2015.
- Expert for BMW on remote data processing case. 2015.
- Expert for BMW (DLA Piper) in vehicle safety technology case (radar, occupant sensing). Invalidity and non-infringement reports, deposition testimony. 2015.
- Expert for Wavetronix (Workman Nydegger) in traffic radar case. IPR declaration, deposition. 2016.
- Expert against LA METRO in HOV reporting case. IPR declaration, deposition. 2016.
- Expert for BMW (DLA Piper) on remote infotainment systems. 2017.
- Expert for Domino’s (DLA Piper, Australia) on fleet monitoring systems. 2017.
- Expert for BMW (DLA Piper) on digital radio systems. 2017.
- Expert for Unified Patents on location-based services. 2017.
- Expert for Velocity v. FCA on vehicle management system. 2018.
- Expert for Unified Patents on map data management and display system. 2018.
- Expert for Blue Dot Systems against Omnitracs on Fleet Management Trade Secrets. 2018
- Expert for MicroMobio on Trademark matter (SuperCruise). 2018.
- Expert on vehicle safety for negligence in personal injury matter. 2019.
- Expert for BMW (DLA Piper) on location-based services patent. 2019.
- Expert for Unified Patents on pairing vehicles with remote devices. 2019.
- Expert for DEI (Cooley) v. ADS in vehicle remote starter patents. 2019.
- Expert for Unified Patents on navigation systems. 2020.
- Expert for BMW (DLA Piper) on connected vehicle systems. 2020.
- Expert for Equipmentshare.com (DLA Piper) on rental equipment remote starter patents. 2021.
- Expert for Unified Patents on pairing vehicles with remote devices. 2021.
- Expert for Tesla on vehicle charging infrastructure. 2022.
- Expert for Unified Patents on infrastructure-based tracking systems. 2022.
- Expert for multiple pedestrian Automatic Emergency Braking related matters. 2023.