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 IPR2023-00911
Patent No. 9,311,271 B2

TABLE OF CONTENTS

Page

I. INTRODUCTION 2

II. EDUCATION AND EXPERIENCE 3

III. LEVEL OF ORDINARY SKILL IN THE ART 4

IV. MY UNDERSTANDING OF CERTAIN LEGAL PRINCIPLES 5

V. THE ’271 PATENT 7

VI. THE ’879 PATENT 10

VII. STATE OF THE ART 11

VIII. THE DRIVING INFORMATION LOGGING AND PROCESSING PROBLEM ADDRESSED BY THE ’879 PATENT AND THE ‘271 PATENT 17

IX. THE ’879 AND ’271 PATENTS’ SOLUTION TO THE DRIVING INFORMAITON LOGGING AND PROCESSING PROBLEM 19

X. CLAIM LANGUAGE OF THE ’879 AND ’271 PATENTS .. 26

XI. SPECIFICATION OF THE ’879 AND ’271 PATENTS 28

XII. SUMMARY OF PETITIONER’S CITED REFERENCES 39

A. International Publication No. WO 201042545 To Curry Et. Al (“Curry”) 39

B. U.S. Patent No. 8,682,399 To Rabu (“Rabu”) 47

C. International Publication No. WO 2010062899 To Callopy Et. Al (“Callopy”) 55

Page

XIII. THE CLAIMS OF EACH OF THE '879 AND '271 PATENTS IS PATENTABLE OVER PETITIONER'S CITED REFERENCES 56

A. Claim 1 Of Each Of The '879 And '271 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 56

B. Claim 1 In Each Of The '879 And '271 Patents Is Patentable Over The Combination Of Curry And Rabu Additionally Because Petitioner Lacks Sufficient Motivation To Combine The References 81

C. Claims 4 And 24 Patentable Over The Combination Of Curry, Rabu, And Tamir 88

D. Claims 9, 10, 14, 15, 17, 18, 32, 33, And 35-38 of the '879 Patent, and Claim 1 of the '271 Patent, Are Patentable Over The Combination Of Curry, Rabu, And Katayama 90

E. Claims 14, 15, 32, And 33 Of The '879 Patent Are Patentable Over The Combination Of Curry, Rabu, And Thompson2010 91

F. Claim 55 Is Patentable Over The Combination Of Curry, Rabu, And Berkobin 95

G. Claim 4 Is Patentable Over The Combination Of Curry, Rabu, And McClellan 96

H. Claims 6 and 7 Of The '271 Patent Are Patentable Over The Combination Of Callopy And Curry 97

XIV. CONCLUSION 104

APPENDIX 106

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: February 29, 2024 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. 9,311,271 B2 ("the '271 patent") and 10,198,879 B2 ("the '879 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. 9,311,271 B2 (IPR2023-00911, hereinafter "the 911 Petition") and 10,198,897 B2 (IPR2023-00857, hereinafter "the 857 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 '271 patent and the '879 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 '271 patent or the '879 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 '271 patent and the '879 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 '879 patent is a continuation of U.S. Patent Application No. 15/061,910, which is a continuation of the '271 patent, they have common specifications.

16. I understand that, at the time of the applications that led to each of the '271 patent and the '879 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 '271 patent and the '879 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 '271 PATENT

19. The '271 patent is directed to methods and systems for logging driving information associated with a vehicle when driven. In one embodiment, a mobile telecommunications device including a sensor set 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, and the driving information is derived without data from vehicle sensors. In one embodiment, the mobile device registers the start of a driving period in response to an initialization input automatically generated in response to sensor data having predetermined values. In another embodiment, the mobile device processes sensor data through multiple driving periods, using a first set of driving periods to establish a benchmark for comparison to subsequent driving periods.

20. For example, location, speed, and acceleration sensor data of the vehicle associated with how the vehicle is driven can be captured from only the mobile device's sensors. USAA-1001 of 911 Pet., 2:10-21. Driving information such as variation in velocity, speed of impact, pitch, yaw, roll, G-force, bearing/heading, and time elapsed can be derived from the sensor data. *Id.*, 10:28-35, 13:65—14:2, 15:40-45, 16:20-27, 19:9-13, 20:60—21:5, 25:31-35. The derived driving information can be processed using only the processing capabilities of the mobile device and analyzed to automatically detect and capture an event such as a crash in

real time. *Id.*, 5:3-23, 7:12-15, 17:22-24, 18:50—19:28. Derived driving information related to that crash can be enhanced, persistently stored in the phone, and prevented from being overwritten so that it can be used by third parties. *Id.*, 4:55-58, 5:3—6:5, 6:60-65, 8:1-6, 16:35—17:7, 17:24-27, 17:59-65, 19:36-46. The mobile device can calculate a driving score associated with a driver with respect to the driving information over that driving period and update the driving score associated with additional driving periods. *Id.*, 6:1-27, 10:12-15, 11:65—12:9.

21. In another embodiment, a data logging system is provided for logging driving information received from a mobile telecommunications device. The data logging system includes a database storing multiple accounts and stores driving information associated with at least one of a vehicle and a driver. The data logging system additionally includes a communication interface communicating with the mobile device, and receiving from the mobile device both a unique identifier associating the mobile device with an account, and driving information to be logged to that account. *Id*., 12:1-14. The driving information is derived based on inputs received by a user interface of the mobile device and sensor data from sensors of the mobile device, all without data from vehicle sensors. The driving information received from the mobile device further includes at least one of a driving score and sensor data captured and processed by the mobile device during a driving period.

The data logging system processes the logged driving information to generate a driving score that is used to determine a risk profile. *Id*., 12:16-20.

VI. THE ’879 PATENT

22. The ’879 patent is a continuation of U.S. Patent Application No. 15/061,910, which is a continuation of the ‘271 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.

23. For example, location, speed, and acceleration of the vehicle associated with how the vehicle is driven can be captured and processed, using only the sensor data from only the mobile device’s sensors. USAA-1001, 2:15-26. Driving information such as variation in velocity, speed of impact, pitch, yaw, roll, G-force, bearing/heading, and time elapsed can be derived from the sensor data. *Id.*, 10:42-

49, 13:64—14:14, 15:65—16:3, 16:48-61, 19:45-48, 21:21-29, 25:65—26:11. The derived driving information can be processed using only the processing capabilities of the mobile device and analyzed to automatically detect and capture an event such as a crash in real time. *Id.*, 5:27-38, 7:23-26, 17:53-58, 19:17-43. The derived driving information related to that crash can be enhanced, persistently stored in the phone, and prevented from being overwritten so that it can later be used by third parties. *Id.*, 5:22-26, 6:39-60, 7:42-49, 8:12-17, 17:8-14, 17:22-26, 18:5-10, 20:5-15. The mobile device can calculate a driving score associated with a driver with respect to the driving information over that driving period and update the driving score associated with additional driving periods. *Id.*, 10:27-30, 12:16-26.

VII. STATE OF THE ART

24. I have reviewed the 911 Petition and the 857 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.

25. 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."

26. Dr. Michalson states that Conover "recognized the need to include [various technologies] in automotive systems." USAA-1003, ¶33 in the 911 Petition and ¶32 in the 857 Petition, 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.

27. 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, ¶¶27-55 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, ¶47 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.

28. Regarding "accident detection," Dr. Michalson states that "several systems were known to detect vehicular accidents based on data from mobile phones." USAA-1003, ¶52. 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.

29. Dr. Michalson states that "Liutkauskas2004 described a number of location-based services that could be provided by mobile phones." USAA-1003, ¶52 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).

30. 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, §52; *see, generally*, USAA-1056.

31. Dr. Michalson further cites to Cheng2010, which relates to an Android implementation for telematics services. USAA-1003, §52; *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, §52. Cheng provides no relevant information regarding accident detection. See, generally, USAA-1011.

32. Dr. Michalson also cites to Thompson2010 for "other examples." USAA-1003, §52. 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.

33. 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

[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.

higher accelerations than the accelerations measured by the ’879 patent and the ’271 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 ’879 patent and the ’271 patent for detecting accidents by the mobile telecommunications device.

34. Thompson 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, 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 ’879 PATENT AND THE ‘271 PATENT

35. Before the inventions of the ‘879 and ’271 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.

36. 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* AT-2003, https://www.nhtsa.gov/sites/nhtsa.gov/files/edr_qas_11aug2006.pdf, which is a 2006 NHTSA document describing EDRs and their regulation. AT-2003 is a true and correct copy of an Internet Publication by the National Highway Traffic Safety Administration, titled 'EDR Q&As," NHTSA.GOV, August 11, 2006, which I obtained from the URL identified above (last visited January 29, 2024), comprising 11 pages (hereinafter "NHTSA").

37. 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.

38. 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 ’879 AND ’271 PATENTS’ SOLUTION TO THE DRIVING INFORMAITON LOGGING AND PROCESSING PROBLEM

39. The ’879 and ’271 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, 3:19-34, 4:50—5:21, 8:8-17. For example, location, 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.

[2] As the '879 patent and the '271 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 specifically to lines of the '879 patent and will be referenced herein simply as "USAA-1001," and citations to the claims of those patents will be to "'879 patent" and "'271 patent" as appropriate.

40. The ’879 and ’271 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.*, 2:15-26. However, as black-box functionality is applied to a mobile phone, storage concerns arise.[3] The inventions of the ’879 and ’271 patents can limit the storage of data to a subset or selection of important data as the important data 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”).

41. The mobile telecommunications device of the ’879 and ’271 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

[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.

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).

42. The inventions of the '879 and '271 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 2:15-32; 4:50—5:60; 6:11-65.

43. 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.* at1:27-30. 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.

44. To achieve these goals of the invention, and as the claims recite, in part, the mobile telecommunications device of the '271 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 either (a) register the start of a driving period in response to an input generated automatically in response to sensor data having predetermined values, where the initialization input is generated in response to a detected speed above a predetermined threshold, ’271 patent at 31:29-56 (claim 1), or (b) derive driving information about how the vehicle is driven during multiple driving periods and define a benchmark for comparison to subsequent driving periods, ’271 patent at 32:1-20 (claim 4).

45. Likewise and to further achieve these goals of the invention, and as the claims recite, in part, a data-logging system of the ’271 patent for logging driving information received from the mobile telecommunications device must include (1) a database for storing accounts (2) arranged to store driving information, and (3) a communication interface communicating with the mobile device, and the communication interface receiving from the mobile device (4) a unique identifier, (5) driving information to be logged to the account, the driving information (6) based on inputs received by (7) a user interface of the mobile device and (8) sensor data from a sensor set of the mobile device, where (9) the driving information is derived without data from vehicle sensors, and (10) wherein the driving information comprises at least one of a driving score and sensor data captured and processed by

the mobile device (11) during a driving period during which (12) the mobile device is removably attached to the vehicle, and where (13) the data logging system is arranged to process the logged driving information to generate a driving score (14) used to determine a risk profile, ’271 patent at 32:40-33:4.

46. According to the claims, the invention of the ’271 patent is novel and non-obvious over the prior art.

47. Likewise to achieve these goals of the invention, and as the claims recite, in part, the mobile telecommunications device of the ’879 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 control the mobile telecommunications device to generate a driving score associated with a driver. ’879 patent at 31:43-32:2 (claim 1).

48. According to the claims, the invention of the ‘879 patent is likewise novel and non-obvious over the prior art.

X. CLAIM LANGUAGE OF THE ’879 AND ’271 PATENTS

49. I understand that in a currently pending Federal District Court proceeding involving the ’879 and ’271 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.

50. Claim 1 of each of the ’879 and ’271 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***.” ’271 patent at 31:39-41; ’879 patent at 31:54-56 (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.

51. Claim 1 of each of the ’879 and ’271 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***.” ’271 patent at 31:43-45; ’879 patent at 31:59-61 (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.

52. 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 Claim 1 of each of the ’879 and ’271 patents, all of this functionality is performed on the claimed mobile telecommunications device.

53. Based on a plain reading of the language of the claims of the ’879 and ’271 patents, “...during which the mobile device is removably attached to the vehicle and the vehicle is in use” does not itself define a “driving period.” Rather, this language simply provides additional limitations of the overall invention.

54. A “driving period” is the period in which the vehicle is being driven. Given the purpose of the invention (to determine insurance premiums, modify driving behavior, or determine a cause of an event such as an accident) (USAA-1001, 1:28-30), the driving period must be the entire period in which the vehicle is

being driven (absent short periods related to getting up to speed, backing out of driveway, leaving a particular geo-fence, etc.).

55. The purpose of the invention would not be met if the "driving period" could start at the beginning, middle or end of the period in which the vehicle is being driven. Accidents and poor driving could be missed. In other words, a monitoring period that starts at any point and monitors only a portion of a driving period for some random period of time, untethered from the vehicle actually being driven, is not a "driving period" as claimed.

56. Driving information is distinct from raw sensor data because it is derived from raw sensor data and is transformed by the phone for further analysis associated with how the vehicle is driven.

XI. SPECIFICATION OF THE '879 AND '271 PATENTS

57. 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 1:49-58. Further, automotive black boxes having their own sensors were prohibitively expensive. *Id.* at 1:53-58. As an alternative, the '879 and '271 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 2:15-26. 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; '879 patent at 33:23-29 (claim 17) and 33:33-38 (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 2:33-38.

58. 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 '879 and '271 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.

59. The '879 and '271 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 2:57-63. 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.

60. In addition to these environmental and cost concerns, the '879 and '271 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.

61. For example, recognizing memory limitations of mobile telecommunications devices, the ’879 and ’271 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 3:21-28; *see also* ’271 patent at 31:38-42 (claim 1); ’879 patent at 31:52-58 (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 3:45-62; 10:5-14; 31:1-14.

62. Further, the ’879 and ’271 patents recognized the need to make utilization of the “finite storage capacity” on the mobile telecommunications device more efficient. *See id.* at 3:21-28. To that end, the mobile telecommunications device of the ’879 and ’271 patents “store only selected driving information for the purpose

of logging how the vehicle is driven during a driving period." *Id.* at 4:50-52, 57-59; *see also* '271 patent at 31:46 (claim 1); '879 patent at 31:62-63 (claim 1).

63. Regardless of storage limitations of a mobile telecommunications device, to act like an automotive black box, the '879 and '271 patents 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* '271 patent at 31:43-45 (claim 1); '879 patent at 31:59-61 (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.

64. 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* '271 patent at 31:43-45(claim 1); '879 patent at 31:59-61(claim 1).

65. Thus, in my opinion a POSITA would understand that "driving information" as set forth in claim 1 of each of the '879 and '271 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* '879 patent at 32:40-53 (claim 9). "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 17:53-55. "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.

66. 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," 2:6-7; 2:47-52; 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 ’879 and ’271 patents.

67. 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; 30:3-13. 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.

68. The ’879 and ’271 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 3:63—4:36. 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 4:44-49. 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.

69. To implement the functions of an automotive black box in a mobile telecommunications device, the '879 and '271 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 5:12-16. 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 5:7-11. 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.

70. 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. The specification defines this predetermined event as a "serious accident event" (USAA-1001 at 5:63-65), 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 3:37—4:49.

71. 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. Such "predetermined action" can be one or more of "transmitting driving information and/or sensor data to a remote system" to alert emergency services (*id.* at 6:41-53); "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 (*id.* at 7:4-9); "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 (*id.* 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) and "transferring data from … short term memory to long term memory" to prevent important event data from being overwritten (*id.* at 8:12-17), for example.

72. Additionally, understanding the mobility of a mobile telecommunications device as well as the differences in device users, the '879 and '271 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. *Id.* 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.

73. 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 ’879 and ’271 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. SUMMARY OF PETITIONER’S CITED REFERENCES

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

74. 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).

75. 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).

76. 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.

77. 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).

78. 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.

79. 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.

80. 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.

81. Curry's server (not phone) may use such information to assist in scoring a driver and determining use permission policies. *See, e.g., id.*, 13:1-19. Thus, when Curry's user activity mode recognition program later determines that the user is driving during a call, a call handling program may then control (e.g., limit or prohibit) phone operation using these scores and policies. *Id.*, 8:4-27, 9:5-20.

82. 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.

83. 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.

84. 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 '879 and '271 patents.

85. 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.

86. I understand that during the prosecution of the application that led to U.S. Patent No. 9,633,487, of which the '879 patent is a continuation, 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.

87. 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 <u>driving information associated with how the vehicle is driven</u>[, 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.

88. As applied to the claims of the '879 and '271 patents, 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")

89. 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.

90. 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.

91. 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.

92. 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 ’879 and ’271 patents.

93. Rabu’s PMD does not process raw sensor data to derive driving information. Rabu is also not concerned with distinguishing and logging driving information within a specific driving period, nor does Rabu cure Curry’s shortcomings regarding logging such driving information. Specifically, even though Rabu purportedly discloses identifying modes by determining a type of motion based on frequency (USAA-1013, 3:1-4), Rabu does not disclose how to determine the start of a driving mode or how a vehicle is being driven.

94. 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 ’879 and ’271 patents. 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.

95. 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.

96. 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.

97. 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).

98. 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 the claims of both the '879 and '271 patents.

99. 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).

100. 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.

101. 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.

102. AT-2002 is a conference publication by Ogawa, A. et al., *Identification of Human Activity Modes with Wearable Sensors for Autonomous Human*

Positioning System, 22nd Asian Conference on Remote Sensing, Centre for Remote Imaging, Sensing and Processing (CRISP), National University of Singapore, Singapore Institute of Surveyors and Valuers (SISV), Nov. 5-9, 2001, Singapore, 4 pages (hereinafter, "Ogawa"). USAA-1013 cites Ogawa at column 7, lines 56-60, and as stated there, Ogawa is incorporated by reference in USAA-1013 in its entirety. In October 2023, I requested and received a copy of Ogawa from counsel for Patent Owner. I inspected the Ogawa publication, and I believe it to be a true and correct copy of the Ogawa publication as cited in USAA-1013 at column 7, lines 45-60. Such belief is further informed by my having found an identical copy of such document online conducting my own search.

103. 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 ’879 and ’271 patents.

C. INTERNATIONAL PUBLICATION NO. WO 2010062899 TO CALLOPY ET AL. (“CALLOPY”)

104. Callopy is directed to a system for insurance customization in which “dynamic insurance rate adjustments or incentive offer(s) to adopt dynamic insurance coverage are communicated to a vehicle operator in order to allow the vehicle operator to adjust various parameters before an actual change to an insurance rate is communicated to a service provider or trusted party.” USAA-1045, Abstract. Cited portions of Callopy disclose an on-board, embedded vehicle “system for real-time monitoring of a driver to facilitate determination of insurance rate(s)” by an insurance provider. *Id.*, [00307]. *See also id.*, [00322], [00332]. Callopy relies on components external to a mobile device for its processing and storage related to monitoring driving.

105. Callopy’s on-board system uses sensors of a vehicle to monitor information regarding “a driver’s driving habits, skills, route of travel, activity, etc., … and forwards the information to the insurance provider….” *Id.*, [00307], [00322], FIG. 40. Callopy relies on an on-board data or diagnostics system that is part of the vehicle’s on-board system to “provide information regarding how a vehicle is being

driven and the current condition of the vehicle." *Id.*, [00316], [00320], [00322], [00323], [00325], FIGs. 40-41.

106. Callopy's external insurance provider aggregates information from different sources "to facilitate determination of an appropriate insurance rate and any other pertinent information concerning the driving habits of the driver." *Id.*, [00307], [00322], FIGs. 40-41. Callopy discloses an external interface for interacting with the insurance provider, the on-board system, and/or a user's mobile device. USAA-1045, [00322].

107. Callopy thus has key differences from the '271 patent, including that the cited portions of Callopy (1) do not depend on only sensors in its mobile device; (2) perform all of Callopy's data analysis for dynamic insurance customization off the mobile device (at its insurance provider system); and (3) disclose a user interface to the Callopy system that is also external to the mobile device (at Callopy's remote monitoring system), in contrast to the user interface of the claimed '271 patent's mobile device.

XIII. THE CLAIMS OF EACH OF THE '879 AND '271 PATENTS ARE PATENTABLE OVER PETITIONER'S CITED REFERENCES

A. Claim 1 Of Each Of The '879 And '271 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

108. 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 ’879 patent and ’271 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 ’879 and ’271 patents.

109. The claimed driving information includes comprehensive data regarding how the vehicle is being driven that neither Curry nor Rabu disclose. A POSITA would have understood the wide scope of “driving information” based on the claim language, including the scope of the claimed sensor set, as supported by the specification, and would also have understood that the same scope is not disclosed by Curry and Rabu, either alone or in combination.

110. Based on a plain reading of the specification and claims, in my opinion a POSITA would have understood that the ’879 and ’271 patents disclose the mobile telecommunications device logging such driving information but the Curry-Rabu phone not logging such driving information.

111. In the ’879 and ’271 patents, such driving information may be utilized for emergency services or in the same way data from a vehicle’s black box would

be utilized, which use encompasses data more comprehensive than mere raw sensor data from GPS and accelerometer sensors to fulfill the role of a black box. See, e.g., USAA-1001, 2:21-25, 2:65—3:2, 5:12-21, 8:18—9:38, 13:36-49, 15:54—16:33, 16:48-61, 19:17-28.

112. In my opinion, a POSITA would have recognized, based on a plain reading of the claims and the specification in support of the claims, that the mobile device must be able to log derived driving information, including detecting events, by processing sensor data from the mobile device, without the need for sensor data from the vehicle's sensors or post-processing by an external service. *See* USAA-1001, 2:16-19, 13:15-30, 31:47-48.

113. Petitioner states that "[t]he Curry-Rabu phone includes client 110 (downloaded from server 104), which enables determination of <u>*whether*</u> an associated vehicle is being driven." *See* 911 Petition at 20 (emphasis added); *see also* 857 Petition at 24. 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." 911 Petition at 20; *see also* 857 Petition at 24.

114. 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).

115. Petitioner further mis-cites claim element 1.1 as "log[ging] driving activity associated with a vehicle" (Pet. 20), apparently to inaccurately mold Curry's "activity mode recognition" to the claims. Petitioner further asserts that Curry discloses "us[ing] the derived information to generate a 'driving safety score' for the

user," regardless of a driving score not being part of claim element 1.1, notwithstanding that Curry's phone does not "use the derived driving information to generate a 'driving safety score.'"

116. 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").

117. When reading Curry as a whole, a POSITA would have understood Curry's server to calculate driving scores in post processing; Curry has no explicit disclosure of its phone calculating a driving score.

118. 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.

119. 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…." Id., 9:23-28.

120. Petitioner asserts that Curry's mobile phone calculates a score (911 Petition At 20; 857 Petition at 8). 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.

121. 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 '879 and '271 patents, and in my opinion Petitioner's arguments do not sufficiently demonstrate such.

122. Claim element [1.3] of both the '879 and the '271 patents requires "a user interface" of the mobile phone. '879 patent at 31:44-49; '271 patent at 31:30-35. 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.

123. 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 '879 or the '271 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 *communication* mode that allows for normal phone usage, and (ii) a *monitoring* mode that restricts calling, texting, and or software use on the phone to promote driving safety. 857 Petition At 12; 911 Petition at 12-13. Curry's phone switches between these operating modes in response to sensor data.

124. As seen in Curry FIG. 4, when the vehicle is being driven, the start of an outgoing or incoming phone call may start the recording of raw data from the mobile device's sensors, which raw data is recorded for some pre-set ("X minutes") duration. *Id.* at 16:7-13. Alternatively, based on the raw data, Curry's phone may estimate its activity status as "driving, walking, remaining still, or unknown…." *Id.*, 10:16-26; *see also id.*, 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] communication

mode." *Id*., 10:21-26. If Curry's activity status cannot be sufficiently estimated due to insufficient data or a change in activity, Curry turns to its remote server to post-process data for higher confidence in the estimation results. *Id.,* 16:13-22.

125. 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.

126. 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 '879 and '271 patents. *See*, *e.g.*, USAA-1001 at 2:9-11 (defining the driving period as the period in which the vehicle is being driven by a driver); 3:19-21 (same); and Fig. 4a (requiring registration of the start of a driving period).

127. 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.

128. 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.

129. A "period" by plain definition of being "a length or portion of time" has a beginning and an end. As the driving period claimed by the '879 and '271 patents necessarily includes only the period in which the vehicle is being driven, the end of that driving period must also necessarily be determined. *See*, *e.g.*, USAA-1001, 20:23-51; FIG. 4a.

130. 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.

131. 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 ’879 or the ’271 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. ’879 patent at 31:59-61; ’369 patent at 31:43-45. “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. Nowhere in Curry is the derivation of “driving information” as claimed by the ’879 and ’271 patents disclosed or suggested.

132. 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.

133. 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 857 Petition, 138; USAA-1003 of 911 Petition, 147 (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.

134. 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.

135. 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.

136. 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 '879 or '271 patents. Claim element [1.8] requires that the mobile device store a selection of the derived driving information to the memory of the phone. '879 patent at 31:62-63; '271 patent at 31:46. 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). 857 Petition 33, *citing*

USAA-1003, ¶145; USAA-1005, 7:5–22, 8:29–10:12, 13:20–16:6, FIGs. 1, 3; *see also* 911 Petition 31. 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].

137. 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.

138. 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.

139. 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.

140. Curry describes this as post-processing by the remote server, not by the mobile device, so Curry's phone must transmit all sensor data, not just a selection, for this post-processing. *Id.* 7:-10, 8:30-9:1, 9:23-33, 11:15-18; 13:1-5; 14:19-26, 16:7-18, 17:32-18:3.

141. Petitioner asserts that "the plain meaning of a 'selection of the driving information' is not limited to a selection of a subset of the same, but instead is broad enough to encompass selection of some or all of that information" (857 Pet. 31-32). However, the '879 specification clearly explains why determining and storing a selection of the driving information by the mobile device is important and describes how a selection of driving information is selected for storage and subsequent transmission to third parties. USAA-1001, 13:64—14:14, 16:66—17:26, 17:53—18:10, 18:26-32, 12:23-28. Curry discloses no similar functionality.

142. Petitioner also asserts that "it would have been obvious to store in the Curry-Rabu phone a subset of (i.e., selection of) the recorded sensor data" (857 Pet. 32). However, this mischaracterizes the features of Curry's phone. Petitioner alleges "Curry explains that 'motion data cache can be compared with the user permission

data to enable a driver safety statistic to be calculated,' indicating that specific aspects of recorded sensor data are more useful for storage and transmission to safety data server 104 (e.g., motion data and related derived information indicating possible use violations, and/or unsafe driving behaviors)." *Id.* However, all data in the motion data cache is needed to compare with the user permission data, because Curry's phone considers *all* raw sensor data in the motion data cache at the time of a phone call to "precisely" determine activity mode (*see* USAA-1005, 13:27—14:4, 17:1-14, FIGs. 3, 5), and then to compare that "activity mode…recognized in real-time" to the user permission to determine whether to block a call (*see id.*, 14:5-16, FIG. 3), and further for the server to perform post-processing on the collection of data, including the activity mode data (*see id.*, 14:19-26).

143. In my opinion, a POSITA would have understood that Curry's phone would not store only a selection of raw sensor data during a recording when Curry's phone needs to know exactly what the vehicle is doing at the time of a phone call.

144. If only a selection was stored in motion data cache, Curry's phone could miss a change in activity mode for effective dynamic call handling by the phone, and only portions of sensor data from the phone sent to the server could result in miscalculation of the driving safety score by the server. As concerns post-processing

by Curry's server, Curry depends on its server to "deliver high-confidence estimation results." *See id.*, 16:13-22.

145. While Petitioner alleges that a POSITA would have "found obvious to implement Curry-Rabu to store specific aspects of recorded sensor data unique to a particular entity" [(e.g., "user's parents"] (911 Pet. 32), there is no such means to do that in the Curry-Rabu phone and it is not otherwise suggested to be done by anything other than Curry's server. Curry's time-stamping of motion data allows further processing by Curry's server at later times of *all* data separated into intervals delineated by time stamps ("each motion measurement associated with a time stamp"), after *all* of the time-stamped data is sent to Curry's server. 857 Pet. 32.

146. 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 [1.10] of the '271 patent. Petitioner references FIG. 1 to illustrate that "a downloaded client application 110 processes 'raw data' from a driving period to derive driving behavior that is stored locally prior to later transmission to a 'driving safety data server.'" 911 Petition 34. This is incorrect - Curry's phone 106 has no way to determine a "driving period" and does not derive driving information according to the claims. "User activity mode recognition," which merely determines that a vehicle is driving and that a phone is being used at the time a vehicle is driving, not how a vehicle is

driving, is not deriving driving information according to the claims. Simply, using a phone is not driving a car.

147. Even if Curry's phone can detect a certain speed from recorded data that would indicate to the phone that a vehicle is in a driving mode, the phone uses this information in conjunction with user permission data to determine whether to block the call. The phone does not start a driving period for collecting further sensor data to derive driving information.

148. I understand that the Board has preliminarily agreed with Petitioner "that Curry's mobile phone 106 performs the Initialization Limitation," Institution Decision, 51, stating that "client unit 110 registers the start of the driving period in response to an initialization input generated automatically in response to the sensor data reflecting a detected speed above a predetermined threshold." This is simply incorrect. In my opinion, the Board is correct that "Curry…indicates the client unit 110 'record[s] the location, speed, and acceleration of' mobile phone 106 'each time a phone call is transmitted from or received by' the phone." *Id.* In fact, in my opinion, this is the crux of Curry's invention. Patent Owner further agrees that "[c]lient unit 110 uses this recorded speed information to determine whether the user is driving a vehicle, and also to apply preset permission policies to phone operations." *Id.*

149. Nonetheless, it is incorrect to say that "this speed data is part of what automatically determines and registers the start of a driving period..... Based on the present record, this appears to be all that the Initialization Limitation requires the mobile device to perform." Institution Decision, 51. Curry's phone features are untethered from a driving period. Determining "whether the user is driving" at a snapshot in time (when a phone call is received or made and possibly sometime thereafter) says nothing about when the driving period started. Further, using a phone is not driving a vehicle, no matter how many times a call comes in or is made while a user is driving. This is made clearer considering that when a phone call is received, for example, Curry's phone does not yet know the activity mode of the phone. Curry's phone must perform a process disclosed in at least one of FIGs. 3, 4, and 5 to first determine an activity mode (e.g., driving, low-speed driving, running, walking, remaining stationary). See USAA-1005, FIGs. 3, 4, 5. To make this determination, the phone first records raw sensor data according to FIG. 4 and evaluates the raw sensor data to determine activity mode, according to FIGs. 3 and 5. *Id.* Thus, while Curry starts something with the received phone call, that something may be an activity mode analysis or recording period, but it is not a driving period.

150. Claim element [1.6], which has direct nexus to claim [1.10], requires "a start of a driving period during which the mobile device is removably attached to the vehicle and the vehicle is in use" to be determined "based on inputs received by the user interface and sensor data from the sensor set." USAA-1001, 31:39-42, 31:49-56. The only things Curry can do, based on the logical timing of its activity mode recognition and phone call blocking features, are determine whether a vehicle is driving and block a call that occurs at the time of that determination. Whether a vehicle is driving at a point in time does not define a driving period of the vehicle. Driving mode determination should not be conflated with determination of a start of a driving period. This would not comport with the '271 patent's specification and claims, which require "logging driving information associated with a vehicle when driven" and "during which the mobile device is installed to the vehicle and the vehicle is being driven by a driver." USAA-1001, Abstract, 31:29-56.

151. Curry does not explicitly disclose an initialization input that is separate from a phone call, or any initialization input generated from a speed determination, or any initialization input that starts a driving period or registers the start of a driving period. Looking at Curry's FIGs. 3-5, no figure reveals any element that could represent an initialization input generated by the mobile phone upon a detected speed from phone-processed sensor data found to be above a predetermined threshold of

predetermined values, where the initialization input controls a mobile device via a downloaded application to register the start of a driving period. See USAA-1005, FIGs. 3, 4, 5.

152. In Curry's FIG. 3, "motion recording activation" 302 merely starts sensor data collection from GPS sensor 314 and accelerometer 316, before driving is determined by activity mode analysis. USAA-1005, FIG. 3, 302. "Start of an outgoing or incoming phone call" merely starts a "phone call period," during which "GPS data recording" starts. *Id.*, FIG. 4. Yet, FIG. 4 does not support that the "GPS data recording" period or "phone call period" are themselves a "driving period" or that the start of the GPS data recording period or phone call period start a driving period.

153. FIG. 5 illustrates details of Curry's activity mode recognition process, but nothing within that process indicates generation of an initialization input to control the mobile phone to register the start of a driving period according to the claims or specification of the '271 patent. See USAA-1005, FIG. 5. In fact, Curry's FIG. 5 illustrates that the output of the activity mode recognition process is determination of discrete activity modes (i.e., driving mode 506, remaining stationary mode 508, running mode 514, walking mode 516, or low-speed driving mode 518). *Id.* Identifying a mode is not registering the start of a driving period.

154. In my opinion, Curry and Rabu, whether alone or in combination, likewise does / do not teach, suggest, or render obvious all of the elements of claim element [1.10] of the '879 patent. USAA-1001, 31:65—32:2. Petitioner concedes that an assessment of "unsafe driving behavior such as speeding, abnormal deceleration and sharp turns," used to generate the driving score, is performed by Curry's server, not by Curry's phone. *See* 857 Petition 29 (*quoting* USAA-1005, 9:22-28). *See also* USAA-1005, 3:24—4:5 (disclosing the activities of the server after data in the motion data cache is transmitted to it); 7:13-17 (disclosing a "driving safety evaluation module" on the server that "perform[s] a statistical analysis on collected raw driving data" and "calculate[s] corresponding safety scores."); 9:22—10:12 (disclosing "motion data uploading" by the mobile phone for later "safety score evaluation" and "safety evaluation data sharing" by the server); 13:1-19 (disclosing "driving safety score evaluation module 212" on Curry's server cross-checking safety performance data at 208 and use permission data at 206 to calculate a driving score); 16:13-18 (disclosing that "unsafe driving behaviors can be penalized after the fact by deducting the driving safety score in the data server, as previously discussed."). Petitioner's reliance on Curry at 11:6-14 doesn't change Curry's fundamental disclosure that the activity mode recognition module on the phone only determines whether the phone is in a moving vehicle or the overall

disclosure in Curry that all processing of driving information (including processing related to a driver score) occurs at the remote server.

155. In my opinion, a POSITA would have understood that Curry's phone does not calculate a driving score, based on a plain reading of the claims as a whole, and by comparing them to the Curry specification, on its face. In my further opinion, a POSITA would not have found obvious Curry's mobile phone "process[ing] the driving information [during a driving period] to generate a driving score" because it is simply not disclosed or suggested by Curry alone. Adding Rabu does not cure Curry's shortcomings, because Rabu is merely cited for its determination of holder status and nuanced driving modes determined by frequency-based motion status, and Rabu does not disclose or suggest a driving score.

156. Rather, as shown throughout Curry's disclosure (*see*, *e.g.*, FIGs. 1, 2, 3, 5), Curry merely discloses an application for a cell phone that, in conjunction with permission data from a remote server, controls use of the cell phone based on an activity mode (e.g., prevents calling or texting while driving). USAA-1005, Title, Abstract, 3:1, 4:33.

157. A close review of Curry's disclosure with regard to its figures reveals that Curry's mobile phone (106) is controlled by mobile phone client (110, 210) to record (302) raw sensor data (114, 116, 314, 316) into a motion data cache (118,

304) when a phone call is made (301) or received (303). Curry's mobile phone (106) further is controlled to process the raw sensor data (114, 116, 314, 316) by an activity mode recognition module (120, 306) to determine the context of the phone call, that is, whether the phone is walking (516), running (514), driving (506), driving slow in traffic congestion (518), or remaining stationary (508). Curry's phone transmits the raw sensor data (114, 116, 314, 316) from the motion data cache (118, 304) for further processing by the server of driving safety performance database (208). Curry's server processes the driving safety performance data to calculate a driving score by driving safety score evaluation (212), from which driving safety score data (214) can be shared to third parties (216). See USAA-1005, FIGs. 1, 2, 3, 5.

158. Further, use permission data (112, 206, 318) is provided by a remote server as inputs to a dynamic call handling module (122, 308), which determines whether to block (310, 312) or allow (313) a phone call based on the activity mode (120, 306) and use permission (112, 318). See USAA-1005, FIGs. 1, 2, 3.

159. Curry's mobile phone simply does not perform other processing related to the raw sensor data, which instead is performed by Curry's remote server upon transmission. A full reading of Curry's specification shows there is no explicit support for any other sensor data processing by Curry's phone, including calculation of driver scores. A POSITA would have had no motivation, suggestion, teaching, or

other reason to combine Curry and Rabu to arrive at claim element [1.10] of the '879 patent.

B. Claim 1 In Each Of The '879 And '271 Patents Is Patentable Over The Combination Of Curry And Rabu Additionally Because Petitioner Lacks Sufficient Motivation To Combine The References

160. 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.

161. 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.

162. 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.

163. 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.

164. 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.

165. 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.

166. 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.

167. 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.

168. Further, the ’879 and ’271 patents rely 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 ’879 and ’271 patents’ 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”).

169. 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.

170. Contrary to the Petitioner's assertion that Curry would benefit from Rabu's phone use restrictions to arrive at the claims of the '879 or '271 patents, neither Curry nor the '879 or '271 patents 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* USAA-1013 at 5:61—6:21.

171. 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* 911 Petition at 14; USAA-1005 at 8:4—9:20.

172. 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 '879 or '271 Patents.

173. 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 4 and 24 Are Patentable Over The Combination of Curry, Rabu, And Tamir

174. Because claims 4 and 24 depend from claim 1 or 21, for the same reasons noted above for claim 1 (which has similar features to claim 21), Claims 4 and 24 are also patentable over the combination of Curry, Rabu, and Tamir, as Tamir does not cure the shortcomings of Curry and Rabu.

175. Further, Tamir is directed to a traffic information system including a method for "evaluating the driving behavior of a plurality of parameters of the operation of a first vehicle" that necessarily involves "determining values of the plurality of parameters for one or more second vehicles" and "comparing the determined values of the first vehicle and the one or more second vehicles and providing an evaluation of the driving behavior of the first vehicle, responsive to the comparison." USAA-1006, Title, Abstract. Tamir's invention requires information from multiple vehicles to evaluate the driving behavior of the first vehicle. *See id.* Tamir also discloses a vehicle black-box configuration that is embedded into Tamir's first vehicle and each other vehicle in the traffic information system, requires sensor data from each vehicle's sensors, requires an external control system

to analyze the data from all vehicles to assess vehicle behavior of one of the vehicles, and determines and assigns a safety score to a vehicle, yet no immediate feedback to a driver of a vehicle, other than "driver warnings," is disclosed. *See id.*, Abstract, FIG. 1, 15:56—16:10. Tamir's disclosure is in direct contradiction to the purpose and intention of the claims and specification of the '879 patent.

176. In applying Tamir, Petitioner ignores the '879 specification. For example, Petitioner cites to Tamir's "data collection technique to improve Curry's motion recording process," yet this data collection technique is disclosed from the perspective of Tamir's vehicle information system, embedded black box, embedded vehicle sensors, and multiple accelerometers. 857 Pet. 53 (citing USAA-1006, 20:52—21:11). Petitioner posits that "a POSITA would have understood and/or found it obvious that the application in Curry-Rabu-Tamir stores the sensor data at whichever sampling rate is being used." 857 Pet. 53. Yet, Petitioner never addresses what modifications might have been needed by a POSITA to ensure that the combination would have worked, or why a POSITA would have understood or found obvious how a Curry-Rabu-Tamir combination would have stored its sensor data in a smartphone like the mobile device of the '879 patent or the purported Curry-Rabu phone. For at least these reasons, in my opinion it is improbable that a POSITA would have looked to Tamir for successful combination with the Curry-Rabu

smartphone, without much more analysis, forethought, complexity, and likely cost, to arrive at Claims 4 and 24 of the ’879 patent.

D. Claims 9, 10, 14, 15, 17, 18, 32, 33, And 35-38 Of The ’879 Patent, And Claim 1 Of The ’271 Patent, Are Patentable Over The Combination Of Curry, Rabu, And Katayama

177. 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 ’879 patent and the ’271 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].

178. In my opinion, Katayama is in direct conflict with the requirements of the ’879 and ’271 patents. 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.

179. 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.

E. Claims 14, 15, 32, And 33 Of The '879 Patent Are Patentable Over The Combination Of Curry, Rabu, And Thompson2010

180. Because claims 14, 15, 32, and 33 depend from claim 1 or 21, for the same reasons noted above for claim 1 (which has similar features to claim 21), Claims 4, 15, 32, and 33 are also patentable over the combination of Curry, Rabu, and Thompson2010, as Thompson 2010 does not cure the shortcomings of Curry and Rabu.

181. Further, Thompson2010 presents several shortcomings that would have discouraged a POSITA from using it in the asserted combination. *See* USAA-1008, 8-9.

182. 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." 857 Pet. 72 (citing USAA-1005, 3:16-28, 9:16-26, cl. 9; USAA-1003, ¶248-248). 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." 857 Pet. 73. However, Thompson2010 is a rudimentary experimental study limited to significant crashes that filters out and/or ignores certain sensor data that the '879 patent would depend on for event detection.

183. 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…." USAA-1008, 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.*, 4 (section 2.2). Thus, in my opinion a

POSITA would have immediately recognized significant problems with Thompson2010.

184. For example, Thompson states that "[t]he required acceleration to trigger airbag deployment is 60G's [10, 11]." USAA-1008, 9. In my opinion, a POSITA would have understood that 60G acceleration corresponds to a very severe crash with almost certain injuries and likely fatalities. In addition to its exaggeration of trigger levels, Thompson2010 determined that its "acceleration filter prevents drops…from triggering accident notifications." *Id.*, 8. Thompson2010's acceleration filter thus is 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.

185. In limiting its study to such experimental levels, Thompson2010 itself recognized that "[i]t may not be possible to detect all accidents with smartphones.… More work is needed to enhance the filtering mechanisms to account for these types of collisions." USAA-1008, 12-13. Although the '879 patent recognized the same potential issue (USAA-1001, 19:65—20:4), the '879 patent went far further to solve challenges posed by Thompson2010. Given Thompson2010's many shortcomings, Thompson2010 would not have provided motivation to combine it with Curry to

arrive at the claims of the ’879 patent. As defined by the ’879 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, 5:12—6:10.

186. 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, 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 that the cell phones of the cited art will reliably capture “accelerations experienced by the driver.” *See* USAA-1003, ¶82.

187. The limitations of Thompson2010’s acceleration measurements would not provide the range needed by the ’879 patent for detecting accidents by the mobile telecommunications device. Thus, in my opinion a POSITA likely would not have looked to combine Thompson2010 with Curry-Rabu to arrive at the subject matter of claims 14, 15, 32, and 33.

F. Claim 55 Is Patentable Over The Combination of Curry, Rabu, And Berkobin

188. Because claim 55 includes the above-described features of claim 1 (with the added feature of a neural network to the processing of the claim, 879 Patent, 38:33-37) claim 55 is patentable for the same reasons as set forth above with respect to claim 1 over the proposed combination of Curry, Rabu, and Berkobin, as Berkobin does not cure the shortcomings of Curry and Rabu.

189. Further, Berkobin introduces its own shortcomings regarding Claim 55. Berkobin discloses techniques "for determining driver behavior based on vehicle operating parameters, adjusting insurance premiums, and preventing fraudulent manipulation." USAA-1010, Abstract. 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]. 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]. In my opinion, Berkobin thus does not disclose or even contemplate any processing on a mobile phone as claimed.

190. 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 for the purposes identified in Claim 55.

G. Claim 4 Of The ''271 Patent Is Patentable Over The Combination Of Curry, Rabu, And McClellan

191. Claim 4 of the '271 patent is patentable at least for the reasons discussed above for claim elements [1.1]-[1.10] in the '271 patent, and McClellan does not cure the shortcomings of Curry and Rabu.

192. Further, the subject matter of Claim 4, like the subject matter of Claim 1 of the '271 patent, is performed *by a mobile telecommunications device*. *See* '271 patent, 32:1, 32:21-29. However, Petitioner's references to Curry cited against Claim 4 are to features not performed on a mobile phone:

- Curry's server "cross-check[ing]" data for "later driving safety score evaluation" (911 Pet. 54, citing USAA-1005, 13:3-5, referring to FIG. 2, 206, 208, 212 at Curry's server);

- Curry's server setting "an initial driving score," adjusting it "during subsequent driving periods," and "compil[ing] and summariz[ing] [it] to form a driving safety score" (911 Pet. 54, citing USAA-1005, 13:5-19, referring FIG. 2, 212, 214, 216, 218 at Curry's server);
- Curry's "safety evaluation data sharing" via a "data exchange server" (911 Pet. 54-55, citing USAA-1005, 10:3-12, referring to FIG. 2, 216 at Curry's server); and
- Curry's "driving safety evaluation module" (Pet. 54-55, citing USAA-1005, 7:15-17, referring to FIG. 2, 212 at Curry's server).

193. Curry's "driving safety evaluation module" (Pet. 54-55, citing USAA-1005, 7:15-17, referring to FIG. 2, 212 at Curry's server).

H. Claims 6 And 7 Of The '271 Patent Are Patentable Over The Combination Of Callopy And Curry

194. Both Claims 6 and 7 recite "[a] data-logging system for logging *driving information received from a remote mobile telecommunications device*…the driving information derived based on inputs received by a user interface of the remote mobile telecommunications device and sensor data from a sensor set of the remote mobile telecommunications device, the driving information derived without data from the vehicle sensors…wherein the driving information comprises at least one of a driving score and sensor data captured and processed by the remote mobile

telecommunications device during a driving period during which the remote mobile telecommunications device is removably attached to the vehicle being driven by the driver." USAA-1001, 32:40-41, 32:55-66, 33:5-6, 33:20—34:9. A plain reading of this claim language makes clear that driving information is derived by the remote mobile telecommunications device, which captures and processes sensor data along with a driving score as part of the driving information for the rest of the data-logging system.

195. First, the Board indicates that the "at least one of" "limitation is satisfied if the system received sensor data, but not a driving score, from the mobile device." 911 Institution Decision, 58. However, the claim further requires that the system receive driving information from the mobile device. That the driving information is derived by the mobile device, which has no equal in Curry or Callopy's disclosures, is important, and the Board appears to be discounting this aspect of the claims by not first acknowledging that the derived information from sensor data and a driving score can both be, and is, encapsulated in the driving information, as supported throughout the disclosure of the '271 patent.

196. The Board further states "a later limitation in claim 6 expressly requires that the *data-logging system* is arranged to generate a driving score." 911 Institution Decision, 58. While I agree with this statement, this fact does not negate that the

mobile device of the data-logging system generates a driving score. Further, other aspects of the data-logging system, besides the mobile device, can also generate a driving score. This is explicit in the specification. *See* USAA-1001, 10:13-16 (noting the mobile device may generate a driving score), 11:66—12:9 (noting the driving information comprises a driving score, and preferably sensor data captured and processed by the mobile device, and likewise that "the system is arranged to process the driving information logged to the corresponding account to generate a driving score" to determine a risk profile and to define an insurance premium). In my opinion, a POSITA, reading the specification in full, would have understood that there can be a driving score generated separately by each of the mobile device and the data-logging system besides the mobile device.

197. Thus, in my opinion, the '271 patent disclosures do support the construction that the mobile device must generate the driving score. As per above, this construction agrees fully with the specification. The Board's statement that "'*the system* is arranged to process the driving information' received from the mobile device 'to generate a driving score'" merely rearranges the claim language to, in effect, further limit the claims to be narrower than the specification supports. 911 Institution Decision, 59. Surely, the system includes the mobile device having the downloaded and executable application to bring the mobile device into the system.

This is akin to a person's laptop alone not being part of a networked gaming system unless and until that person's laptop has downloaded and installed software to participate in the gaming system as part of the computer network.

198. Further, for both claim elements [6.9] and [7.9] of the '271 patent, Petitioner admits that "Callopy does not explicitly teach calculating scores…for determining insurance premiums." 911 Pet. 61. Petitioner then alleges, based on Curry, that "doing so would have been obvious to a POSITA" and provides conclusory explanation that "the use of a score was well-known by the critical date, as evidenced by Curry." *Id.* However, showing "use of a score" is not sufficient for reading on the particular elements of Claims 6 and 7, because "*use* of a score" is not the same as *deriving* "driving information comprising at least one of a driving score…" as in claim elements [6.9] and [7.9]. Petitioner does not show that Curry teaches calculating scores by the mobile phone. Indeed, the only derivation of any driving information, including driving scores, disclosed in Curry is performed at the server.

199. Thus, Petitioner is incorrect that "Curry describes setting an initial driving score…and sharing the score with an insurance company to determine insurance premiums" in relationship to Curry's mobile phone. 911 Pet. 62. Petitioner cites to Curry at 13:3-14, but this passage of Curry does not disclose that Curry's

mobile phone sets an initial driving score. *See* 911 Pet. 62. Rather, in this passage, Curry discloses that "[t]he safety performance data [208 in FIG. 2] and use permission data [206 in FIG. 2] can be crossed checked with each other and used in a later driving safety score evaluation module 212." USAA-1005, 13:1-5. These elements are external to Curry's Mobile Phone Client 210 on Driving Safety User Control and Monitoring Web Site 102, on Curry's server side. *See id.*, FIG. 2, 13:1-5.

200. Petitioner also cites to Curry at 7:13-17, which discloses, "A driving safety evaluation module [212 in FIG. 2] can be used to perform a statistical analysis on collected raw driving data. The evaluation module can then calculate corresponding safety scores." 911 Pet. 62; USAA-1005, 7:13-15. This reference, again, points to the same element of Curry outside of the mobile phone. *See* USAA-1005, FIG. 2. Similarly, Petitioner cites to Curry at 10:2-12, but this passage discloses that "[t]hrough a data exchange server [Driving Safety Data Server 104 of FIG. 1] or a data exchange interface [Driving Safety User Control and Monitoring Web Site 102 of FIG. 1], *a system user* can share the safety score of the user of the mobile phone 106 with a third party such as an insurance company 130 to obtain insurance premiums." 911 Pet. 62; USAA-1005, 10:2-4 (emphasis added). Here, Curry discloses that the system user, not the user of the mobile phone, uses a resource

(data exchange server or data exchange interface) outside of the mobile phone to share the safety score. *See* USAA-1005 at 10:2-4.

201. Further, Petitioner states, "Curry teaches that insurance companies determine insurance premiums using a driving safety score determined by a mobile device from the sensor data." 911 Pet. 63 (citing USAA-1005, 7:15-17). However, in the cited passage, Curry discloses that "[t]he evaluation module can then calculate corresponding safety scores." USAA-1005, 7:14-15. As disclosed by Curry, the "evaluation module" indeed uses the sensor data uploaded from the motion data cache 118, but the evaluation module 212 is outside of the mobile phone on device 102. *See id.*, FIGs. 1, 2. Curry may teach "how sensor data is analyzed to detect 'driving safety violations,'" but this is performed by Curry's driving safety data server, not by Curry's mobile phone. Pet. 63-64; USAA-1005, 7:15-17, 10:2-12, 11:10-12, 13:3-19, FIGs. 1, 2. In these ways, Petitioner consistently misconstrues what Curry discloses.

202. Even further, Petitioner's reasoning behind its Callopy-Curry combination is based on hindsight. For example, Petitioner alleges that "[a] POSITA would have found obvious implementing Callopy's vehicle monitoring system for determining insurance premiums with Curry's driving score based on its collected driving data for determining insurance premiums." 911 Pet. 62. First, this statement

ignores aspects of the claim language in that Curry's mobile phone does not calculate driving scores.

203. Curry's data server 208 performs its safety evaluation and scoring using motion data that the mobile phone transmits to the server (USAA-1005, 13:1-19), but there is no indication in Callopy or Curry that the mobile phone specifically calculating scores for individual drivers would serve Callopy's purpose of dynamic insurance customization or Curry's purpose of monitoring and preventing mobile phone use while driving.

204. Contrary to Petitioner's assertions, in my opinion a POSITA would *not* have been motivated to modify Callopy's system to include Curry's mobile device, at least because Curry does not "[teach] that insurance companies determine insurance premiums using a driving safety score *determined by a mobile device* from the sensor data." 911 Pet. 63 (citing USAA-1005, 7:15-17, which does not disclose what Petitioner says it discloses); *see supra* Section IX.A. Callopy's system modified to include Curry's mobile device thus would not read on or make obvious "the driving information comprises at least one of a driving score and sensor data captured and processed *by the remote mobile telecommunications device,*" as recited by claim elements [6.9] and [7.9] (emphasis added).

205. In my further opinion, "Callopy's lack of implementation details regarding 'analytical methods' or how insurance provider system 4035 calculates the insurance rates would" *not* have caused a POSITA to turn to Curry, at least because Curry does not provide that guidance in the way the claims recite, per the discussion above. *See* 911 Pet. 63.

206. Petitioner likewise argues that "a POSITA would have … found obvious generating a driving score from Curry's description of adjusting an initial safety score based on driving behavior." Pet. 65. Curry, however, fails to disclose determination of a driving score by the mobile device 106. *See* USAA-1005, 13:3-19, FIG. 1, FIG. 2. Michalson adds no evidence to support any other conclusion. *See* USAA-1003, ¶217.

XIV. CONCLUSION

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

208. 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.

209. 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.