

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

TESLA, INC.,
Petitioner

v.

CHARGELOGIC LLC,
Patent Owner

Case IPR2026-00382
U.S. Patent 11,909,011

DECLARATION OF SAMUEL RUSS, PH.D.

TABLE OF CONTENTS

TABLE OF CONTENTS	2
I. Introduction.....	4
II. Background and Qualifications	4
III. Legal Standards	6
A. Patentability	7
B. Prior Art.....	11
C. Inherency	12
D. Person of Ordinary Skill In The Art.....	13
E. Claim Construction.....	14
IV. Bases For Opinions.....	15
V. Level of Ordinary Skill In The Art.....	16
VI. Claim Construction.....	18
VII. Opinions Regarding Ground 1.....	19
A. Claim 1[e]: [a controller configured to:] during charging of the battery with the vehicular battery charger: repeatedly receive at least one signal indicative of a level of charge of the battery	20
1. Kelty-078	20
2. Fujita	21
3. Suyama.....	27
4. The Petition’s lack of explanation of how the proposed combination(s) discloses the limitation.	29
5. The Petition’s asserted motivations to combine.	31
6. The Petition’s Reasonable Expectation of Success Analysis.	33
B. Claim 1[f]: [a controller configured to:] repeatedly estimate, based at least in part upon the at least one signal, an amount of time remaining to charge the battery, and	36
C. Claim 1[g]-1[i]: [a controller configured to:] repeatedly display on a display mounted within the vehicle and within view of a user seated in the vehicle: information indicative of the amount of time remaining to charge the battery based at least in part upon the	

	estimating step, and information indicative of the level of charge of the battery.	38
1.	The proposed combination’s mapped controller (VMS 32) cannot perform the functions required by the claim limitations.	38
2.	The Petition’s motivation to combine with Suyama is fundamentally flawed	42
D.	Conclusion as to Claim 1	46
E.	Claims 2-4, 6, and 10-12	46
VIII.	Opinions Regarding Grounds 2-8.....	46
IX.	Conclusion	47

I. INTRODUCTION

1. I have been retained as a technical expert by ChargeLogic LLC (“ChargeLogic” or “Patent Owner”) and asked to provide my objective and unbiased opinions concerning the patentability of U.S. Patent No. 11,909,011 (“the ’011 Patent”). Specifically, I have been asked to provide my opinions on the patentability of the challenged claims of the ’011 Patent in view of the grounds advanced in the pending Petition for Inter Partes Review filed by Tesla, Inc. (“Tesla” or “Petitioner”) against the ’011 Patent (IPR2026-00382), the state of the art at the time of the claimed inventions, and the knowledge of a person of ordinary skill in the art at the time of the claimed inventions.

II. BACKGROUND AND QUALIFICATIONS

2. My Curriculum Vitae is attached hereto as Appendix A.
3. In forming the opinions expressed in this Declaration, I have considered and relied upon my education, background, and experience. In addition, I have reviewed and relied upon materials in preparation of this Declaration, as described herein.
4. I received a Bachelor’s degree in Electrical Engineering from the Georgia Institute of Technology (“Georgia Tech”) in 1986 and a Ph.D. in Electrical Engineering from Georgia Tech in 1991.
5. From 2007 to the present, I have been a member of the faculty of the University of South Alabama as an Assistant and Associate Professor in the Department

of Electrical and Computer Engineering. During that time, I have won awards for excellent teaching.

6. I am active in the Institute of Electrical and Electronic Engineers (IEEE) and am a Distinguished Lecturer for the IEEE Consumer Electronics Society. As a consultant, I have conducted briefings for members of the financial community on technology trends in the cable, satellite, and IPTV sectors.

7. I also served on the faculty of Mississippi State University from 1994 to 1999 as an Assistant Professor in the Department of Electrical & Computer Engineering, where I taught circuit board design and two-way interactive video classes, among other things.

8. I have also authored at least 15 journal articles and at least 31 conference papers.

9. With regards to batteries and battery charging, subject matter associated with the '011 Patent, I have actively developed numerous systems that used batteries and battery chargers.

10. From 1999 to 2000, I developed a portable version of a payment terminal. To complete the design based on Nickel Metal Hydride (NiMH) batteries, I had to consider thermal issues, charge management, and charge memory associated with incomplete discharging.

11. From 2016 to 2022, I managed the design of a fully functional satellite that was successfully deployed on orbit in 2022. The satellite included a maximum power-point tracking solar battery charger and Lithium-Ion batteries. The batteries required a special safety rating for safe storage on the International Space Station and I architected the software specifically for very low power consumption. I overhauled the EE 457 Embedded Systems course to include components of safety and ethics, and I use batteries and battery chargers as examples of systems with significant safety risks. I also teach specifically on battery charging and battery chemistry so that students can be prepared for battery-equipped systems.

12. I have no financial interest in ChargeLogic or the '011 Patent. I am being compensated for my time spent in connection with these proceedings at an hourly rate. I am also being reimbursed for reasonable expenses, such as travel expenses. My compensation is not contingent on my opinions, on the outcome of any matter, or on any of the technical positions I explain in this declaration.

III. LEGAL STANDARDS

13. I am not an attorney. For purposes of this Declaration, I have been informed about certain aspects of the law that are relevant to my opinions, as set forth below.

A. Patentability

14. I understand that for an invention claimed in a patent to be valid and patentable, it must be, among other things, new and not obvious in light of what was known and came before it. That which was known or came before the invention claimed is generally referred to as “prior art.”

15. I understand that there are two ways in which prior art may render a patent claim unpatentable. First, the prior art can be shown to “anticipate” the claim. Second, the prior art can show that the claim was obvious to a person of ordinary skill in the field of the invention at the time the invention was made.

16. I understand that, for a patent claim to be “anticipated” by the prior art, each and every element or requirement of the claim must be found, expressly or inherently, in a single prior art reference. Further, I understand that anticipation requires that the single prior art reference must disclose the elements of the claim arranged or combined in the same way as in the claim. It is my understanding that whether a claimed invention is obvious is a question of law, with underlying factual inquiries that are determined from the perspective of a person of ordinary skill in the art at the time of the claimed invention.

17. It is my understanding that a claimed invention is obvious if 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 (a “POSITA”).

18. It is my understanding that obviousness requires consideration of the following underlying factual inquiries:

- determining the scope and content of the prior art
- ascertaining the differences between the claimed invention and the prior art;
- resolving the level of ordinary skill in the art; and
- evaluating objective evidence or “secondary considerations” of non-obviousness, such as experimental results, commercial success, long-felt but unresolved needs, failure of others, industry praise, and unexpected results.

19. It is my understanding that a reference must be analogous art to the claimed invention in order to be properly considered for use in an obviousness inquiry. It is my understanding that a reference is analogous art to the claimed invention if:

- The reference is from the same field of endeavor as the claimed invention (even if it addresses a different problem); or
- The reference is reasonably pertinent to the problem faced by the inventor (even if it is not in the same field of endeavor as the claimed invention).

20. It is my understanding that whether a reference is reasonably pertinent depends on how the problem faced by the inventor is reflected, either explicitly or implicitly, in the specification.

21. It is my understanding that the following are exemplary rationales that may support a conclusion of obviousness:

- Combining prior art elements according to known methods to yield predictable results;
- Simple substitution of one known element for another to obtain predictable results;
- Use of known techniques to improve a similar method or product in the same way;
- Applying a known technique to a known method or product ready for improvement to yield predictable results;
- Obvious to try – choosing from a finite number of identified, predictable solutions, with a reasonable expectation of success;
- Known work in one field of endeavor may prompt variations of it for use in either the same field or a different one based on design incentives or other market forces if the variations are predictable to one of ordinary skill in the art; and
- Some teaching, suggestion, or motivation in the prior art that would have led one of ordinary skill to modify the prior art reference or to combine prior art reference teachings to arrive at the claimed invention.

22. In addition to the above, I understand that a person of ordinary skill in the art may resort to logic, judgment and common sense available to him or her at the time of the invention or prior to the invention to find a claim feature obvious, even if the prior art relied on does not explicitly state or teach that feature. I understand that when common sense is relied on to find a feature obvious, the reasoning for that conclusion must be articulated with sufficient clarity.

23. I also understand that a patent claim is not proved obvious merely by demonstrating that each of its elements was, independently, known in the prior art. An obviousness determination requires finding both that a skilled artisan would have been motivated to combine the teachings of the prior art references to achieve the claimed invention, and that the skilled artisan would have had a reasonable expectation of success in doing so. I understand that it is important to be careful not to allow hindsight reconstruction of references to produce the claimed invention, without any explanation as to how or why the references would be combined to produce the claimed invention.

24. Regarding “objective evidence” or “secondary considerations,” I understand that for such evidence to be relevant to the obviousness of a claim, there must be a causal relationship (called a “nexus”) between the claim and the evidence. I also understand that such objective evidence may include: commercial success of products covered by the patent claims; long-felt need for the invention; failed attempts by others to solve the problem addressed by the invention; copying of the invention by

others in the field; unexpected results achieved by the invention; praise of the invention; the taking of licenses under the patent by others; expressions of surprise by experts and those skilled in the art at the making or use of the invention; and that the patentee proceeded contrary to the accepted wisdom of the prior art.

25. I understand that a person of ordinary skill is also a person of ordinary creativity. I further understand that the obviousness analysis need not seek out precise teachings directed to the specific subject matter of the challenged claim, but instead can take into account “ordinary innovation” that does no more than yield predictable results, which are inferences and creative steps that a person of ordinary skill in the art would be understood to employ.

26. I understand that sometimes it will be necessary to look to interrelated teachings of multiple patents and publications; the effects of demands known to the relevant field or present in the marketplace; and the background knowledge possessed by a person having ordinary skill in the art. I understand that all these issues may be considered to determine whether there was an apparent reason to combine the known elements in the fashion claimed by the patent at issue.

B. Prior Art

27. I understand that for purposes of this proceeding, prior art includes patents and printed publications (e.g., journal articles) in or outside the United States before the effective filing date of the claimed invention. I also understand that prior art includes

U.S. patents, published U.S. patent applications, and published international applications (pursuant to the Patent Cooperation Treaty) that themselves have an effective filing date before the effective filing date of the claimed invention, as long as they name another inventor.

C. Inherency

28. I understand that if a prior art reference does not expressly set forth a particular claim element, the prior art may still disclose that element if it is “inherent” in its disclosure. To establish inherency, it is my understanding that evidence must make clear that the missing descriptive matter is necessarily present in the thing described in the reference. It is my understanding that inherency may not be established by probabilities or possibilities. In other words, it is my understanding that the mere fact that a certain thing may result from a given set of circumstances is not sufficient to establish inherency.

29. I understand that under the principles of inherency, if a prior art device, in its normal and usual operation, would necessarily perform a claimed method, then the method will be considered to be anticipated by the prior art device. I also understand that when the prior art device is the same as a device described in the specification for carrying out the claimed method, it can be assumed that the device will inherently perform the claimed process.

D. Person of Ordinary Skill In The Art

30. I understand that “a person of ordinary skill in the art” or POSITA is a hypothetical person who is presumed to have known the relevant art at the time of the invention. Such a person would necessarily have the capability of understanding any scientific and engineering principles applicable to the pertinent art.

31. I understand that factors that may be considered in determining the level of ordinary skill in the art include, but are not limited to, the following:

- the educational level of the inventor;
- the type of problems encountered in the art;
- prior art solutions to those problems;
- the rapidity with which innovations are made;
- the sophistication of the technology; and
- the educational level of active workers in the field.

32. I understand that a person of ordinary skill in the art is not a real person, but rather is a hypothetical individual having the qualities reflected by the factors above. This hypothetical person has knowledge of all prior art in the relevant field as if it were arranged on a workshop wall and takes from each reference what it would teach to a person of ordinary skill in the art.

33. I understand that a person of ordinary skill in the art is a person of ordinary creativity, not an automaton. In many cases a person of ordinary skill will be able to fit the teachings of multiple prior art references together like pieces of a puzzle.

34. I understand that a person of ordinary skill in the art can collaborate with one or more other persons of ordinary skill in the art for one or more aspects with which the other person may have superior expertise, experience, and/or knowledge.

E. Claim Construction

35. It is my understanding that claim construction, or the interpretation of the claims of a patent, is ultimately a question of law. I have been informed that claim terms are generally presumed to carry their ordinary and customary meaning. However, I understand that a patent applicant is his own lexicographer and is entitled to provide alternate definitions of words in common usage, but if the patent applicant uses a term that is in common usage without providing an alternate definition, then that term should generally be understood as having its common meaning.

36. I understand that a person of ordinary skill in the art is deemed to read a claim term not only in the context of the particular claim in which the disputed term appears, but in the context of the entire patent specification and the “file history” of the patent developed during examination by the Patent Office.

37. I understand that the claims, the specification, and the file history are referred to as “intrinsic evidence,” and are to be read as a person of ordinary skill in the art at the time of the invention would have done at the time of the alleged invention.

38. In addition to the intrinsic evidence, I understand that the court or tribunal may also consider other relevant evidence, which is called “extrinsic evidence,” concerning relevant scientific principles, the meaning of technical terms, and the state of the art. Such evidence includes the testimony of qualified expert witnesses. Although extrinsic evidence may be used to resolve ambiguities that may exist after reviewing the intrinsic evidence, I understand that extrinsic evidence cannot be used to contradict a claim construction that is clear from the intrinsic evidence.

39. I understand that some claims are independent, and that those independent claims are complete by themselves. Other claims refer to these independent claims, or other dependent claims, and are “dependent” on those claims. The dependent claims include all of the limitations of the claims on which they depend.

IV. BASES FOR OPINIONS

40. The opinions set forth in this Declaration are my own. In forming the opinions herein, I have considered the Petition for Inter Partes Review filed in the IPR proceedings referenced above and exhibits thereto, as well as the additional materials cited in this Declaration (including the exhibits to the Patent Owner’s Response cited herein), and my education, training, and experience.

41. My analysis of the materials relating to this matter is ongoing and I will continue to review any new material that is provided to me. This Declaration represents certain opinions that I have formed to date and the bases for those opinions. I reserve the right to revise, supplement, and/or amend my opinions based on new information presented to me and on my continuing analysis of the materials cited herein or later provided to me.

V. LEVEL OF ORDINARY SKILL IN THE ART

42. I understand that the Petition asserts the following level of skill of a POSITA at the time of the '011 Patent:

A POSITA at the time of the '011 Patent would have had at least a bachelor's degree in electrical or mechanical engineering (or an equivalent field) and at least two years of work experience involving automotive systems, including electric vehicle battery charging systems. Additional industry experience or technical training may offset less formal education, while advanced degrees or additional formal education may offset lesser levels of industry experience. EX 1003-Dec., ¶¶30-32.

Petition, 2.

43. I understand that Petitioner's expert, Dr. Andrews, provides the following opinion on the level of a POSITA as of August 18, 2008:

[A] POSITA at the time of the '011 Patent would have had at least a bachelor's degree in electrical or mechanical engineering (or an

equivalent field) and at least two years of experience involving automotive systems, including electric vehicle battery charging systems. Additional industry experience or technical training may offset less formal education, while advanced degrees or additional formal education may offset lesser levels of industry experience.

Ex. 1003 ¶ 30.

44. For purposes of this Declaration only, I have applied the definition of a person having ordinary skill in the art (“POSITA”) proposed by Dr. Andrews and Petitioner but with the one modification. Specifically, the proposed definition should not require “automotive systems” experience generally, which encompasses experience with systems unrelated to the technology at issue, such as transmissions, cooling systems, and the like. Likewise, although the ’011 Patent focuses on electric vehicle battery chargers, a POSITA would not require specific experience with such chargers if they have sufficient experience with other types of chargers. For example, I have considerable experience with battery chargers for satellite systems and for portable payment terminals, which are not meaningfully different in terms of technical complexity or complexity of operation as compared to vehicle chargers.

45. My education and experience exceed that of a POSITA as described above and qualify me to testify as to the knowledge of a POSITA under any reasonable definition. *See* Section II (“Background and Qualifications”). Moreover, even under Petitioner’s proposed level of ordinary skill in the art, I qualify based on my

significantly higher level of education, which offsets the requirement of any specific industry experience.

46. All references to a POSITA here are made pursuant to this modified definition. However, my application of that definition is not a reflection of my agreement or disagreement with it. I reserve the right to provide my own opinion on the level of ordinary skill should there be further proceedings.

47. With these understandings, my testimony herein relates to the knowledge and understanding of a POSITA as of August 18, 2008. I understand this is the priority date applied by Petitioner, and I have been asked to use this date for the purposes of my testimony. I have formed no opinion on whether this date is the appropriate date, nor have I been asked to do so.

VI. CLAIM CONSTRUCTION

48. I understand that, with one exception, the Petition asserts that it is applying the “ordinary and customary meaning of the claim terms,” but does not provide any explanation of any such meanings. Petition, 3. The one term identified in the Petition for construction, “cost of power,” appears in dependent claims 5, 13-16, 18, 20. *Id.*, 3-4; EX 1001.

49. As detailed below, my review of the Petition indicates that Ground 1, the only ground directed at independent claim 1 (the only independent claim), does not show that claim 1 is unpatentable. The remaining grounds (2-8) do not contend that any

of their additional references address the deficiencies identified for Ground 1, and appear to assert the same combinations as Ground 1 for their included limitations of claim 1. Therefore, these grounds too do not show that any challenged claim is unpatentable, based solely on the analysis of Ground 1 for claim 1. Therefore, at this time I do not address the Petition's construction of "cost of power" appearing only in the dependent claims, as it is not necessary to construe this term to resolve the issues presented in the Petition.

50. I also have not identified any claim terms that require construction to resolve the challenge to independent claim 1 presented in the Petition. I may undertake additional analysis of the asserted grounds and the associated challenges to the patentability of the claims to the extent this proceeding continues to a later stage. Therefore, I reserve the right to identify and provide my opinion as to the construction of any claim terms that I later recognize are material to resolving the challenges presented in the Petition.

VII. OPINIONS REGARDING GROUND 1

51. The Petition generally asserts for Ground 1 that the combination of Kelty-078, Fujita, and Suyama renders claims 1-4, 6, and 10-12 obvious. Petition, 2. For independent claim 1, the Petition asserts that Kelty-078 alone teaches claim elements 1[pre], 1[a], 1[b], 1[c], 1[d], and 1[g]. *Id.*, 6-22, 40-41. Petitioner combines Kelty-078 and Fujita, or alternatively Kelty-078 and Fujita and Suyama, for claim 1[e]. *Id.*, 22;

but see Section VII.A. below (discussing ambiguity in the proposed combination). The Petition asserts that claim 1[h] is taught by a combination of Kelty-078 and Fujita. Petition, 46. For claim 1[i], Petitioner asserts a combination of Kelty-078 and Suyama. *Id.*, 47-51. Based on my analysis, I have concluded that Ground 1 does not render any of the challenged claims unpatentable, for the reasons explained below.

A. Claim 1[e]: [a controller configured to:] during charging of the battery with the vehicular battery charger: repeatedly receive at least one signal indicative of a level of charge of the battery

52. The Petition asserts that Kelty-078 in combination with Fujita alone, or in combination with Fujita and Suyama, discloses Claim 1[e]. Petition, 22. As detailed below, the asserted references do not clearly disclose a controller configured to repeatedly receive a signal indicative of the battery's level of charge during charging. The Petition is also unclear in its explanation of what combinations are actually asserted, as well as their specific details, making a full analysis and assessment extremely difficult or even impossible. Therefore, in my opinion the Petition has not shown that this claim element is taught or suggested by Ground 1, nor does the Petition show that the claim was obvious.

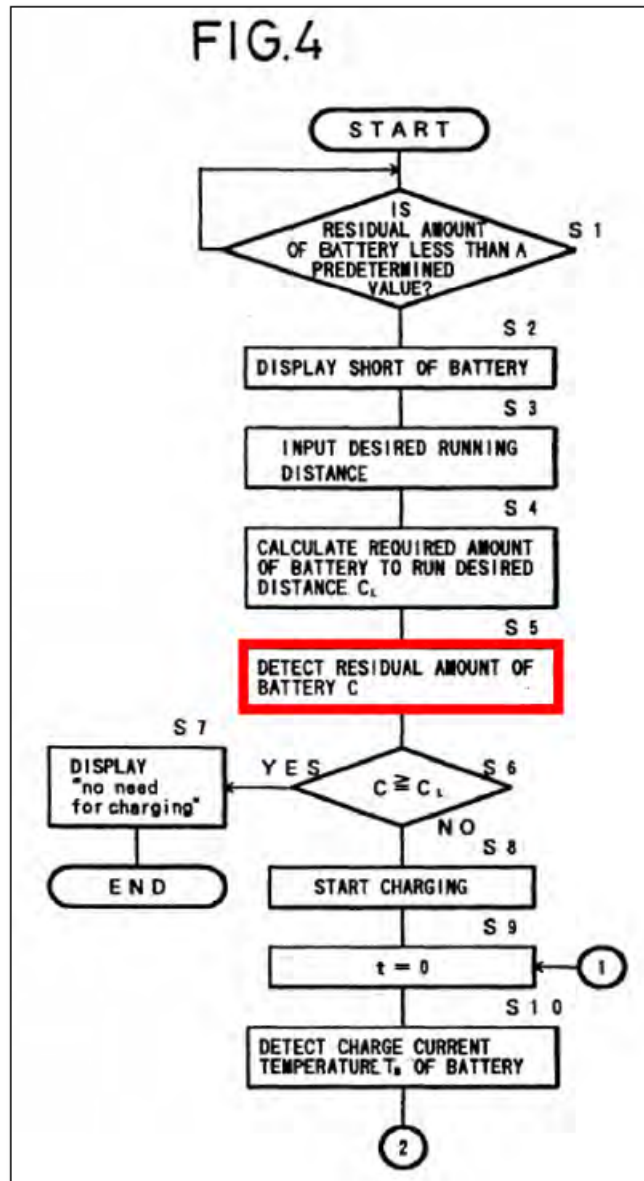
1. Kelty-078

53. The Petition identifies Kelty-078's teaching that "user 20 may be capable of querying or monitoring the electric vehicle's battery pack and cells 26 for its state of charge." Petition, 22-23 (citing EX 1004, 5:9-15, Fig. 3). The Petition does not assert

that this qualifies as the claimed repeated reception of a signal indicating the level of charge, but only that Kelty-078 “teaches SOC (*level of charge*) is capable of being queried or monitored.” *Id.*

2. Fujita

54. The Petition maps Fujita’s electronic control unit (ECU) 16 to the claimed controller. Petition, 27. The Petition maps the claimed signal indicating the state of charge of the battery to Fujita’s “DETECT RESIDUAL AMOUNT OF BATTERY C” in Step S5 of Figure 4, which Petitioner annotates as shown below:



Petition, 27-28. As can be seen in the figure, this step occurs prior to the beginning of charging (step S8). EX 1006, Fig. 4. Fujita’s specification states for this step that the ECU “calculates a current residual amount C of electric energy of the battery (step S5).” *Id.*, 3:65-68; Petition, 29.

55. The Petition also identifies the ECU's constant monitoring "during navigation [of] whether the residual amount of electric energy of the battery is beyond a predetermined level." Petition, 29 (citing EX 1006, 3:54-68). The end of the clause quoted in the Petition explicitly states that this is "(step S1)" EX 1006, 3:54-56. As shown in Figure 4, this step also occurs prior to charging (step S8). *Id.*, Fig. 4 (Step S1). The Petition asserts that "[b]ecause the ECU (via control circuit) is communicating with the battery 30 and receiving information for calculating a residual charge level (C), Fujita teaches *receive at least one signal indicative of a level of charge of the battery*, namely detecting and calculating the charge level C." Petition, 30.

56. I note first that the claim language requires receiving a "signal indicative of a level of charge of the battery." In Fujita, while Figure 4 denotes Step S5 as "Detect Residual Amount of Battery C," the specification specifically explains that this step is a calculation and not a detection. EX 1006, 3:65-4:2 ("The ECU 16 then, calculates a required amount C_L of electric energy of the battery to run the desired distance L (step S4), calculates a current residual amount C of electric energy of the battery (step S5), and compares the required amount C_L obtained in step S4 with the residual amount C (step S6)."). Thus, Step S5 is not described as a detection of the residual capacity of the battery, but a calculation of the residual capacity of the battery.

57. Second, even if Step S5 denoted reception of a signal comprising the residual capacity of the battery, neither Step S1 nor Step S5 occurs during charging,

which only begins later at Step S8. EX 1006, 4:5-14; Fig. 4. Thus, neither step can satisfy Claim 1[e].

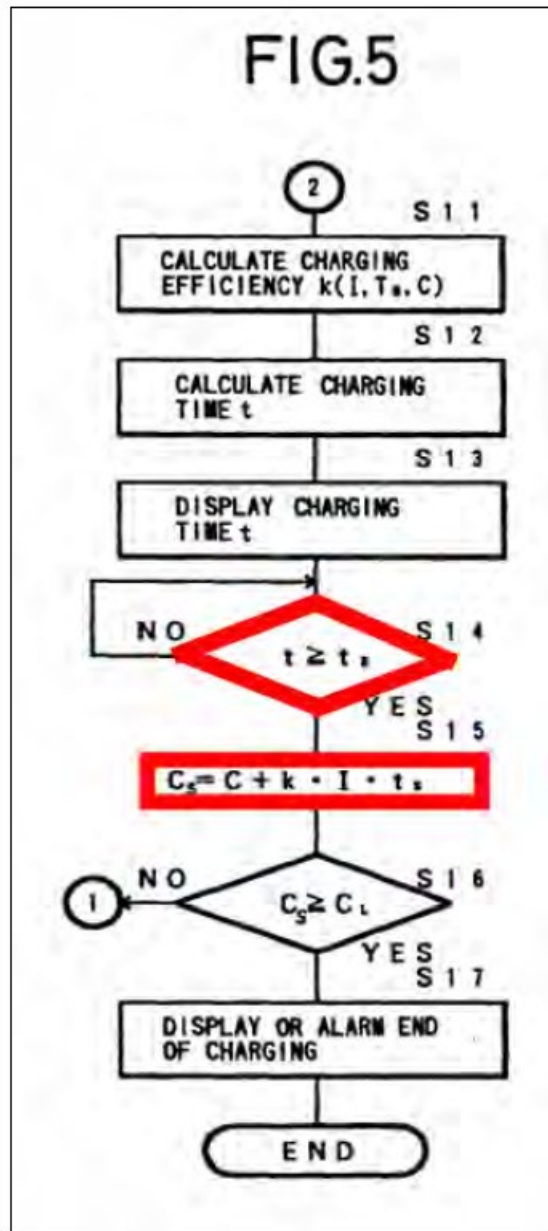
58. The Petition proceeds to map the “repeatedly” portion of the limitation to Fujita’s repeated charge time calculations. Petition, 30-31 (“Fujita teaches calculating the charge time (t) ‘during the charging’ of vehicle 10 ...”). Fujita teaches that at the beginning of charging, beginning at Step S9, an initial calculation of charging time is performed. Specifically, Fujita explains that its ECU detects the charge current (I) flowing through the battery, and the battery temperature (T_B). EX 1006, 4:15-18; Fig. 4 (S10). The ECU calculates a charging efficiency (k) as a function of I, T_B , and the previously calculated (at S5) residual amount C of the battery’s electric energy. *Id.*, 4:21-26, Fig. 4 (S11). The specifics of this calculation are not detailed because it varies “depending on the kind and other factors of the battery 30 used.” *See id.* The charging time (t) is then calculated as a function of the required amount of energy (C_L) to run a desired distance (L), the residual battery energy C, the charging efficiency k, and the charge current I. *Id.*, 4:27-30. This charge time t is the time remaining until the battery has been charged to at least that level necessary to run the desired distance (C_L). *Id.*, 4:32-34. The calculated charge time is then displayed. *Id.*

59. A POSITA would understand that Fujita assumes that one can come up with an accurate value of the charging efficiency “k” based on the referenced conditions, and then estimates or interpolates the charge using “k”. In other words,

Fujita is not attempting to detect or measure the actual state of the battery, for example by measuring or counting the total amount of current over time or by measuring voltage. In addition, although Fujita does not specify the type of battery, Fujita's repeated use of battery temperature indicates to a POSITA that it was likely directed to charging nickel-cadmium (NiCd) batteries, because temperature is an extremely common way to detect end-of-charge for NiCd batteries.

60. Next, Fujita explains that after a specific time lapse (t_s), the values of the charge current and battery temperature are renewed, and the residual battery energy (C) is revised (to C_s) by performance of another calculation, where the charging efficiency, charging current, and time lapse are multiplied and added to the previous residual energy C . *Id.*, 4:35-40; Fig. 5 (S14-S15). If charging is not completed, the calculations repeat from Step S10. *Id.*, 4:41-49; Figs. 4-5 (S16 returning to S10).

61. The Petition asserts that because "at least Step S15 is repeated" as shown in Figure 5, Fujita teaches repeatedly receiving a signal indicative of the charge level of the battery during charging:



Petition, 30-31. Dr. Andrews’ declaration more precisely explains that the Petition is mapping the claimed signal indicative of the level of charge of the battery, “i.e., detection of the residual amount C”—to the ECU’s “receiving signals and performing calculation steps after charging begins.” EX 1003 ¶ 149.

62. Fujita does describe repeated calculation of the battery's level of charge in Step S15. That step is described solely as a calculation of the residual amount C of the battery based on the values of the charge current I , and temperature T_B :

The ECU 16 compares the charge time t with a predetermined time t_s (step S14) and when a lapse of time t_s is detected, the values of the charge current I , temperature T_B and residual amount C of the battery are renewed, in which the residual amount of electric energy of the battery 30 is revised by $C_s = C + k \cdot I \cdot t_s$ (step S15).

EX 1006, 4:35-40. Fujita does not state that it receives a signal directly containing or indicating the residual capacity of the battery at any step other than S1, which is not repeated. As discussed above, even if Step S5 is considered reception of such a signal, this does not occur during charging and the step is not repeated. Thus, Fujita does not disclose repeated reception of a signal at Step S15. Thus, Fujita does not disclose Claim 1[e].

3. Suyama

63. The Petition next turns to Suyama. Petition, 32. The Petition maps claim 1[e] to Suyama's "determining the residual capacity of the main battery 18" from "the **signal read or detected from the battery residual capacity meter 54.**" Petition, 32 (citing EX 1007, 8:58-9:19, Figs. 6-7). The Petition asserts that the residual capacity is repeatedly received because Steps S1 through S15 are repeatedly executed, including the "*signal receiving Step S3.*" *Id.* (citing EX 1007, 8:46-51, Fig. 6, Claim 1).

64. Like Fujita, Suyama teaches that the referenced “determining the residual capacity of the main battery 18” is a computation performed by the charge-status determining ECU 48. Specifically, Suyama states that

Next, the control circuit 22 **computes** a depth-of-discharge ("DOD") of the main battery 18 based on the output signal of the battery residual capacity meter 54, which has been read in Step S2, **and determines** the fully-charged capacity of the main battery 18 from the value of the computed depth-of-discharge. Further, the control circuit 22 **determines the present residual capacity DOD** with respect to the fully-charged capacity (Step S3).

EX 1007, 8:4-11. Suyama further describes this computation at Step S3:

A routine **for determining** the residual capacity of the main battery 18 is executed in Step S3. That is, the charge-status determining ECU 48 **computes the remaining capacity DOD** of the main battery 18 based on the signal read or detected from the battery residual capacity meter 54 (Step S3-1 in FIG. 7).

EX 1007, 8:58-63.

65. While this computation/determination is based on a signal from the battery residual capacity meter 54, the specifics of what this meter is, how it works, precisely what it measures, and what information is in its signal is not detailed in Suyama. However, Suyama is clear in the foregoing passages that the remaining capacity of the battery—its level of charge—is calculated. *See also id.*, Fig. 7, Step S3-1 (“Compute residual capacity”). It is this “computed residual capacity DOD [depth-of-discharge]”

which is displayed via the battery residual-capacity indicator 102 in display circuit 30 of display card 14. *Id.*, 9:12-15; 8:4-9, 5:66-6:3, 7:43-45. Thus, merely repeating this calculation is not the repeated reception of a signal indicative of the battery's state of charge. The Petition expressly acknowledges this, stating that "[t]he residual capacity is **determined** *during charging of the battery* because the residual capacity **is determined** while 'under the charge.'" Petition, 32 (citing EX 1007, 5:55-57). Thus, like Fujita, Suyama calculates or determines the level of charge. This is not the same as repeated reception of a signal indicative of the level of charge. Thus, Suyama's repeated calculation does not disclose claim 1[e].

4. The Petition's lack of explanation of how the proposed combination(s) discloses the limitation.

66. After discussing the separate teachings of Kelty-078, Fujita and Suyama, the Petition addresses motivation to combine and reasonable expectation of success. Petition, 34-36. However, the Petition does not explain how the proposed combination (rather than the individual references) itself incorporates or discloses the claim limitation.

67. I note that the Petition's actual asserted combinations are difficult to determine. In its identification of the challenge under 37 CFR § 42.104(B), the Petition asserts that a combination of Kelty-078, Fujita, and Suyama is directed to Claim 1. Petition, 2. I understand this to encompass all of the Petition's element-by-element sub-

combinations, which do not individually include all three references. Therefore, it is not clear that the Petition intends to combine these three references together for claim 1[e] based on the identification of the challenge. In discussing claim 1[e] itself, the Petition asserts that the limitation is taught by just Kelty-078 and Fujita, or alternatively the combination of Kelty-078-Fujita-Suyama. *Id.*, 22. However, in setting forth evidence for its motivation to combine, the Petition asserts only a motivation to combine Kelty-078 and Fujita, or Kelty-078 and Suyama, but does not provide any analysis or evidence of a motivation to combine all three references. *Id.*, 34; EX 1003 ¶ 153. It is thus unclear exactly what combination(s) the Petition is asserting.

68. For the Kelty-078-Fujita combination, the Petition most clearly explains the proposed combination where it states that the combination entails configuring Kelty-078's VMS to "receive Fujita's residual amount C of the battery." Petition, 27 (citing § V.A.6.e, the "Motivation to Combine" section). But in the cited motivation to combine section, the Petition states instead that it proposes including "Fujita's ... repeated estimating the level of charge of the battery during charging." Petition, 34-35. The Petition appears to assert that estimating or calculating level of charge is the same as receiving a signal indicative of the level of charge. *Id.*, 35. Specifically, the Petition asserts that "[i]t would have been desirable to repeatedly receive information indicative of the level of charge, **including calculating the level of charge**" *Id.* This assertion expressly states that calculating the level of charge is equivalent to receiving

information indicative of the level of charge. But as discussed above for Fujita, the actual residual amount C is obtained only prior to battery charging, and thereafter, only a calculation (an “estimation”) based on battery temperature, current information, and the prior residual amount is performed. Thus, modifying the VMS to receive either the pre-charge residual amount, or the residual amount calculated during charging, would not create a combination actually disclosing receiving a signal indicative of the level of charge.

69. As discussed, the Petition never proposes a motivation to combine Kelty-078, Fujita, and Suyama. Thus, it is unclear exactly what this combination entails. The Petition does assert a motivation to combine Kelty-078 and Suyama alone. This is described as in the same manner as for Fujita: “[a] POSITA would have found obvious and been motivated to modify Kelty-078 to include either Fujita’s or Suyama’s repeated estimating the level of charge of the battery during charging.” Petition, 34-35. As discussed above, even if repeated estimating of the level of charge during charging were included, such estimation or computation does not meet the requirements of claim 1[e].

5. The Petition’s asserted motivations to combine.

70. As discussed, the Petition’s combination (in some manner) imports Fujita and/or Suyama’s estimations or calculations of the level of charge into Kelty-078. The Petition’s motivation to combine analyses fail to support these proposed combinations, to the extent those can be ascertained with any specificity from the Petition.

71. The Petition first asserts that “a good SOC [state of charge] calculator provides numerous advantages for EVs.” Petition, 35 (citing EX 1014, 57). This is not explicitly described as a motivation to combine. Assuming that was the intention, a POSITA would not have been motivated to add a state of charge calculator to Kelty-078, because Kelty-078 already teaches the provision of its actual state of charge, or at least its own calculation of the state of charge, to the user. EX 1004, 5:9-18 (“[T]he user 20 may be capable of querying or monitoring the electric vehicle’s battery pack and cells 26 **for its state of charge (SOC)** (step 309).”); Fig. 3 (Step 309, “Determining battery SOC”). Thus, Kelty-078 already expressly possessed either a calculator or an actual measurement of the battery’s state of charge. Therefore, a POSITA would not have been motivated to add another SOC calculator to Kelty-078.

72. The Petition next asserts that it would have been desirable for the system “to know during charging when had [sic] reached the pre-set charge level to indicate such to the user,” (Petition, 35) and that a POSITA would have valued “repeated monitoring of the level of charge” to “improve the user’s safety by quickly detecting charging faults” and that the modification would “improve Kelty-078’s overall performance by “repeatedly monitoring the vehicle’s battery to prevent detrimentally overcharging or discharging” (*id.*, 35-36). The problem with these motivations is that the proposed combination(s), which import only estimations of charge level, would not appear to actually achieve any of these objectives. The proposed combinations would

not receive a direct signal indicating when any particular charge level was reached, would not directly monitor the actual level of charge, and would not directly monitor the vehicle's battery with respect to the level of charge, because it instead only performs estimations or calculations. Therefore, these alleged benefits do not provide a motivation to combine.

73. Also, as discussed above, for the Kelty-078-Fujita-Suyama combination, the Petition does not explain why a POSITA would have had a motivation to combine both Fujita's and Suyama's teachings with Kelty-078. Although apparently proposing a combination of all three references, the Petition only provides analysis of a motivation to combine with either Fujita or Suyama, but not both. The motivation for the Kelty-078-Fujita-Suyama combination is simply not addressed in the Petition.

6. The Petition's Reasonable Expectation of Success Analysis.

74. The Petition's reasonable expectation of success arguments for claim 1[e] do not provide any additional explanation for how the references would be combined to yield a system meeting the claim limitation. Petition, 36. The Petition states only that modifying Kelty-078 to "repeatedly receive SOC information during charging was a simple programming modification." Petition, 36. Because the combination itself is not detailed, the programming modification envisioned is not described, and therefore this assertion is incapable of further evaluation. This assertion does not explain how the combination would receive the signal indicative of the level of charge in the modified

Kelty-078, rather than calculating the level of charge as taught in Fujita and Suyama. The Petition's assertion that this would be simple programming modification is not supported by any further detail in Dr. Andrews' declaration. There, Dr. Andrews makes the same general assertion without any additional support or explanation. EX 1003 ¶ 157.

75. I also note that neither the Petition nor Dr. Andrews' declaration address the significant architectural differences between Kelty-078, Fujita, or Suyama. Kelty-078 only discloses on-demand querying of the state of charge, as the Petition acknowledges. Fujita's repeated calculations of the residual charge is designed for a wired, in-vehicle-only emergency system without any portable wireless controller and only provides an interpolated estimate of the state of charge that relies on specific pre-determined constants such as "k" and a pre-determined algorithm that uses "k," battery temperature and current. Worse, it is specifically designed to be in-vehicle because it is designed for a roadside-assistance context, in which a wired in-vehicle display makes sense. Likewise, Suyama's cyclical update mechanism was designed for a wireless remote display card, not an in-vehicle display as in the proposed combination. Suyama expressly cites the ability to view the information at a location remote from the vehicle is its express purpose. *See, e.g.*, EX 1007, Abstract. When lined up against the context of Kelty-078, the combination makes even less sense—Kelty-078 is drawn to a garage where the remote access is less valuable; the driver is at home. *See also* Section VII.C.2.

below. The Petition does not explain how a POSITA would integrate either into Kelty-078's architecture using an in-vehicle display integrated with its phone-based control system. This is necessary because neither Fujita's nor Suyama's repeated calculation of the state of charge was designed for, or contemplated integration with, a system having Kelty-078's wireless portable-controller architecture for an in-vehicle display.

76. Further, neither the Petition nor Dr. Andrews' declaration attempt to reconcile Fujita's method of estimating the charging efficiency parameter "k" and interpolation with Suyama's method, which relies on its "residual capacity meter." Nor do they bridge the gap between the calculated/interpolated values and an estimate of residual capacity on one hand (the prior art) and a signal indicative of a level of charge of a battery on the other hand (the claim limitation).

77. For the Kelty-078-Fujita-Suyama combination, the Petition does not explain why a POSITA would have had a reasonable expectation of success in implementing both Fujita's and Suyama's teachings into Kelty-078, while also maintaining Kelty-078's wireless-communication display functionality. Again, although this is a combination of three references, the Petition only analyzes it in a disaggregated, pairwise fashion. Petition, 36; *see also* EX 1003 ¶ 157. The proposed combination of all three references is thus unsupported.

78. Based on the foregoing, the Petition has not established that the proposed combination would have been obvious. But even if it had, the Petition has not established that the combination would actually disclose or possess claim 1[e].

B. Claim 1[f]: [a controller configured to:] repeatedly estimate, based at least in part upon the at least one signal, an amount of time remaining to charge the battery, and

79. The Petition proposes combining Kelty-078 and Fujita to meet claim 1[f]. Petition, 36-40. As explained below, the combination cannot satisfy claim 1[f], because the limitation requires that the required estimation of remaining charge time must be based on the signal required by claim 1[e], which as discussed for that limitation, is not present in the combination. *See* Section VII.A.

80. In addition, the Petition's analysis of motivations for the combination (Petition, 38-39) do not adequately address what Fujita, as a whole, would have suggested or taught to a POSITA. A POSITA would have understood that Fujita is directed to addressing a roadside, emergency-charge situation, where a driver must stop mid-trip to get a boost charge from a gasoline-powered vehicle. *See* EX 1006, 1:52-60, Fig. 1, Abstract ("In an emergency where the residual electric energy of the battery is less than required to run the required distance, the electric vehicle can easily be supplied with electric power from other vehicles such as a gasoline engine vehicle having a low-voltage power source and charge the battery").

81. Thus, in Fujita, it makes sense to provide the driver—waiting in the vehicle to continue his journey—with a repeated, updated estimate of the time remaining to complete the on-going charge. But there is no motivation to provide such an estimate on an in-vehicle display in Kelty-078, which contemplates an at-home (or at second-home) charging situation where the driver is not anxiously waiting for the charge to be completed. Thus, the Petition’s assertion that doing so in light of changing battery conditions “ensures a driver is alerted with minimal delay” (Petition, 39) is correct for Fujita’s system, but simply makes no sense in Kelty-078 which is clearly addressed to predetermined charging modes in a garage setting. EX 1004, 5:58-6:7 (discussing pre-registration with a local utility and utility control of charging), 6:40-7:21 (discussing predetermined charging modes), 8:53-65 and 9:28-34 (discussing periodic travel to a second home or other location and pre-selection of desired charge mode).

82. In addition, Kelty-078 already discloses notifying the remote user that the battery is fully charged and ready for driving, and of any problems occurring during charging. *Id.*, 5:18-26. This disclosure alone addresses all of the Petition’s asserted motivations to combine. Petition, 38-39. Thus, a POSITA seeking to improve Kelty-078, considering Fujita’s full disclosure, would not have been motivated to add Fujita’s repeated updating of remaining charging time to an in-vehicle display.

- C. **Claim 1[g]-1[i]: [a controller configured to:] repeatedly display on a display mounted within the vehicle and within view of a user seated in the vehicle: information indicative of the amount of time remaining to charge the battery based at least in part upon the estimating step, and information indicative of the level of charge of the battery.**

83. For limitations 1[g]-[i], the Petition relies on Kelty-078 alone (claim 1[g]), a combination between Kelty-078 and Fujita (claim 1[h]), and a separate combination between Kelty-078 and Suyama (claim 1[i]). Petition, 40-52.

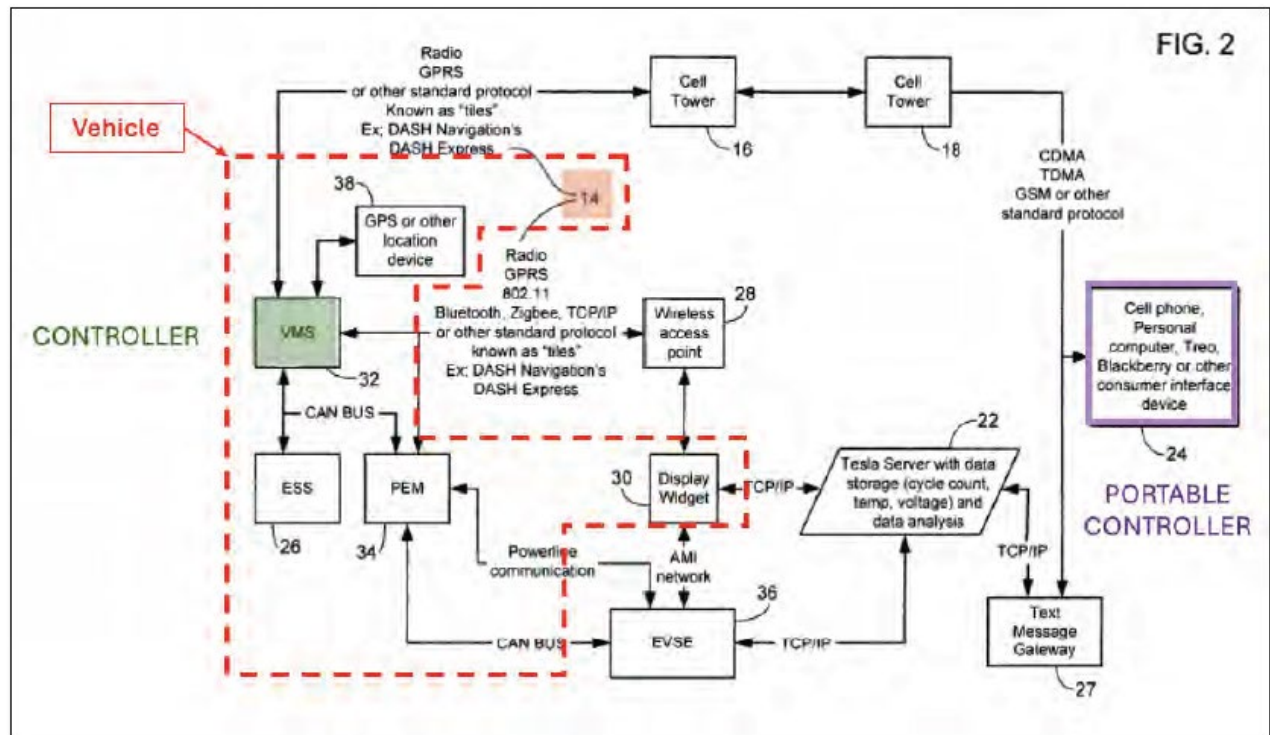
84. As discussed further below, the Petition does not show that Kelty-078's VMS 32, its mapped controller, is configured to repeatedly display on the vehicle-mounted display the information required by claims 1[h]-1[i]. The Petition's Kelty-078-Suyama combination requires importing Suyama's battery residual capacity indicator on a remote display card and adding it to Kelty-078's in-vehicle display. Given Suyama's disclosure, no POSITA would have ever made such a combination, because Suyama's entire objective was to provide such information to a user at a location remote from the vehicle—i.e., not on an in-vehicle display.

1. The proposed combination's mapped controller (VMS 32) cannot perform the functions required by the claim limitations.

85. The Petition asserts that "VMS 32 [which is the claimed controller] controls display 30 via 'CAN BUS' through PEM 34 and [EVSE] 36." Petition, 41. Based on this, the Petition asserts that Kelty-078 teaches that VMS 32 is configured to perform the functions of limitations 1[g]-[i]. *Id.*

86. The cited passage of Kelty-078 states that: “[PEM 34] may also be in communication with an [EVSE] 36 via power line communication, CAN BUS or any other known communication method, which also may be in communication with the display device 30 of the electric vehicle 12.” EX 1004, 7:64-8:2. This passage establishes that there is communication via a CAN BUS between PEM 34 and EVSE 36. However, the passage states that it is EVSE 36, not PEM 34, which “may be in communication with the display device 30 of the electric vehicle 12.” Therefore, this passage does not support the Petition’s assertion that there is communication from or between PEM 34 and display 30.

87. Even if it did, it does not support the Petition’s assertion that VMS 32 is itself in control of the display 30 via CAN BUS “through PEM 34 and [EVSE] 36.” Petitioner’s analysis is reminiscent of the childhood game of “Telephone,” requiring the VMS to control the display by first communicating with PEM 34, which then communicates with EVSE 36, which then communicates with display 30. Petitioner’s assertion that the VMS is in control of the display via the EVSE is indeed nonsensical, because—as the Petition itself acknowledges—EVSE 36 is not part of the vehicle:



Petition, 11.

88. Because it is not part of the vehicle, EVSE 36 is not within the control of VMS 32. VMS 32 “is the onboard computer that monitors, controls and coordinates various systems **in the electric vehicle**” EX 1004, 7:47-49; *see also* Petition, 9-10 (citing this passage and asserting that the VMS is configured to perform the claimed functions as detailed in the claim limitation analyses because it controls the vehicle’s systems). Because VMS 32 is not controlling the EVSE, it is certainly not controlling the display via control of the EVSE.

89. Kelty-078 only discusses EVSE 36 in two passages, referring to it as “electric vehicle service equipment” and “electric vehicle service equipment module.”

EX 1004, 7:63-8:2, 8:15-17. The EVSE is not further described, and its function within Kelty-078 is unclear, other than it serves as a communication node interfacing between the PEM 34 in the vehicle and external components such as the manufacturer's server 22. *Id.* Figure 2 shows that it is in communication with the display via "AMI network." EX 1004, Fig. 2. Although Kelty-078 does not, at any point, describe or discuss the "AMI network" (nor does the Petition provide any explanation), a POSITA might have understood that this refers to an "Advanced Metering Infrastructure" network, which is a utility company's two-way smart meter communication system linking a charging site to the grid operator. If that is correct—and that is not clear—then there is no reason for the EVSE to pass along PEM messages. This is because the connection from EVSE to display is driven by a utility-company function.

90. Whatever the EVSE's function, it is not the Petition's mapped controller for the other claim functions (1[a]-1[f]), which is plainly VMS 32. In addition, as discussed above, the Petition does not show that VMS 32 controls the display via CAN BUS through PEM 34 and EVSE 36. After review of Kelty-078, it is not clear to me (nor would it have been clear to a POSITA) how data can plausibly pass from the VMS to the PEM to the EVSE to the display. This is because any data flowing from the VMS to the display would traverse two different nodes that serve completely different purposes than passing along display data. The PEM consists of sufficient power electronics to supply power to the battery for charging. The EVSE appears to be

something related to the service provider. Neither would have the purpose of passing along user-interface data from the VMS.

91. Therefore, neither Kelty-078 alone, nor the proposed combination (which relies on Kelty-078 alone for claim 1[g]), teaches a controller configured to perform the required functions of these claim limitations.

2. The Petition's motivation to combine with Suyama is fundamentally flawed

92. The Petition relies on Suyama to disclose claim 1[i] and asserts that its combination with Kelty-078 was obvious. Petition, 47-52. The Petition asserts there was a motivation to combine because “[p]roviding the level of charge during charging on an in-vehicle display **allows the user to wait in their car while completing charging and stay repeatedly informed on the time to charge,**” and that “that using visuals (e.g., indicator 102) **in dashboard displays, like display 30, are useful for drivers** to quickly interpret information.” Petition, 51. But a POSITA would not find these asserted motivations to supports a combination with Suyama, because they are fundamentally at odds with Suyama’s disclosure.

93. Suyama specifically explains that at least one prior art reference (prior art to Suyama) disclosed displaying the “state of charging of the battery” on a dashboard panel, but that this required “the charging operator ... to [often] proceed to the garage ... to confirm the conditions of the electric vehicle being charged, thus inconveniencing

the charging operator.” EX 1007 1:19-36. A POSITA, reviewing Suyama’s entire disclosure, would have understood that it is directed to providing “a portable display system ... capable of monitoring the status of charging of an electric vehicle and the status of the electric vehicle in detail **at a location remote from the electric vehicle being charged.**” *Id.*, 1:39-45; *see also id.*, Abstract (“Thus, a charging operator can obtain information about the status of the charging vehicle **while at a location remote from the electric vehicle.**”); 1:8-14 (“Field of the Invention ... The present invention relates to a charge-status display system suitable for use with an electric vehicle ... capable of monitoring the status of charging ... and the status of the electric vehicle **at a location remote from the electric vehicle.**”). A POSITA would thus have recognized that Suyama’s entire inventive concept is directed to enabling a driver or charging operator to monitor charge status at a location remote from the electric vehicle.

94. As explained in Suyama, its portable display card 14 is removable from the vehicle to a remote location and has its battery 32 precisely so the operator need not remain in or even near the vehicle during charging. *Id.*, 5:66-6:13. All of Suyama’s disclosed functionality, including display of the battery residual capacity on indicator 102, relied on by the Petition (Petition, 47-50) is directed to providing relevant charging and status information **to the remote display card 14**. EX 1007, 4:33-37 (Fig. 1 description), 4:45-51 (Figs. 4-5 description), 7:42-51 (display circuit description), 7:55-61 (explaining that operation of display system 10 is described in Figs. 6-21), Fig. 1

(showing display system 10 and display circuit 30); Figs. 4-5 (showing functional relationships of display card components and describing the configuration of the display circuit in Fig. 1).

95. The Petition, contrary to Suyama, proposes adding a level of charge indicator from Suyama's **remote display card** to Kelty-078's **in-vehicle display** 30. This display, by definition, is viewed only when the user is physically present in the vehicle. This is the exact opposite of what Suyama teaches and suggests. Suyama's residual-capacity indicator is displayed on a device designed to be carried away from the vehicle, and Suyama's entire objective is to eliminate the need for the operator to return to the vehicle to check charge status on an in-vehicle display. Adding charging status information to a fixed, in-vehicle display is completely contrary to Suyama's express purpose. A POSITA reading Suyama would be motivated to implement remote monitoring capability—not to add charging status information to a display that can only be viewed from inside the vehicle.

96. This is a fundamental flaw in the Petition. This flaw is further compounded by the fact that Kelty-078 itself already discloses a portable device 24 (e.g., a cell phone) that wirelessly communicates with the vehicle to allow the user to monitor and control charging from a remote location. EX 1004, 4:16-21 (detailing contemplated user interface device 24), 4:58-5:5 (explaining that in Step 307, a user may use their portable device to communicate with the vehicle to “program and send specific instructions to

the electric vehicle 12 for controlling and monitoring the battery system” and that such devices may be placed in “a home or at another location of the user” and the user “may check or change the charge status and settings”), Fig. 3 (detailing step 307 and other related steps for remote control and monitoring of the charging operation). Kelty-078’s portable device 24 thus already satisfies the very purpose that Suyama’s invention addresses—remote charge monitoring—without any modification to the in-vehicle display 30. A POSITA seeking to implement Suyama’s teaching of remote level-of-charge monitoring in the context of Kelty-078’s system would have no motivation whatsoever to modify Kelty-078’s in-vehicle display 30. This is because Kelty-078 already disclosed an existing portable device 24 that provided existing remote-monitoring functionality.

97. The Petition does not adequately explain why a POSITA, in view of Suyama, would be motivated—completely contrary to Suyama—to import Suyama’s **remote** monitoring capability to the **in-vehicle display**, instead of simply replicating it on Kelty-078’s existing portable device 24. This is further exacerbated by the fact that device 24 was already configured to control the EV’s battery system and receive charging information.

98. Accordingly, in my opinion a POSITA would not, under any circumstances, have been motivated to modify Kelty-078 to reproduce Suyama’s remote charge monitoring on Kelty-078’s in-vehicle display.

D. Conclusion as to Claim 1

99. To summarize, and without limiting any of the foregoing discussion, none of the references asserted in Ground 1 teach or suggest multiple limitations required by Claim 1, including repeated reception of a signal indicative of a level of charge, or repeated display on the vehicle-mounted display information indicative of the remaining charge time, or the level of charge of the battery. The Petition's actual proposed combinations are unclear with regard to certain elements. Further, no POSITA would, in view of Suyama's disclosure, have been motivated to incorporate Suyama's remote charge display capability on Kelty-078's in-vehicle display.

E. Claims 2-4, 6, and 10-12

100. The Petition asserts that Ground 1 renders claims 2-4, 6, and 10-12 obvious. Petition, 52-62. Because these claims all depend from claim 1, and because the Petition's analysis appears to merely incorporate the claim 1 analysis for the limitations of the challenged dependent claims, Ground 1 fails to render them obvious for the same reasons as for claim 1. Because of this, I have not at this time analyzed the specific analysis set forth in the Petition for these claims. I will do so should a trial on the Petition be instituted.

VIII. OPINIONS REGARDING GROUNDS 2-8

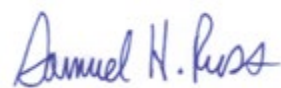
101. The Petition's analysis of Grounds 2-8 is directed at claims 5, 7-9, and 13-20, all of which depend from Claim 1. Petition, 63-94. The Petition does not propose

any different analysis for the limitations of the incorporated independent claim for any of these grounds. *See id.* I note that the Petition does not even incorporate its Ground 1 analysis for these grounds or claims, but only addresses the dependent limitations. *See id.* Assuming that the Petition intended to incorporate that analysis for these grounds, they fail to render any of their challenged claims unpatentable, at least for the same reasons discussed for Ground 1 above. Further, the Petition does not contend that any of the additional references cited in Grounds 2-8 (Sutardja, Kelty-218, Johnson, Pollack, Hotta, and Hobbs) address the deficiencies identified for Ground 1. Petition, 63-94. For these reasons, I have not at this time analyzed the specific analysis set forth in the Petition for these claims. I will do so should a trial on the Petition be instituted.

IX. CONCLUSION

102. I declare that all statements made herein of my knowledge are true, and that all statements made on information and belief are believed to be true, and that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code. I further declare under penalty of perjury under the laws of the United States of America that the foregoing is true and correct.

Dated: September 23, 2026



Samuel Russ, PhD.

APPENDIX A

Curriculum Vitae of Dr. Samuel H. Russ

Personal

Mailing Address: 150 Student Services Dr., SH 4119, Mobile, AL 36688
Phone: (251) 461-1378
e-mail: sruss@southalabama.edu
Citizenship: U.S.

Education

Ph.D. in Electrical Engineering, Georgia Institute of Technology, 1991.
Thesis Title: *An Information-Theoretic Approach to Analysis of Computer Architectures and Compression of Instruction Memory Usage*
Thesis Advisor: Dr. Cecil O. Alford
Bachelor's of Electrical Engineering (with Highest Honor), Georgia Institute of Technology, 1986.

Employment

Aspect Aerospace

2023 – Present

Co-Founder and CTO: Pursue venture capital investments, work with potential customers, develop engineering plan for the company, write grant proposals, supervise patenting process. Write and obtain grant funding. Develop satellite architectures and products including power system and battery charging.

University of South Alabama

2007 – Present

Interim Chair, Department of Electrical and Computer Engineering (2015-2016)

Associate Professor, Department of Electrical and Computer Engineering (2011-present)

Assistant Professor, Department of Electrical and Computer Engineering

Developing new class in signal integrity, developing cross-disciplinary collaborative research efforts, updating labs and class materials, teaching both undergraduate and graduate classes. Pioneering coursework in embedded-system safety includes battery chemistries, chargers, and safety issues. Developed and launched a fully functional CubeSat satellite that included a power system with solar power and a battery charger, and optimized the software for minimal power consumption.

Scientific-Atlanta (Later Cisco, Now Technicolor)

2000 - 2007

Manager, Advanced Technologies R&D, Explored major new technologies including home networking and multi-room video distribution; oversaw construction of prototypes and demonstrations; demonstrated technologies at trade shows and to stock analysts; managed group of approximately 10 designing set-top boxes for the cable television industry including all phases of high-volume electronic design including layout, high-speed digital design, emissions considerations, gate array conversion, and designing with custom ASICs; supervised cross-functional team to increase hard drive reliability; wrote numerous patent applications. Products deployed widely, including Time Warner Cable and Cablevision.

IVI Checkmate (Now Ingenico)

1999 – 2000

Matrix Manager, Electrical Engineering, Supervised staff of approximately 6 electrical engineers, oversaw assignments, allocated time across multiple projects, worked to coordinate project schedules with priorities, assisted in sales and other customer communications.

Staff Electrical Engineer, Oversaw major design overhaul of touch-pad payment system including embedded-systems design, power-system design, battery-powered operation, optimization of charging including thermal issues, and system layout and schematic capture. System deployed widely at Wal-Mart, Home Depot, and others.

Mississippi State University

1994 - 1999

Thrust Leader, Computing Systems Research Thrust and Systems Integration Group, NSF Engineering Research Center -- Coordinate research plans and NSF reporting for 6 faculty and 3 full-time staff, assist in development of strategic plans and pursuit of funding opportunities, oversight of development of the ERC-wide integrated testbed. Managed multi-year research project in distributed computing that included 11 students and 5 faculty.

Assistant Professor, Department of Electrical & Computer Engineering -- Developed all-new graduate class in circuit board design, authored textbook chapter, developing new undergraduate lab, pioneered teaching classes over 2-way interactive video.

Dickerson Vision Technologies (Now Cognex)

1992 - 1994

Director of Manufacturing--Oversaw the development and implementation of a manufacturing plan for the company.

Senior Applications Engineer--Developed firmware and user-interface software for the company's proprietary hardware, Assisted in development of machine vision system hardware, Assisted in sales duties.

Georgia Institute of Technology

1987 - 1991

Graduate Research Assistant--Helped design five VLSI chips while developing two custom CPU's, Silicon-compiler-based computer chip design, including initial design, full functional simulation, size and timing optimization, and manufacturing test development.

Publications

Books

1. Samuel H. Russ, *Signal Integrity: Applied Electromagnetics and Professional Practice*, Springer, 2016. (Textbook)
2. Samuel H. Russ, *Signal Integrity: Applied Electromagnetics and Professional Practice*, Second Edition, Springer, 2022. (Textbook)

Book Chapters

1. Samuel H. Russ, "High-Speed Digital Effects", Chapter 10 of John Kraus and Daniel Fleisch, *Electromagnetics with Applications, Fifth Edition*, McGraw-Hill, 1998. (Textbook)
2. Samuel Russ, Bret Webb, Jonathan Holifield and Justin Walker (2011). "PILS: Low-Cost Water-Level Monitoring, Environmental Monitoring", Dr. E.O. Ekundayo, Ph.D., (Ed.), pp. 137-156, ISBN: 978-953-307-724-6, InTech, (Peer-reviewed)

Journal and Magazine Articles

1. Samuel Russ, "The Threat of Malicious Circuit-Board Alteration: Attack Taxonomy and Examples," *Electronic Device Failure Analysis*, Vol. 23, Issue 3, August 2021, pp. 13-22.
2. Mink DM, McDonald J, Bagui S, Glisson WB, Shropshire J, Benton R, Russ S. Near-Real-Time IDS for the U.S. FAA's NextGen ADS-B. *Big Data and Cognitive Computing*. 2021; 5(2):27. <https://doi.org/10.3390/bdcc5020027>
3. S. H. Russ and J. Gatlin, "Ways to hack a printed circuit board: PCB production is an underappreciated vulnerability in the global supply chain," *IEEE Spectrum*, vol. 57, no. 9, pp. 38-43, Sept. 2020.
4. Samuel H. Russ, Cade C. Cashen, Thomas Thomas, and Roma Hanks, "Smart Grid Architecture for Unobtrusive Home Health Monitoring," *National Social Science Journal*, Vol. 44, No. 1, 2015, pp. 62-68.
5. Samuel H. Russ, Tho D. Ha, and Jonathan H. Shapiro, "Simulation-based Optimization of Wear Leveling for Solid-State Disk Digital Video Recording," *IEEE Transactions on Consumer Electronics*, Vol. 60, No. 3, Nov. 2014, pp. 363-367.

6. Samuel H. Russ and Salim Alsharif, "Packet Loss Behavior of HomePlug AV Traffic at Video Bit Rates", *IEEE Transactions on Consumer Electronics*, Vol. 57, No. 2, May 2011, pp. 823-826.
7. Samuel H. Russ and Ramesh Nallur, "Digital Video Recording onto Solid-State Disks: Feasibility and Lifetime Estimation", *IEEE Transactions on Consumer Electronics*, Vol. 57, No. 2, May 2011, pp. 558-563.
8. Samuel H. Russ and Sasan Haghani, "802.11g Packet-Loss Behavior at High Sustained Bit Rates in the Home", *IEEE Transactions on Consumer Electronics*, Vol. 55, No. 2, May 2009, pp. 788-791.
9. Samuel H. Russ, and Ramesh Nallur, "A Framework for Calculating Fundamental DVR Performance Limits", *IEEE Transactions on Consumer Electronics*, Vol. 55, No. 1, Feb. 2009, pp. 132-138.
10. Ioana Banicescu, Sheikh Ghafoor, Vijay Velusamy, Samuel H. Russ, Mark Bilderback, "Experiences from integrating algorithmic and systemic load balancing strategies", *Concurrency and Computation: Practice and Experience*, Volume 13, Number 2, pp. 121-139 (2001).
11. Roger L. King, Samuel H. Russ, Aric B. Lambert, Donna S. Reese, "An artificial immune system model for intelligent agents", *Future Generation Computer Systems*, Volume 17, Issue 4, pp. 335 - 343 (January 2001).
12. Dr. Samuel H. Russ, Jonathan Robinson, Matt Gleeson, Brad Meyers, and Chun-Heong Tan, "Using Hector to Run MPI Programs over Networked Workstations", *Concurrency - Practice and Experience*, Vol. 11, No. 4, pp. 189-204 (1999).
13. Russ, S.H. Reece, K. Robinson, J. Meyers, B. Rajan, D. Rajagopalan, L. Chun-Heong Tan, "Hector: an agent based architecture for dynamic resource management", *IEEE Concurrency*, Vol. 7, No. 2, pp. 47-55, Apr-Jun 1999.
14. Dr. Samuel H. Russ, Jonathan Robinson, Dr. Brian K. Flachs, and Bjorn Heckel, "The Hector Distributed Run-Time Environment", *IEEE Transactions on Parallel and Distributed Systems*, Vol. 9, No. 11, pp. 1102-1114 (1998).
15. S.H. Russ and C.O. Alford, "Coupled Noise and Its Effects on Modern Packaging Technology", *IEEE Transactions on Components, Hybrids, and Manufacturing Technology*, Volume 13, Number 4, December 1990, pp. 1074-1082.

U.S. Patents

1. U.S. Patent Number 6,748,080, "Apparatus for entitling remote client devices", Samuel Russ, Michael Gaul, Anthony Wasilewski, and Howard Pinder, June 8, 2004.
2. U.S. Patent Number 7,181,010, "Apparatus for entitling remote client devices", Samuel Russ, Michael Gaul, Anthony Wasilewski, and Howard Pinder, February 20, 2007.
3. U.S. Patent Number 7,360,233, "Broadcast carousel system access for remote home communication terminal", Samuel Russ, Michael Gaul, and Anthony Wasilewski, April 15, 2008.
4. U.S. Patent Number 7,360,235, "Systems and methods for operating a peripheral record/playback device in a networked multimedia system", David Davies, Samuel Russ, and Irvan Krantzler, April 15, 2008.
5. U.S. Patent Number 7,499,822, "Analog set-top calibration patterns in manufacturing", Leo Montreuil, Wayne B. Williams, Samuel H. Russ, and Robert Kriete, March 3, 2009
6. U.S. Patent Number 7,505,592, "Apparatus for entitling and transmitting service instances to remote client devices", Samuel H. Russ, Michael Gaul, Anthony Wasilewski, and Howard Pinder, March 17, 2009
7. U.S. Patent Number 7,516,470, "Locally-updated interactive program guide", Samuel H. Russ and Michael Gaul, April 7, 2009
8. U.S. Patent Number 7,826,711, "Digital Video Disc (DVD) Player or Digital Video Recorder (DVR) Playback with Memory", Samuel H. Russ, Nov. 2, 2010.
9. U.S. Patent Number 7,849,486, "Networked subscriber television distribution", Samuel H. Russ, David Lett, Jonathan Robinson, and Michael Gaul, Dec. 7, 2010.

10. U.S. Patent Number 7,860,250, "Apparatus for entitling and transmitting service instances to remote client devices", Samuel H. Russ, Michael Gaul, Anthony Wasilewski, and Howard Pinder, Dec. 28, 2010.
11. U.S. Patent Number 7,861,272, "Networked subscriber television distribution", Samuel H. Russ, David Lett, Jonathan Robinson, and Michael Gaul, Dec. 28, 2010.
12. U.S. Patent Number 7,870,584, "Interactive program guide with selectable updating", Samuel H. Russ and Michael Gaul, Jan. 11, 2011.
13. U.S. Patent Number 7,876,998, "DVD playback over multi-room by copying to HDD", William Wall and Samuel H. Russ, Jan. 25, 2011.
14. U.S. Patent Number 7,908,625, "Networked multimedia system", Neil C. Robertson, David B. Lett, Samuel H. Russ, Bohdan S. Prus, Michael A. Gaul, and Ajith N. Nair, March 15, 2011.
15. U.S. Patent Number 7,937,737, "Field qualification of disk drives in consumer electronics devices", Samuel H. Russ and Mark R. Murray, May 3, 2011.
16. U.S. Patent Number 7,961,780, "Generated set top calibration patterns in manufacturing", Leo Montreuil, Wayne B. Williams, Samuel H. Russ, and Robert Kriete, Jun. 14, 2011.
17. U.S. Patent Number 7,978,720, "Digital media device having media content transfer capability", Samuel H. Russ, Christopher L. Stallings, July 12, 2011.
18. U.S. Patent Number 8,046,806, "Multiroom point of deployment module", William E. Wall, Samuel H. Russ, Oct. 25, 2011.
19. U.S. Patent Number 8,127,236, "Proximity detection using wireless connectivity in a communications system", Paul J. Claussen, Ajith N. Nair, and Samuel H. Russ, Feb. 28, 2012.
20. U.S. Patent Number 8,181,205, "PVR Channel and PVR IPG Information", Samuel H. Russ, Michael A. Gaul, and Dariusz S. Kaminski, May 15, 2012.
21. U.S. Patent Number 8,208,796, "Systems and methods for prioritizing the storage location of media data", Bohdan Prus and Samuel H. Russ, June 26, 2012.
22. U.S. Patent Number 8,280,229, "DVD playback over multi-room by copying to HDD", William E. Wall and Samuel H. Russ, October 2, 2012.
23. U.S. Patent Number 8,295,338, "Generated set top calibration patterns in manufacturing", Leo Montreuil, Wayne B. Williams, Samuel H. Russ, and Robert A. Kriete, October 23, 2012.
24. U.S. Patent Number 8,364,015, "Stretch and zoom bar for displaying information", Samuel H. Russ and Gary Hibbard, January 29, 2013.
25. U.S. Patent Number 8,549,567, "Media content sharing over a home network", Samuel H. Russ, David B. Lett, Jonathan Robinson, Michael A. Gaul, October 1, 2013.
26. U.S. Patent Number 8,627,385, "Systems and methods for operating a peripheral record playback device in a networked multimedia system", David B. Davies, Samuel H. Russ, Irvan J. Krantzler, January 7, 2014.
27. U.S. Patent Number 8,966,550, "Home communication systems," David B. Davies, Samuel H. Russ, Irvan J. Krantzler, February 24, 2015.
28. U.S. Patent Number 9,762,970, "Access of stored video from peer devices in a local network," David B. Davies, Samuel H. Russ, and Irvan J. Krantzler, September 12, 2017.
29. U.S. Patent Number 10,412,439, "PVR Channel and PVR IPG Information", Samuel H. Russ, Michael A. Gaul, and Dariusz S. Kaminski, Sep. 10, 2019.

European Patents

1. European Patent Number EP1543680B1, "Locally-updated interactive program guide", Samuel Russ and Michael Gaul, Feb. 17, 2010.
2. European Patent Number EP1673937B1, "Proximity detection using wireless connectivity in a communications system", Paul Claussen, Ajith Nair, and Samuel Russ, April 21, 2010.
3. European Patent Number EP1604523B1, "Method for determining the encryption of a service content depending on the fidelity of the reformatting of said content", Samuel Russ, Michael Gaul, Anthony Wasilewski, and Howard Pinder, Nov. 21, 2012.

4. European Patent Number EP1552699B1, "Networked multimedia system", Neil Robertson, David Lett, Samuel Russ, Bohdan Prus, Michael Gaul, and Ajith Nair, Dec. 18, 2013.
5. European Patent Number EP1334617B1, "Networked Subscriber Television Distribution", Samuel Russ, David Lett, Jonathan Robinson, and Michael Gaul, April 1, 2015.
6. European Patent Number EP1920601B1, "Multiroom Point of Deployment Module," William Wall and Samuel Russ, May 4, 2016.
7. European Patent Number EP1510033B1, "Apparatus for Entitling Remote Client Devices," Samuel H. Russ, Michael Gaul, Anthony Wasilewski, and Howard Pinder, April 26, 2017.
8. European Patent Number EP1540946B1, "Broadcast Carousel System Access for Remote Home Communications Terminal via a Gateway Device," Samuel Russ, Michael Gaul, and Anthony Wasilewski, April 18, 2018.
9. European Patent Number EP2008280B1, "Method and Device for Prioritizing the Storage Location of Media Data," Bohdan Prus and Samuel Russ, September 26, 2018.

Conference Papers

1. J. E. S. Dalgety and S. Russ, "Design, Implementation, and Verification of a DC-Powered Solar Cell Test Bench," *SoutheastCon 2025*, Concord, NC, USA, 2025, pp. 1328-132
2. McDonald, Jeffrey Todd, Jennifer Parnell, Todd R. Andel, and Samuel H. Russ. "Effectiveness of Adversarial Component Recovery in Protected Netlist Circuit Designs." In *SECURITY*, pp. 181-192. 2022.
3. S.H. Russ, M. Khan, S. Latif, "Surreptitiously Adding a WLAN Antenna to a Printed Circuit Board" 2022 IEEE Physical Assurance and Inspection of Electronics (PAINE), Huntsville, AL, USA, 2022.
4. J. Todd McDonald, Rebecca C. Clark, Lee M. Hively, and Samuel H. Russ. 2022. "Phase space power analysis for PC-based rootkit detection." In *Proceedings of the 2022 ACM Southeast Conference (ACM SE '22)*. Association for Computing Machinery, New York, NY, USA, 82–90. <https://doi.org/10.1145/3476883.3520212>
5. S. H. Russ, " Surreptitiously Adding a Microcontroller to a Printed Circuit Board," 2021 IEEE Physical Assurance and Inspection of Electronics (PAINE), Washington, DC, USA, 2021.
6. S.H. Russ, "Circuit Board Security Vulnerabilities and Counteractions", IPC APEX EXPO 2021.
7. S. H. Russ, "Techniques to Thwart Surreptitiously Altered PCBs," 2020 IEEE Physical Assurance and Inspection of Electronics (PAINE), Washington, DC, USA, 2020, pp. 1-4.
8. S. H. Russ, E. Spencer, T. Scroggins, and S. Latif, "Power-Efficient Software Architecture for a CubeSat System", *2020 SoutheastCon*, Raleigh, NC, USA, 2020, pp. 1-6.
9. A. Russ, S. H. Russ, E. Spencer and M. Frank, "Motor Controller and Reaction Wheel for CubeSat," *2019 SoutheastCon*, Huntsville, AL, USA, 2019, pp. 1-3.
10. F. Lorenzo, J. T. McDonald, T. R. Andel, W. B. Glisson and S. Russ, "Evaluating Side Channel Resilience in iPhone 5c Unlock Scenarios," *2019 SoutheastCon*, Huntsville, AL, USA, 2019, pp. 1-7
11. E. Spencer, D. Clark, S. Russ, *et al.*, "First results from a time domain impedance probe for measuring plasma properties in the ionosphere," 2017 IEEE 60th International Midwest Symposium on Circuits and Systems (MWSCAS), Boston, MA, 2017, pp. 1284-1287.
12. E. Spencer, D. Clark, R. Gollapalli, S. Russ and B. Kerrigan, "A System On Chip design for fast time domain impedance spectroscopy," 2017 IEEE 60th International Midwest Symposium on Circuits and Systems (MWSCAS), Boston, MA, 2017, pp. 124-127.
13. Ramya Manikyam, J. Todd McDonald, William R. Mahoney, Todd R. Andel, and Samuel H. Russ, "Comparing the effectiveness of commercial obfuscators against MATE attacks," *Proceedings of the 6th Workshop on Software Security, Protection, and Reverse Engineering (SSPREW '16)*, 2016, Article 8. DOI: <https://doi.org/10.1145/3015135.3015143>
14. Samuel Russ, Tho Ha, and Jonathan Shapiro, "Simulation of Digital Video Recording to

- Maximize Solid-State Disk Lifetime,” *Proceedings of the 2014 International Conference on Consumer Electronics*, Jan. 10-13, 2014, pp. 562-563.
15. Thomas Thomas, Cade Cashen, and Samuel Russ, “Leveraging Smart Grid Technology for Home Health Care”, *Proceedings of the 2013 International Conference on Consumer Electronics*, Jan. 11-14, 2013, pp. 276-277.
 16. Cade Cashen, Samuel Russ, and Thomas Thomas, “Using a Wireless LAN to Perform Motion Detection”, *Proceedings of the 2013 International Conference on Consumer Electronics*, Jan. 11-14, 2013, pp. 63-64.
 17. Nicklaus Thomas, David Evans, and Samuel Russ, “A Markovian Algorithm for Creating Immersive Public-Speaking Audiences”, *Proceedings of the 2013 International Conference on Consumer Electronics*, Jan. 11-14, 2013, pp. 384-385.
 18. Samuel H. Russ, “Podcasting to Improve Software Usage”, *Proceedings of the 2012 ASEE Southeastern Section Conference*, April 1-3 2012, Starkville, MS, Paper ID 605.
 19. Samuel H. Russ, “Using Student ID Numbers to Create Customized Homework Problems”, *Proceedings of the 2012 ASEE Southeastern Section Conference*, April 1-3 2012, Starkville, MS, Paper ID 606.
 20. Samuel H. Russ and Ramesh Nallur, “Digital Video Recording Onto Solid-State Disks”, *2011 Digest of Technical Papers, 2011 International Conference on Consumer Electronics*, pp. 495-496. (2nd place in best paper contest, 2011.)
 21. Mohammad Mushtaq, Samuel H. Russ, and Mohammad S. Alam, “Variable FEC to Reduce ECC Overhead in Digital Video Transmission”, *2011 Digest of Technical Papers, 2011 International Conference on Consumer Electronics*, pp. 215-216.
 22. Samuel H. Russ and Salim Alsharif, “Behavior of HomePlug AV Traffic At High Sustained Bit Rates in the Home”, *2011 Digest of Technical Papers, 2011 International Conference on Consumer Electronics*, pp. 682-683.
 23. Samuel H. Russ, Viswakalyan Perepa, Silas Leavesly, and Bret Webb, “Novel Low-Cost Salinity Sensor for Embedded Environmental Monitoring”, *Proceedings of IEEE Southeastcon 2010*, March 18-21, 2010, pp. 53-56.
 24. Samuel H. Russ and Kung-Hsien Chen, “Thermally Conductive Circuit Boards”, *Proceedings of the 59th Electronic Components and Technology Conference (ECTC 2009)*, May 2009, pp. 465-468.
 25. Samuel H. Russ and Sasan Haghani, “Behavior of 802.11g Traffic at High Sustained Bit Rates in the Home”, *2009 Digest of Technical Papers, 2009 International Conference on Consumer Electronics, Jan. 2009*, pp. 423-424.
 26. Samuel H. Russ, and Ramesh Nallur, “A Framework for Calculating Fundamental DVR Performance Limits”, *2009 Digest of Technical Papers, 2009 International Conference on Consumer Electronics, Jan. 2009*, pp. 51-52.
 27. Samuel H. Russ, “Home Networking: Extending Cable’s Reach”, *The Complete Technical Paper Proceedings from NCTA*, 2001, pp. 160-165.
 28. Samuel H. Russ, Rashid Jean-Baptiste, Tangirala Shailendra Krishna Kumar, and Marion G. Harmon, “Transparent Real-Time Monitoring in MPI”, *IPPS/SPDP Workshops 1999*, in *Parallel and Distributed Processing*, Lecture Notes in Computer Science, vol. 1586, Springer-Verlag, 1999, pp. 1327-1334.
 29. Roger L. King, Aric B. Lambert, Samuel H. Russ, and Donna S. Reese, “The Biological Basis of the Immune System as a Model for Intelligent Agents”, *IPPS/SPDP Workshops 1999*, in *Parallel and Distributed Processing*, Lecture Notes in Computer Science, vol. 1586, Springer-Verlag, 1999, pp. 156-164.
 30. Aric Lambert, Roger King, Sam Russ, and Donna Reese, “Intelligent Control Agents for Resource Management of Heterogeneous Parallel Computing”, *Computational Intelligence for*

Modeling, Control, and Automation (CIMCA 98) in Concurrent Systems Series, vol. 55, IOS Press, 1999, pp. 116-121.

31. Samuel H. Russ and Adam Gaither, “Developing An Integrated Environment for Computational Field Simulation”, *Object-Oriented Methods for Inter-Operable Scientific and Engineering Computing: Proceedings of the 1998 SIAM Workshop*, pp. 50-57.
32. Samuel H. Russ, Ioana Banicescu, Sheikh Ghafoor, Bharathi Janapareddi, Jonathan Robinson, and Rong Lu, “Hectiling: An Integration of Fine and Coarse-Grained Load-Balancing Strategies”, *Proceedings of the Seventh International Symposium on High Performance Distributed Computing*, August 1998, IEEE Computer Society, pp. 106-113.
33. Samuel H. Russ, “An Architecture for Rapid Distributed Fault Tolerance”, 3rd International Workshop on Embedded High-Performance Computing, in J. Rolim, Editor, *Parallel and Distributed Processing*, Lecture Notes in Computer Science, vol. 1388, Springer-Verlag, 1998, pp. 925-930.
34. Dr. Samuel H. Russ, Brad Meyers, Jonathan Robinson, Matt Gleeson, Laxman Rajagopalan, Chun-Heong Tan, and Bjørn Heckel, “User-Transparent Run-Time Performance Optimization”, *Proceedings of the 2nd International Workshop on Embedded HPC Systems and Applications*, Geneva, April 1997.
35. J. Robinson, S.H. Russ, B. Flachs, and B. Heckel, “A Task Migration Implementation of the Message-Passing Interface”, *Proceedings of the 5th High Performance Distributed Computing Conference (HPDC-5)*, August 1996, IEEE Computer Society, pp. 61-68.
36. S.H. Russ, B. Flachs, J. Robinson, and B. Heckel, “Hector: Automated Task Allocation for MPI”, *Proceedings of the 10th International Parallel Processing Symposium*, April, 1996, IEEE Computer Society, pp. 344-348.
37. W.S. Tan, C.O. Alford, and S.H. Russ, “GT-EP: A Novel High-Performance Real-Time Architecture”, *Proceedings of the 18th International Symposium on Computer Architecture*, May 1991, pp. 12-21.

Reports

1. Aric B. Lambert, Roger L. King, Samuel H. Russ, Donna S. Reese, “Adaptive Analysis for the Design of Hardware Agents Using the Artificial Immune System Model for Resource Management of Heterogeneous Systems”, Miss. State Technical Report No. MSSU-COE-ERC-98-10, Aug. 1998.
2. Daniel H. Linder, Robert B. Reese, Jon Robinson, and Samuel H. Russ, “JavaCADD: A Java-based Server and GUI for Providing Distributed ECAD Services”, Mississippi State University Technical Report No. MSSU-COE-ERC-98-07, May 1998.
3. Samuel H. Russ, “Using Hector in an Architecture for Rapid Distributed Fault Tolerance”, Mississippi State Technical Report No. MSSU-EIRS-ERC-97-17, December 1997.
4. Samuel H. Russ, Jonathan Robinson, Matt Gleeson, and Jose Figueroa, “Dynamic Communication Mechanism Switching in Hector”, Mississippi State Technical Report No. MSSU-EIRS-ERC-97-8, September 1997.
5. Samuel H. Russ, Brian Flachs, Jonathan Robinson, and Bjorn Heckel, “Hector: Automated Task Allocation for MPI”, Mississippi State Technical Report No. MSSU-EIRS-ERC-95-6, September, 1995.

Funded Grants and Contracts

University of South Alabama

1. National Space Grant Foundation, Aug. 2018-May 2019, “Automation Infrastructure for Gateway Biological Laboratory,” PI, \$28,062.
2. Nfina (Local Mobile Company), March 2018 – March 2019, “Redhawk”, PI, \$119,881.

3. NASA, May 2016 – Present, “Spatially Resolved Measurements Of Plasma Density Irregularities In The Ionosphere F Region For Scintillation Studies”, Co-I, \$100,000.
4. Marine Environmental Science Consortium (GRI), Jan. 2011-Dec. 2011, “Conductivity Based In-Situ Hydrocarbon Sensor”, PI, \$9,338.
5. University of South Alabama Research Council (USARC), Feb. 2008 – Feb. 2009, “Instrumentation of Hurricane Forecast Models for Performance Optimization”, \$5,000 for one year.

Mississippi State University

1. National Science Foundation, April 1998-March 1999, “An ERC-CREST Partnership in Distributed and Computational Systems”, PI, \$100,000/year, renewable for 5 years.
2. Office of Naval Research, Nov. 1996-Nov. 1998, “Distributed Visualization and Virtual Environments for Oceanography and Meteorology”, Co-PI, \$200,000.
3. U.S. Army Waterways Experiment Station, July 1996-July 1999, “Efficient Parallel Wave Modeling”, PI, \$200,000, Funded under CHSSI (Common HPC Scalable Software Initiative) of the DoD. (\$50,000 actually funded.)
4. NSF Engineering Research Center for Computational Field Simulation, April 1995- May 1999, “Heterogeneous Computing Testbed (CA 8)”, PI, By year: \$34,983/\$70,111/\$55,916. Funded through NSF Engineering Research Center.

Dickerson Vision Technology

1. Small Business Innovations Research Program of the NSF, Division of Industrial Interface, September 1993 - February 1994, Award No. III-9260914. (\$50,000 Phase I contract conducted at Dickerson Vision Technologies.)

Technology Transfer and Licensing

Hector Distributed Run-Time Environment licensed by MPI Software Technology, Inc., Starkville, MS in June 1998 (while at Mississippi State University)

Students Advised (Major Professor)

Level	At USA	At MSU
Ph.D.	--	0
Masters	3	9

Courses Created and Enhanced

University of South Alabama

EE 264 Microprocessor Systems and Interfacing – Replaced 68HC11 with Freescale 9S12 architecture and redesigned the entire course, Introduced use of 68HC11 simulator and accompanying podcast to enhance student’s ability to visualize microprocessor operation

EE 268 Digital Logic Design Lab – Updated one lab experiment

EE 368 Microprocessor Systems Lab – Developed all-new sequence to tie EE 368 to senior projects with hands-on experiments like motors, photocells, and servomotors.

EE 401 Introduction to ECE Design – Completely overhauled the first-semester senior project course. Added lectures on professionalism, career development, and legal aspects of engineering. Structured the course so that reports would lead up to their senior-project reports.

EE 404 ECE Design – Completely overhauled the second-semester senior project course by requiring better projects and adding material on giving effective presentations. Obtained very enthusiastic response from the department’s Industrial Advisory Board.

EE 446 – Obtained donation of boards from Freescale and redesigned all of the experiments to develop more interesting demonstrations and to switch from assembly language to C.

EE 457/557 – Developing series of podcasts to augment in-class lectures with materials related to embedded systems and professional development.

EE 469/569 Advanced Digital System Design – Developed all-new course in high-speed circuit board design from an electromagnetics perspective, and authored a textbook for the course. Added a lab experience in 2009.

EE 560 Advanced Computer Architecture – Selected new textbook for the class and developed lecture materials to match

EG 101 – Developed systematic curriculum shared by all sections including “checklists” for instructors, handouts, and lecture materials. Introduced motors project, which has become the most popular EG 101 project.

Mississippi State University

EE 8993 High Speed Digital Design -- Offered on video nationwide, it features pioneering treatment of high-speed circuit board design from an electromagnetics perspective. Material from the class has been included in one of the best-known electromagnetics textbooks, and it continues to be one of the most popular graduate classes in the department.

EE 4743 Computer Aided Digital Design -- Added breakthrough educational technology to permit remote access to logic synthesis capabilities. Offered on live two-way video starting Fall 1998.

Courses Taught

University of South Alabama

EE 220, Circuit Analysis I, 1 course.

EE 263, Digital Logic Design, 2 courses.

EE 264, Microprocessor Sys-Interfacing, 4 courses.

EE 268, Digital Logic Design Lab, 1 course.

EE 368, Microprocessor Sys Interf Lab, 14 courses.

EE 401, Intro Elec and CpE Design - W, 7 courses.

EE 404, Elec and Comp Eng Designs-W, 7 courses.

EE 440, HDL Logic Synthesis, 1 course.

EE 446, Embedded System Design Lab, 2 courses.

EE 457, Embedded System Design, 10 courses.

EE 469, Signal Integrity, 5 courses.

EE 534, VLSI Design Systems, 1 course.

EE 540, HDL Logic Synthesis, 1 course.

EE 548, Computer-Network Security, 5 courses.

EE 557, Adv. Embedded System Design, 8 courses.

EE 560, Adv Computer Architecture, 3 courses.

EE 569, Signal Integrity, 5 courses.

EG 101, Intro to Engineering & Design, 5 courses.

EG 231, Intro to Ethics and Economics, 2 courses.

Mississippi State University

Number Description

EE 2111 Electrical Lab I

Class Description

Accompanies introductory digital class

EE 2713 Digital Devices
 EE 4723 Microcomputers II
 EE 4743 Computer Aided Digital Design
 EE 8993 High-Speed Digital Design

Introductory digital class
 Microcontroller interfacing
 VHDL, logic design, and synthesis
 Signal integrity and high-speed design

Honors and Awards

University of South Alabama College of Engineering “Teacher of the Year” 2015

Mobile Area Council on Engineering “Engineering Educator of the Year” 2015

Technology and Engineering Emmy® Award, 2012, for “Pioneering Development of Multi-Room DVR.” Awarded to Cisco. I managed the groups that built the first prototypes, gave public demonstrations, wrote numerous patent applications, and developed the first mass-production set-top containing Multi-Room DVR.

2nd Place in “Best Paper – Storage Category” at ICCE 2011. The paper is “Digital Video Recording Onto Solid-State Disks” as noted in Conference publications above.

Attendee, “Top Prof” Banquet – University of South Alabama chapter of Mortar Board, 2009,2010

Tau Beta Pi Engineering Professor of the Year – University of South Alabama chapter of Tau Beta Pi, 2008. One of two highest awards in the College of Engineering for teaching, and the only award voted on by honor students in the College.

Finalist, 53rd International Science and Engineering Fair, 1983, Albuquerque, NM.

Professional Activities

Expert Witness Engagements

Case	Jurisdiction and Case Number	Year(s)	Witness for	Expert Reports	Dep.	Trial	IPR* Rep.
WNE Holdings v. Rockwell Automat.	Southern District of Alabama	2011	Plaintiff	1	0	0	0
Personalized Media Corp. (PMC) v. Echostar	Eastern District of Texas	2010-2015	Plaintiff	2	3	0	0
Pegasus v. DirecTV et al.	Delaware	2011-13	Plaintiff	1	0	0	0
Apple v. Samsung	Int’l Trade Commission 337-TA-796	2012	Respondent	4	1	1	0
EON v. MobiTV et al.	Delaware	2013	Defendant	1	1	0	0
PMC v. Zynga	Eastern District of Texas	2013	Plaintiff	1	5	0	4
OpenTV v. Netflix	Delaware	2014	Defendant	0	0	0	0
Kaplan v. OnForce	N.D. California	2014	Defendant	0	0	0	1
Intellectual Ventures v. J.P. Morgan Chase	Southern District of New York	2013-2019	Defendant	2	2	0	0
PMC v. Amazon	Delaware	2014-2015	Plaintiff	1	9	0	5
Better Mouse Corp. v. Steelseries et al.	Eastern District of Texas	2015-2016	Plaintiff	2	0	1	0

Case	Jurisdiction and Case Number	Year(s)	Witness for	Expert Reports	Dep.	Trial	IPR* Rep.
SyncPoint v. Nintendo et al.	Eastern District of Texas	2015	Plaintiff	2	1	0	0
TQ Beta v. Dish	USPTO (IPR)	2016	Defendant	1	1	0	0
Script v. ADT et al.	Eastern District of Texas	2016	Plaintiff	2	2	0	0
Sony v. Pace	USPTO (IPR)	2016	Defendant	0	1	0	4
PMC v. Apple	EDTX and USPTO (IPR)	2016-2021	Patent Owner	2	1	1	2
PMC v. Samsung	Eastern District of Texas	2016	Patent Owner	2	0	0	0
Music Choice v. Stingray	Eastern District of Texas	2016-2019	Plaintiff	2	2	0	4
Broadcom v. AMD	USPTO (IPR)	2016	Petitioner	0	0	0	1
Tech Pharmacy v. Alixa et al.	Eastern District of Texas	2017	Plaintiff	2	2	1	0
Rovi v. PMC	Eastern District of Texas, Arbitration	2017	Defendant	0	1	0	0
Implicit v. Trend Micro	Eastern District of Texas	2017	Defendant	2	1	0	0
Implicit v. Palo Alto	Eastern District of Texas	2018	Defendant	1	1	0	0
Invensas v. Samsung	Eastern District of Texas	2018	Plaintiff	2	1	0	0
Selective Signals v. Palo Alto	USPTO (IPR)	2018	Petitioner	0	1	0	1
Rovi Tivo v. Various	Canada	2018	Plaintiff	0	0	0	0
Implicit v. Netscout	Eastern District of Texas	2018	Defendant	0	0	0	0
Rovi Tivo v. Comcast	USPTO (IPR)	2019-2020	Plaintiff	0	4	0	5
Rovi Tivo v. Comcast	ITC	2019-2020	Petitioner	2	1	1	0
BBiTV v. OpenTV	California	2019	Defendant	0	0	0	0
Roku v UEI	USPTO (IPR)	2019-Now	Petitioner	0	6	0	8
MV3 v Roku	Western District of Texas	2019-2020	Defendant	2	2	1	0
BBiTV v Dish	USPTO (IPR)	2019-2020	Petitioner	0	3	0	6
PMC v Google	Eastern District of Texas	2020	Plaintiff	1	1	0	0
PMC v Netflix	Southern District of New York	2020	Plaintiff	2	0	0	0
UEI v Roku <i>et al.</i>	ITC	2020-2021	Respondent	1	1	1	0
BBiTV v Dish	Western District of	2020-	Defendant	1	5	0	6

Case	Jurisdiction and Case Number	Year(s)	Witness for	Expert Reports	Dep.	Trial	IPR* Rep.
	Texas	2021					
Flexiworld v Amazon <i>et al.</i>	Western District of Texas	2020-Now	Defendant	0	0	0	0
Flexiworld v Roku	Western District of Texas	2021-2022	Defendant	2	0	0	0
Roku v UEI <i>et al.</i>	ITC	2021-2022	Complain.	1	0	1	0
Roku v DivX	USPTO (IPR)	2021	Petitioner	0	0	0	1
Apple v Identity	USPTO (IPR), Ex Parte Re-Exam, Western District of Texas	2022-2024	Patent Owner	2	1	1	6
Audi v Aprese	USPTO (IPR)	2022	Petitioner	0	0	0	2
paSafeShare	Ex Parte Re-Exam, Western District of Texas	2021-Now	Patent Owner, Plaintiff	1	0	0	3
PerfectVision v PPC Broadband	USPTO (IPR)	2022-Now	Petitioner	0	0	0	1
Google v Nobots	USPTO (IPR)	2022	Patent Owner	0	2	0	4
Fall Line v Various	Eastern District of Texas	2022-Now	Plaintiff	6	2	1	0
Assa Abloy v CPC	USPTO (IPR)	2023-2024	Patent Owner	0	2	0	4
IOENGINE v Roku	Western District of Texas	2023-2024	Defendant	5	2	1	0
Gratuity v Toast	USPTO (IPR)	2023-2024	Petitioner	0	1	0	1
Lexos v Ebay	USPTO (IPR)	2024	Patent Owner	0	1	0	1
Entropic v Various	USPTO (IPR) Eastern District of Texas	2024-Now	Patent Owner / Plaintiff	3	6	0	7
Roku v Anonymous	USPTO (IPR)	2024	Petitioner	0	0	0	6
Adeia v Videotron	Fed. Court of Canada	2024-2025	Plaintiff	2	0	1	0
AMD v Concurrent	USPTO (IPR)	2024-Now	Petitioner	1	0	0	0
TrueSight v Samsung	Eastern District of Texas	2025	Defendant	2	1	0	0
Sandpiper v Various	USPTO (IPR)	2025-Now	Patent Owner	0	0	0	1
Mood v Eglä	USPTO (EPR)	2026	Petitioner	0	0	0	1

* Includes reports submitted for IPRs, CBMRs, and Re-Exams

Invited Lectures

“Real-time Monitoring in MPI”, Florida A&M University, Tallahassee, FL, August 1998

Consulting

Consulted with various investment firms concerning telecommunications market, 2007 – 2011.
Cox Communications – DVR Reliability – 2015

Society Memberships

Institute of Electrical and Electronic Engineers (Senior Member), IEEE Consumer Electronics Society, IEEE Computer Society, Eta Kappa Nu, Tau Beta Pi, Phi Kappa Phi, Gamma Beta Phi
Secretary, Northeast Mississippi Subsection of the IEEE, 1994-95

Article Reviewer

Computers and Electrical Engineering, Supercomputing '94, IEE Transactions, Concurrency: Practice and Experience, International Parallel Processing Symposium, IEEE Transactions on Education, IEEE Transactions on Parallel and Distributed Systems, ICT 2012, ICAEE 2012

Proposal Reviewer

Army Research Office, National Science Foundation, U.S. Department of Energy

University Service

Chair, Search Committee, ECE Department – Search for Assistant Professor positions, 2008-now (chair since 2011)

Member, ECE Department Undergraduate Affairs Committee, 2015-now

Member, College of Engineering Academic Standards Committee, 2016-now

Member, Search Committee, College of Engineering – Search for 2 Associate Dean positions, 2015

Member, Search Committee, College of Engineering – Search for Associate Dean positions, 2008-09

Member, University of South Alabama Council on International Education, 2008-15

Chairman, ECE Department “Open House” Committee, 2008-09

Conducted open house and other demonstrations for the department, 2008-now

Chairman, ECE Department Recruiting and Retention Committee, 2007-08

Updated and conducted experiment for ACE program, 2007

Member, Hearin Undergraduate Committee, 1998

Department Coordinator, United Way Campaign, 1995

Award Referee, 1995 Instructional Paper Award, MSU College of Engineering