

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

Askeladden L.L.C.,
Petitioner

v.

Calabrese Stemer LLC,
Patent Owner

Case: IPR2024-00367 Case: IPR2024-00369 Case: IPR2024-00368
U.S. Patent No. 7,357,310 U.S. Patent No. 7,954,706 U.S. Patent No. 8,783,564

DECLARATION OF DR. ROBERT AKL, D.SC.

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LIST OF EXHIBITS

PETITIONER EXHIBIT	DESCRIPTION
1001	U.S. Patent No. 7,357,310 (“the ’310 patent”) U.S. Patent No. 7,954,706 (“the ’706 patent”) U.S. Patent No. 8,783,564 (“the ’564 patent”) Note: I have been informed that the ’310, ’706, and ’564 patents will be submitted as Exhibit 1001 in their respective proceedings. I refer to those patents in this declaration specifically as the ’310 patent, ’706 patent, or the ’564 patent for clarity.
1002	Prosecution History of the ’310 patent Prosecution History of the ’706 patent Prosecution History of the ’564 patent Note: I have been informed that the prosecution histories for the ’310, ’706, and ’564 patents will be submitted as Exhibit 1002 in their respective proceedings. I refer to those prosecution histories in this declaration specifically as the prosecution history for the ’310 patent, ’706 patent, or the ’564 patent for clarity.
1004	Declaration of Glenn J. Perry
1005	Supporting Exhibit to the Declaration of Glenn J. Perry
1006	Certified English Translation of Japanese Patent Application No. 2002-133100 (“Horie”) and Certification
1007	Certified English Translation of Japanese Patent Application No. 2001-306806 (“Kobayashi”) and Certification
1008	U.S. Patent No. 5,915,222 (“the ’222 patent”)
1009	Japanese Patent Application No. 2002-133100 (“Horie”)
1010	Japanese Patent Application No. 2001-306806 (“Kobayashi”)
1011	Certified English Translation of PCT Application Publication No. WO2002-008981 (“Kano”) and Certification
1012	PCT Application Publication No. WO2002-008981 (“Kano”)

I. Introduction

1. My name is Robert Akl. I am a citizen of the United States and a resident of the state of Texas. I am over the age of 18 years, and I am not a party to the above-titled *inter partes* review proceedings.

2. I have submitted this Declaration at the request of Askeladden L.L.C. (“Askeladden” or “Petitioner”) for consideration by the Patent Trial and Appeal Board in the *inter partes* reviews of U.S. Patent Nos. 7,357,310 (“the ’310 patent”), 7,954,706 (“the ’706 patent”) and 8,783,564 (“the ’564 patent”) (collectively, the “patents at issue”).

3. In forming my conclusions, I relied upon my knowledge and experience in the field and on documents and information referenced in this Declaration. For my work in connection with these matters, I am being compensated at my standard consulting rate of \$895 per hour. No part of my compensation in this matter is dependent upon the outcome of this proceeding or any issue in any related proceeding. I have no financial interest in Askeladden or Calabrese Stemer LLC (“Patent Owner”).

4. I am qualified to act as an expert in this matter. A copy of my *curriculum vitae* is attached as **Appendix A**, which contains a summary of my experience and credentials.

II. Materials Considered

5. I have reviewed and considered the following documents in forming the analysis and conclusions set forth in my declaration¹:

- The patents at issue;
- Exhibit 1002 – the prosecution histories for each of the patents at issue;
- Exhibit 1006 – the Certified English Translation of Japanese Patent Application No. 2002-133100 (“Horie”) and Certification;
- Exhibit 1007 – the Certified English Translation of Japanese Patent Application No. 2001-306806 (“Kobayashi”) and Certification;
- Exhibit 1008 – U.S. Patent No. 5,915,222 (“the ’222 patent”);
- Exhibit 1011 – the Certified English Translation of PCT Application Publication No. WO2002-008981 (“Kano”) and Certification.

6. I have also relied upon my own experience and expertise in the field of securely transmitting and processing authorization requests over wired and wireless networks, such as requests for the processing of financial transactions, in forming the analysis and conclusions set forth in my Declaration.

III. Qualifications & Background

7. I am qualified to testify as an expert in this matter. I earned my Bachelor of Science degrees in Electrical Engineering and Computer Science

¹ When citing from these documents, all emphasis is added unless otherwise noted.

summa cum laude with a grade point average of 4.0/4.0 and a ranking of first in my undergraduate class from Washington University in St. Louis in 1994. In 1996, I earned my Master of Science degree in Electrical Engineering from Washington University in St. Louis with a grade point average of 4.0/4.0. I earned my Doctor of Science in Electrical Engineering from Washington University in St. Louis in 2000, again with a grade point average of 4.0/4.0, with my dissertation being on “Cell Design to Maximize Capacity in Cellular Code Division Multiple Access (CDMA) Networks.”

8. While a graduate student, from 1996 through 2000, I worked at MinMax Corporation in St. Louis, where I designed software packages that provided tools to flexibly allocate capacity in a CDMA communications network and maximize the number of subscribers. I also analyzed and simulated different audio compression schemes. I also validated the hardware architecture for an Asynchronous Transfer Mode (ATM) switch capable of channel group switching, as well as performed logical and timing simulations, and developed the hardware architecture for the ATM switch. I also worked with Teleware Corporation in Seoul, South Korea, where I designed and developed algorithms that were commercially deployed in a software package suite for analyzing the capacity in a CDMA network implementing the IS-95 standard to maximize the number of subscribers.

9. After obtaining my Doctor of Science degree, I worked as a Senior Systems Engineer at Comspace Corporation from October of 2000 to December of 2001. At Comspace, I designed and developed advanced data coding and modulation methods for improving the reliability and increasing the available data rates for cellular communications. I coded and simulated different encoding schemes (including Turbo coding, Viterbi decoding, trellis coded modulation, and Reed-Muller codes) and modulation techniques using amplitude and phase characteristics and multi-level star constellations. This work further entailed the optimization of soft decision parameters and interleavers for additive white Gaussian and Rayleigh faded channels. In addition, I also extended the control and trunking of Logic Trunked Radio (LTR) to include one-to-one and one-to-many voice and data messaging.

10. In January of 2002, I joined the faculty of the University of New Orleans in Louisiana as an Assistant Professor in the Department of Electrical Engineering. While in this position, I designed and taught two new courses called "Computer Systems Design I and II." I also developed a Computer Engineering Curriculum with a strong hardware-design emphasis, formed a wireless research group, and advised graduate and undergraduate students.

11. In September of 2002, I received an appointment as an Assistant Professor in the Department of Computer Science and Engineering at the

University of North Texas (UNT), in Denton, Texas. In May of 2008, I became a tenured Associate Professor in the Department of Computer Science and Engineering. As a faculty member, I have taught courses and directed research in networking and telecommunications, including 2G, 3G, 4G, 5G, CDMA/WCDMA, GPS, GSM, UMTS, LTE, ad-hoc networks, Bluetooth, call admission control, channel coding, communication interfaces and standards, compression, computer architecture, MIMO systems, multi-cell network optimization, network security, packet-networks, telephony, VoIP, Wi-Fi (802.11), 802.15.4, Zigbee, wireless communication, and wireless sensors. I am also the director of the Wireless Sensor Lab (“WiSL”) at UNT. I am a member of the Center for Information and Cyber Security (CICS) and the NSF Net-Centric & Cloud Software & Systems: Industry-University Cooperative Research Center (I/UCRC). Several of my research projects are funded by industry. In January of 2015, I was promoted to Associate Chair of Graduate Studies in the Department of Computer Science and Engineering.

12. In addition to advising and mentoring students at UNT, I was asked to join the faculty of the University of Arkansas in Little Rock as an Adjunct Assistant Professor from 2004 to 2008 in order to supervise the research of two Ph.D. graduate students who were doing research in wireless communications. At UNT, I have advised and supervised more than 250 undergraduate and graduate

students, several of whom received a master's or doctorate degree under my guidance.

13. In addition to my academic work, I have remained active in the communication industry through my consulting work. In 2002, I consulted for Input/Output Inc. and designed and implemented algorithms for optimizing the frequency selection process used by sonar for scanning the bottom of the ocean. In 2004, I worked with Allegiant Integrated Solutions in Ft. Worth, Texas to design and develop an integrated set of tools for fast deployment of wireless networks, using the 802.11 standard. Among other features, these tools optimize the placement of Access Points and determine their respective channel allocations to minimize interference and maximize capacity. I also assisted the Collin County Sheriff's Office (Texas) in a double homicide investigation, analyzing cellular record data to determine user location.

14. I have authored and co-authored over 100 journal publications, conference proceedings, technical papers, book chapters, and technical presentations in a broad array of communications-related technologies, including networking and wireless communication. I have also developed and taught over 100 courses related to communications and computer systems, including several courses on signals and systems, LTE, OFDM, VoIP, Wi-Fi (802.11), 802.15.4, Zigbee, wireless communication, communications systems, communication

interfaces and standards, sensor networks, source coding and compression, network security, computer systems design, game and app design, and computer architecture. These courses have included introductory courses on communication networks and signals and systems, as well as more advanced courses on wireless communications. A complete list of my publications and the courses I have developed and/or taught is also contained in my *curriculum vitae*.

15. My professional affiliations include services in various professional organizations and serving as a reviewer for a number of technical publications, journals, and conferences. I have also received a number of awards and recognitions, including the IEEE Professionalism Award (2008), UNT College of Engineering Outstanding Teacher Award (2008), and Tech Titan of the Future (2010) among others, which are listed in my *curriculum vitae*.

16. I also have specific experience in the field of wired and wireless networks used for the processing of secure transactions.

17. I have also served as an expert in certain legal proceedings. A list of cases in which I have testified at trial, hearing, or by deposition (including those during the past five years) is provided in my *curriculum vitae*. Over the years, I have been retained by both plaintiffs as well as defendants; and petitioners and patent owners in *inter partes* review proceedings.

IV. Legal Standards Applied

18. I am not a lawyer and I do not possess any legal training or education. The following legal standards have been provided to me by Askeladden's attorneys. Where I state "I have been informed and understand..." what follows is information that I have received from Askeladden's attorneys. I apply the legal standards provided to me in my analysis herein.

19. **Claim construction standard for *inter partes* reviews.** I have been informed and understand that a claim in an *inter partes* review shall be construed according to the plain and ordinary meaning of such claim as understood by one of ordinary skill in the art in light of the specification and the prosecution history of the patent at issue. I have been informed and understand that claim terms are generally given their plain and ordinary meaning as would be understood by a person of ordinary skill in the art in the context of the entire disclosure of the patent. Unless otherwise specified in this declaration, I have applied that plain and ordinary meaning of the claim terms of the patents at issue in my analysis and conclusions.

20. **Anticipation.** I have been informed and understand that claims of a patent are anticipated by a prior art reference, and therefore invalid, if each and every element of a claim, as properly construed, is found either explicitly or inherently in a single prior art reference.

21. **Obviousness.** I have been informed and understand that a claim is obvious in light of prior art if the difference or differences between the claimed subject matter and the prior art are such that the subject matter as a whole would have been obvious, at the time the invention was made, to a person having ordinary skill in the art. I have been informed and understand that the Supreme Court provided an outline for analyzing obviousness in which it rejected an earlier test in favor of an “expansive and flexible approach” using “common sense.” I have also been informed and understand that the Supreme Court explained that under the correct analysis, any need or problem known in the field of endeavor at the time of invention and addressed by the patent can provide a reason for combining the elements in the manner claimed. I have also been informed and understand that the Supreme Court explained that “[t]he combination of familiar elements according to known methods is likely to be obvious when it does no more than yield predictable results.” I further have been informed and understand that the Court pointed to other factors that may show obviousness. These factors include the following principles:

- a combination that unites old elements with no change in their respective functions is unpatentable. As a result, the combination of familiar elements according to known methods is likely to be obvious when it does no more than yield predictable results,

- a predictable variation of a work in the same or a different field of endeavor is likely obvious if a person of ordinary skill would be able to implement the variation,
- an invention is obvious if it is the use of a known technique to improve a similar device in the same way, unless the actual application of the technique would have been beyond the skill of the person of ordinary skill in the art. In this case, a key inquiry is whether the improvement is more than the predictable use of prior art elements according to their established functions,
- an invention is obvious if there existed at the time of invention a known problem for which there was an obvious solution encompassed by the patent's claims,
- inventions that were “obvious to try” — chosen from a finite number of identified, predictable solutions, with a reasonable expectation of success — are likely obvious,
- 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 would have been predictable to one of ordinary skill in the art, and
- an explicit teaching, suggestion, or motivation in the art to combine references, while not a requirement for a finding of obviousness, remains “a

helpful insight” in determining upon which a finding of obviousness may be based.

V. Level of Ordinary Skill in the Art Applied

22. Based on my experience, education, and review of the materials identified in Section II above, the relevant field of technology of the patents at issue would be the hardware and software used for securely transmitting and processing requests for and notifications of activity over wired and wireless networks, such as requests for processing financial transactions. A person of ordinary skill in the art of the patents at issue would have at least a bachelor’s degree in computer science, or computer engineering, or electrical engineering (or a related discipline). A person of ordinary skill would also have at least one to two years of practical experience working with wired and wireless networks used for securely processing requests via those networks for authorization of activity. A person with greater education (for example, a Master’s degree) could have less work experience, and a person with more significant work experience (more than two years) would need less formal education to be considered a person of ordinary skill in the context of the patents at issue.

23. As of the March 11, 2005 priority date of the patents at issue, I was at least a person of ordinary skill in the art. Unless otherwise specified in this

declaration, all of my analysis and conclusions are explained from the perspective of a person of ordinary skill in the art.

VI. The Relevant Date of My Analysis

24. I have been informed and understand that the relevant date for my analysis is no later than March 11, 2005. I have been informed and understand that this date is the relevant date because the patents at issue state on the face of those documents that they have “priority” to an application filed on March 11, 2005.

25. I have not performed any analysis as to whether the patents at issue are entitled to a “priority date” of March 11, 2005. I have been informed and understand that a “priority date” is the earliest date to which an issued patent may be entitled to benefit, and that this date is used to determine what may be considered “prior art” in a proceeding for *inter partes* review. In the event that Patent Owner argues that the patents at issue are entitled to a different priority date, I reserve the right to supplement my analysis and conclusions.

26. Unless otherwise specified, all of my analysis and conclusions are explained from the perspective of a person of ordinary skill in the art as of the relevant date, namely March 11, 2005.

VII. The Patents at Issue

27. The patents at issue are members of the same patent family because they originate from the same U.S. patent application, Application No. 11/077,783, which was filed on March 11, 2005.

28. The patents at issue share the same specification and figures. Unless otherwise specified, I will specifically cite to portions of the '310 patent with the understanding that the '706 and '564 patents contain the same disclosure.

29. I have been informed and understand that the Petitioner has summarized the disclosure of the patents at issue in its petitions for *inter partes* review. Having reviewed that summary, I agree with its contents and reproduce it here below with respect to the '310 patent.

30. According to the '310 patent, “[c]redit cards and charge cards have become the primary vehicle by which payments . . . are transacted” but “charge errors and charge fraud causes millions of dollars in losses in the United States.” ’310 patent, 1:13-15, 32-33. These errors occur, according to the patent, when the consumer is “charged too much” or “authorize[s] the incorrect amount,” but more often errors occur when there are “incorrect or non-authorized charges” related to “fraudulent or even innocent mistakes.” *Id.* at 1:22-23, 29-30. The patent proposes that these errors “could have been avoided, had better authorization security been assured” during the time of purchase. *Id.* at 1:30-31.

31. The '310 patent, titled "Mobile Phone Charge Card Notification and Authorization Method," generally describes "a credit card transaction notification and authorization method." *Id.* at Title, 1:57-58. The method begins when a customer "swipe[s]" or "manually enter[s]" a "charge card" at a "merchant terminal." *Id.* at 2:44-47. According to the patent, the merchant terminal can be either "a store, . . . a teller or an automated teller machine (ATM), or . . . a virtual terminal in an internet-type transaction." *Id.* at 2:47-49. The "charge card" refers to "credit cards" as well as "debit and ATM card processing" and any "equivalent or similar payment mechanisms." *Id.* at 4:12-16.

32. Before the customer signs for the purchase, the "merchant terminal 3 connects, through a modem 5, to an acquirer 6" and the acquirer "checks against its data sources whether or not the transaction should be authorized." *Id.* at 2:56-60. At the same time, the acquirer also checks "the customer's set preferences concerning the notification/authorization options." *Id.* at 2:60-63. The customer's profile can be "set to simple 'notification,' which means the system only notifies the cardholder by sending a message" to the customer. *Id.* at 2:64-66. Alternatively, the profile may require a "prompt [to the customer] to confirm the purchase." *Id.* at 3:4-6.

33. The '310 patent asserts that this notification/authorization method "does not add any time to the transaction" but that any "delay" may be justified by

“[t]he added security.” *Id.* at 3:15-18. However, any delay can be avoided if the customer “provide[s] preauthorization when a charge request is imminent” by “call[ing] ‘ahead’ and provid[ing] preauthorization for the impending purchase.” *Id.* at 3:20-25.

34. The '310 patent further states that the notification/authorization can go to “a third party” which would “be beneficial in a parent/child relationship, or in an employer/employee relationship.” *Id.* 4:27-30.

35. Figures 1 and 2 of the '310 patent are reproduced below.

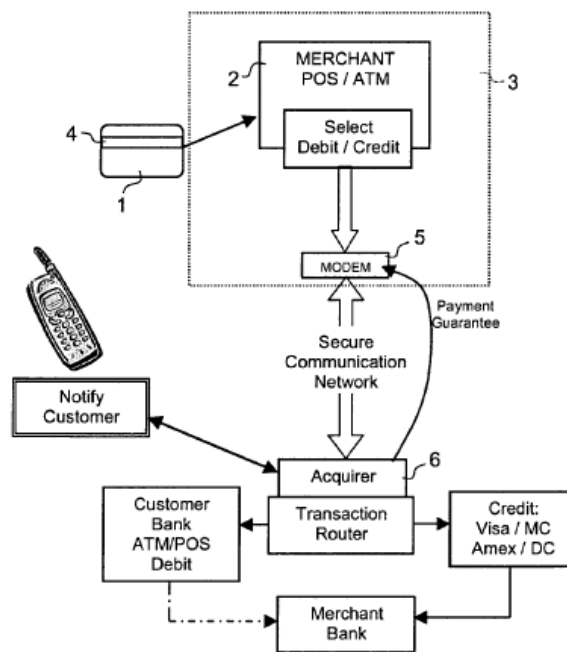


FIG. 1

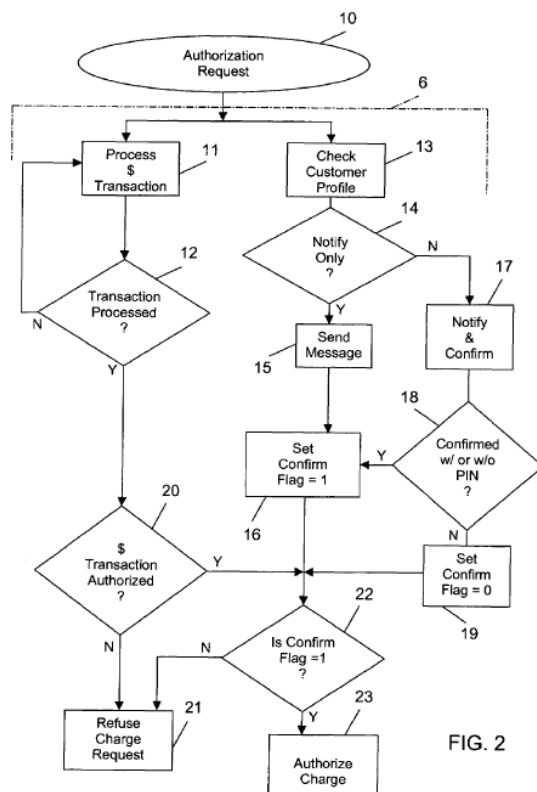


FIG. 2

VIII. Scope and Summary of Analysis and Conclusions

36. For the reasons explained in detail below, a person of ordinary skill in the art would have been motivated to combine the disclosures of Horie and Kobayashi.

37. The disclosure of Horie discloses and/or renders obvious each and every element of claims 1-4 of the '310 patent; claims 1-2 of the '706 patent; and claims 1-9 of the '564 patent.

38. The disclosure of Kano discloses and/or renders obvious each and every element of claims 6-7 of the '706 patent.

39. Horie, in view Kobayashi and the knowledge of a person of ordinary skill in the art, discloses and/or renders obvious claims 3-5 of the '706 patent and claims 10-19 of the '564 patent.

40. In reaching this conclusion, I have analyzed the disclosures of each reference and compared those prior art references to each and every element of the challenged claims.

41. I have been informed and understand that Askeladden has provided tables summarizing the proposed grounds of invalidity in its petitions for IPR. I have reproduced those tables below.

U.S. 7,357,310			
Ground	35 U.S.C.	Claims	References
1	§ 102	1-4	Horie
2	§ 103	1-4	Horie in view of the knowledge of a POSITA

U.S. 7,954,706			
Ground	35 U.S.C.	Claims	References
1	§ 102	1-2	Horie
2	§ 103	1-2	Horie in view of the knowledge of a POSITA
3	§ 103	3-5	Horie in view of Kobayashi and the knowledge of a POSITA
4	§ 102	6-7	Kano
5	§ 103	6-7	Kano in view of the knowledge of a POSITA

U.S. 8,783,564			
Ground	35 U.S.C.	Claims	References
1	§ 102	1-9	Horie
2	§ 103	1-9	Horie in view of the knowledge of a POSITA
3	§ 103	10-19	Horie in view of Kobayashi and the knowledge of a POSITA

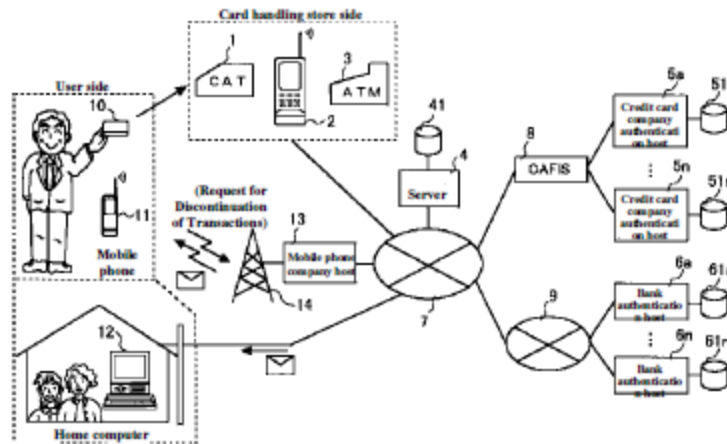
IX. Summary of the Prior Art

42. I have been informed and understand that Askeladden has prepared summaries of the prior art references at issue in the above-captioned IPR proceedings. I have reviewed those summaries, as well as the certified translations of the prior art references themselves, and I agree with Askeladden’s summaries. I reproduce those summaries below for reference.

A. Horie (Ex. 1006)

43. Horie was published on May 10, 2002, and is therefore prior art under pre-AIA 35 U.S.C. § 102(b). Horie was not cited during prosecution of the ’564 patent. Horie discloses “a card usage status notification method that automatically notifies a card user [] that a card payment transaction has occurred . . . using an informational terminal device such as a mobile phone or a personal computer” Ex. 1006, [0001].

44. Figure 1 depicts “a schematic configuration of the entire card payment transaction system” *Id.* at [0039].



45. As shown, the method “has a card transaction terminal device . . . , an information processing company server 4, a credit card company authentication host 5 for card authentication processing when using a credit card, a bank authentication host 6 for card authentication processing when using a debit card (cash card), a network 7 connecting them, [and] a mobile phone company host 13 . . .” *Id.* at [0076]. According to Horie, “when there is a card payment transaction, a processing request for card usage status notification from the side of the card authentication host 5 to 6 is received at the server 4 once . . . and a processing request is sent from the side of the server 4 to the host of the applicable mobile phone company to make such a notification.” *Id.* at [0077].

46. In one embodiment of Horie, “the special processing for notification is continued until the specific signal and/or specific data is sent from the mobile phone company host 13 to the mobile phone 11.” *Id.* at [0078]. In this way, “various preset incoming behavior patterns” such as “an incoming melody,

vibration in manner mode, [or] lighting of a light” “allow the mobile phone user to know that a particular card has been used for a payment transaction.” *Id.* at [0079]. Further, “specific data indicating the content of card payment transactions can be transmitted from the mobile phone company host to a mobile phone 12, and the mobile phone 12 can display the content on the display by text, etc.” *Id.*

47. Horie discloses as a goal “to provide a card usage status notification method that more quickly and reliably notifies a user to that effect, thereby enabling detection of card fraud” *Id.* at [0006]. Therefore, “a father who wants to keep track of the credit card usage status of his wife and children at all times can find out more quickly and reliably without notification from his family.” *Id.* at [0013].

48. Horie discloses “card[s]” which can include “a credit card, a debit card” as well as “various payment transaction cards such as cash advance cards issued by consumer financial institutions.” *Id.* at [0009]. A “card payment transaction,” as described by Horie, includes “product purchases, cash advance services, deposits and withdrawals to and from bank accounts, and the like.” *Id.*

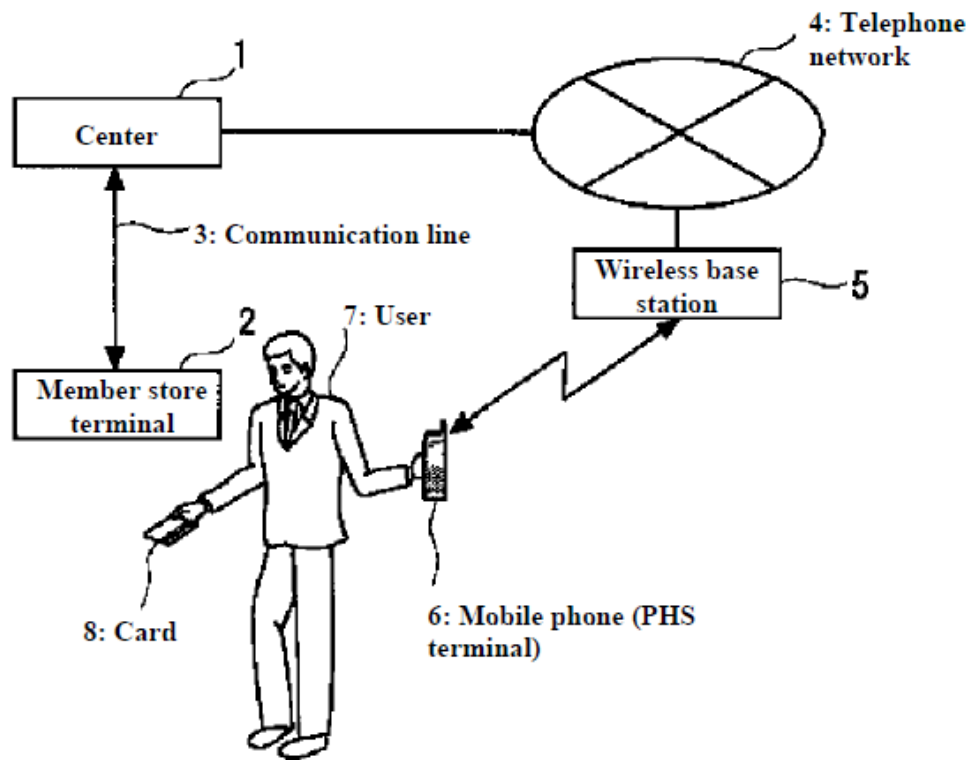
49. Finally, according to Horie, “when using card payment transactions, both normal card authentication processing and card usage status notification . . . are performed simultaneously.” *Id.* at [0043].

B. Kobayashi (Ex. 1007)

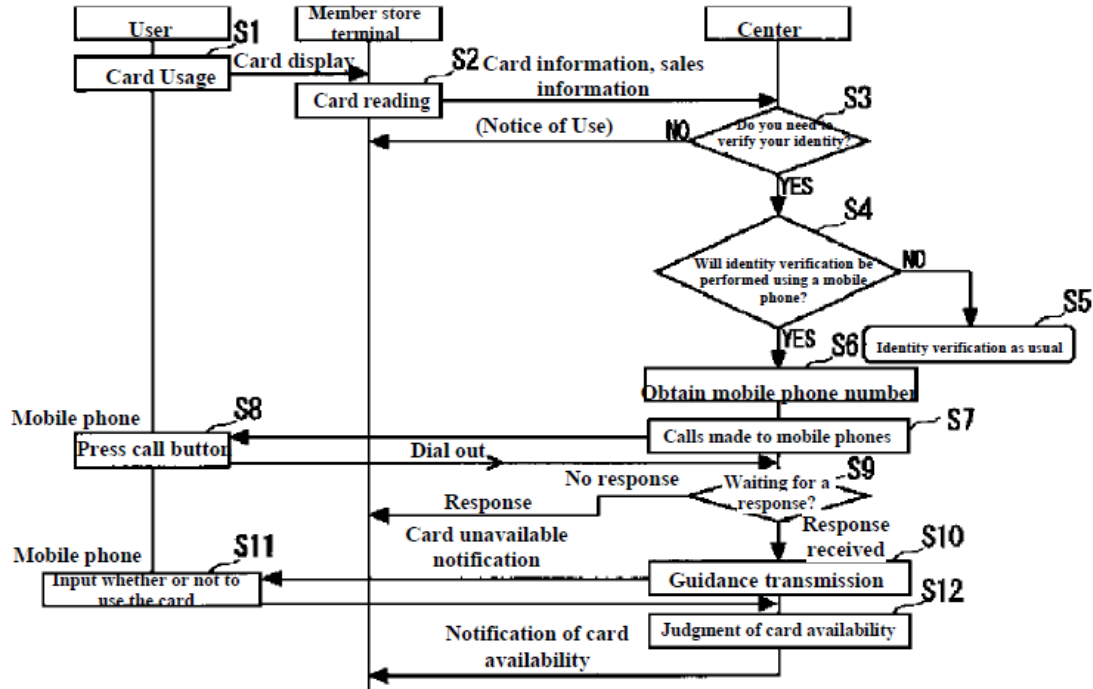
50. Kobayashi was published on November 2, 2001, and is therefore prior art under pre-AIA 35 U.S.C. § 102(b). Kobayashi was not cited during prosecution of the '564 patent. Kobayashi discloses “a card usage status notification method that automatically notifies a card user [] that a card payment transaction has occurred . . . using an informational terminal device such as a mobile phone or a personal computer” Ex. 1007, [0001].

51. Fig. 1 is “a diagram showing a system configuration of the present invention.” *Id.* at [0040]. Figure 4 is a diagram that explains “the processing flow of the user 7 (mobile phone 6), member store terminal 2, and center 1 in one embodiment of the present invention.” *Id.* at [0053].

[FIG. 1]



[FIG. 4]



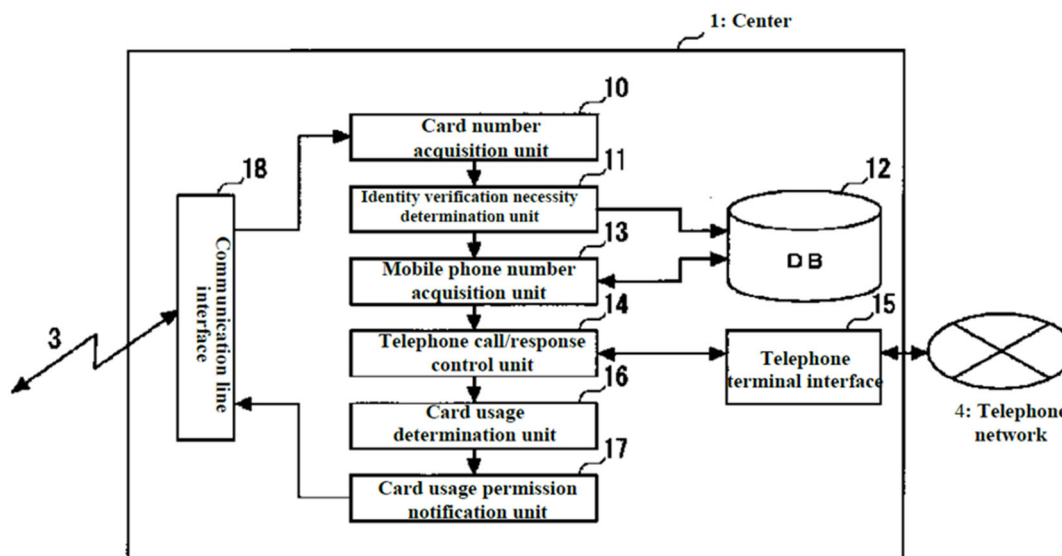
52. According to Kobayashi, the method includes “a member store terminal 2 having a credit card reader, and a center 1 of a credit card company which is connected to the member store terminal 2 via a communication line 3 and performs card management.” *Id.* at [0040]. “When a user 7 uses a card for payment at the time of purchasing a product at a card member store . . . the card information and sales information are transmitted from the member store terminal 2 to the center 1 via [a] communication line 3.” *Id.* at [0042].

53. The center will then “retrieve[] the telephone number of the portable telephone set of the user registered in advance from the card number transmitted

from the member store terminal 2 and makes a call to the portable telephone set 6 of the user.” *Id.* at [0043]. Then if “the user makes a speech connection in response to the incoming call notice . . . that the card can be used . . . the use of the card is enabled.” *Id.* at [0044].

54. Figure 2 shows a process for determining whether to seek user authorization by the center. The center “includes a database 12 in which a mobile phone number, a password, and the like of a member are registered as member information in association with a card number (ID) for each member.” *Id.* at [0047]. When the center receives card information, it will “search[] a database 12 from the card number, and confirm[] whether or not a mode for performing principal confirmation by a cellular phone is set from record data corresponding to the card number.” *Id.*

[FIG. 2]



55. According to Kobayashi, “[w]hen a portable telephone set 6 . . . responds to a call from a center 1 . . . and card usable information is inputted” then the card is made usable. *Id.* at [0048]. However, when the user provides “information indicating that the card cannot be used” or “when the mobile phone 6 does not respond to a call from the mobile phone 6” then the card is set to “be unavailable.” *Id.* at [0049].

56. The user, “[a]t the time of creating the card” will describe in the application form “whether or not to perform identity verification using a mobile phone” and the “telephone number and password of the mobile phone owned by the user.” *Id.* at [0050].

C. Kano (Ex. 1011)

57. Kano was published on January 31, 2002, and is therefore prior art under pre-AIA 35 U.S.C. § 102(b). Kano was not cited during prosecution of the ’706 patent. Kano discloses “a commercial transaction method, device, and system that can authenticate [a] person without disclosing confidential data such as credit numbers to a person authentication institution or credit card company, and can safely settle the purchase of goods.” Ex. 1011, 7:39-42.

58. In the purchasing method of Kano, the customer will set his/her mobile phone “to the mobile shopping mode” and then enters information related to the purchase he/she wishes to make including “the store ID,” “his or her

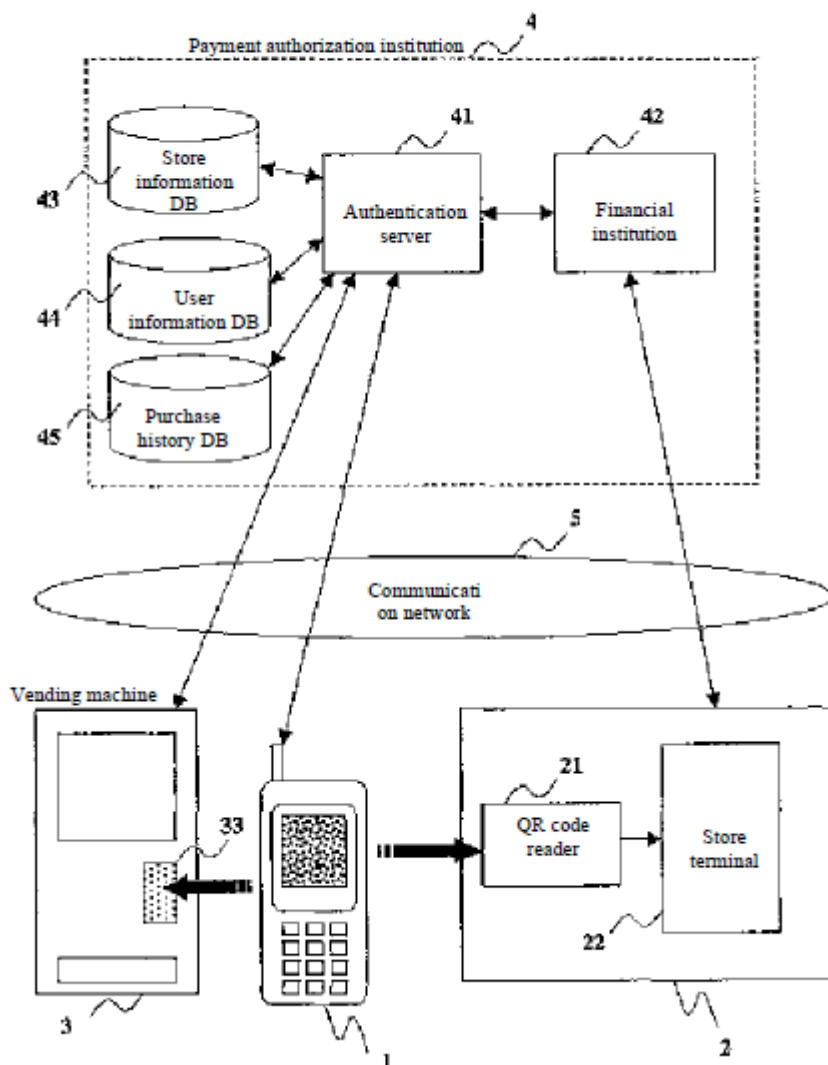
personal ID number,” “the payment method,” and “the purchase price of the product.” *Id.* at 13:33-37. The information inputted by the user “is sent to the authentication server” for an authorization request and the authentication server “performs authentication processing for the store and the user.” *Id.* at 13:47-49. The authentication server will verify that “the store ID is registered,” “the user with the PIN number and the credit card number . . . is registered,” and the “usage limit or the balance” of the user’s input. *Id.* at 13:50-14:8. Based on these verifications, “a transaction prohibition message or QR authorized certification key is generated” and “transmitted to the mobile phone.” *Id.* at 14:9-14.

59. If the transaction is approved, “a QR authorized certification key consisting of a two-dimensional code . . . is generated . . . and transmitted to the mobile phone.” *Id.* at 14:12-14. The user then “presents the pre-selected desired product to the store staff,” “places an order for the desired product,” and “inserts and attaches the mobile phone 1 with the QR authorized key 1201 displayed to the reader portion of the QR code reader 21 attached to the store terminal 22.” *Id.* at 14:20-24. Finally, if the QR code “is recognized as genuine” then “the authentication server 41 returns the detailed settlement approval to the store terminal 22.” *Id.* at 14:49-50.

60. Figure 1 of Kano is reproduced below.

[FIG. 1]

FIG. 1



X. Claim Construction

61. As I stated earlier, I have been informed and understand that a claim in an *inter partes* review shall be construed according to the plain and ordinary meaning of such claim as understood by one of ordinary skill in the art in light of the specification and the prosecution history pertaining to the patent. I have been

informed and understand that claim terms are generally given their plain and ordinary meaning as would be understood by a person of ordinary skill in the art in the context of the entire disclosure of the patent. Unless otherwise specified in this declaration, I have applied that plain and ordinary meaning of the claim terms of the patents at issue in my analysis and conclusions.

62. I have been informed and understand that Askeladden has not proposed any claim terms in any of the patents at issue for construction. I agree. None of the challenged claims of the patents at issue recites any terms of art or limitations that have a specialized meaning in the relevant field, based on my knowledge and experience.

63. The independent claims of the '310 patent recite "merchant's", in the context of "a merchant's" or "the merchant's". See '310 patent, claims 1, 3. For example, claim 1 of the '310 patent recites "gathering, at a merchant's, account information...". Independent claim 1 of the '706 patent also recites a or the "merchant's." I have reviewed the prosecution history of the '310 patent, and in the prosecution history the applicant made several references to a "merchant's terminal." For example, the applicant explained that the "secure network and the 'payment guarantee' channel are illustrated between the acquirer 8 [sic] and the modem 5 of the merchant's terminal." '310 patent prosecution history, at 45. While I have been informed and understand that this is not an express construction

proposed by Askeladden, I have applied this understanding of the context of references to “merchant’s” in my analysis with respect to the ’310 patent and the ’706 patent.

64. I reserve the right to supplement my analysis in the event that the Board adopts any specific construction for any claim term of the patents at issue beyond the plain and ordinary meaning of the claim term as it would have been understood by a person of ordinary skill in the art.

XI. Motivations to Combine and/or Modify the Prior Art

A. Legal standard for combining and/or modifying prior art

65. I have been informed and understand that a combination of familiar elements according to known methods which yields no more than predictable results is likely obvious to one of skill in the art. I have further been informed and understand that one rationale to support a conclusion of obviousness is the use of a known technique to improve similar devices (methods, or products) in the same way. I have further been informed and understand that to establish that a modification is the use of a known technique to improve similar devices and methods in the same way, it is necessary to establish (1) that the prior art contained a “base” device/method upon which the claimed invention can be seen as an “improvement,” (2) a finding that the prior art contained a “comparable” device/method that is not the same as the base device/method and that has been

improved in the same way as the claimed invention, and (3) that the skilled artisan could have applied the known “improvement” technique in the same way to the base device/method with predictable results.

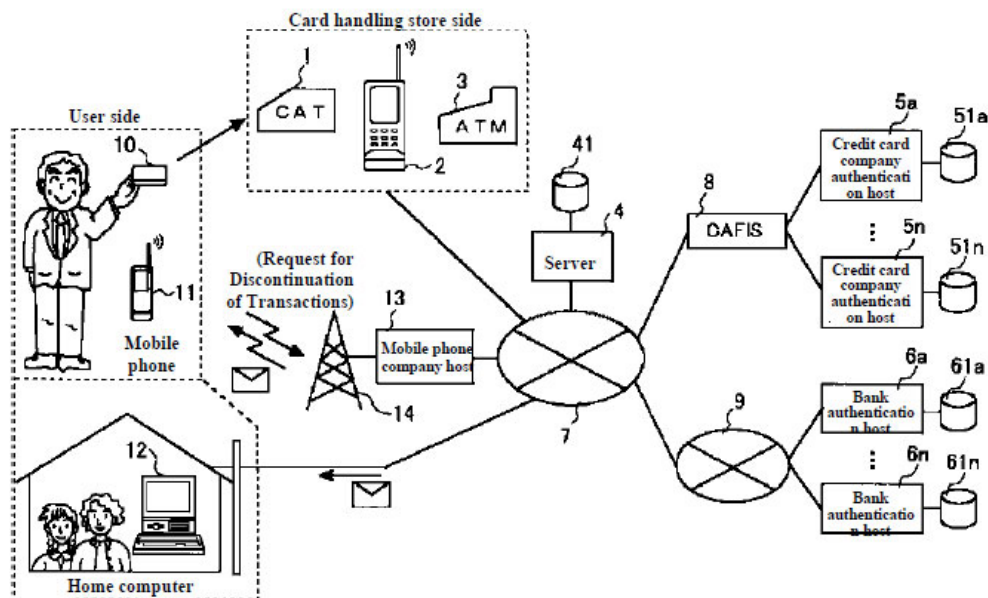
B. Motivation to Combine Horie and Kobayashi

66. Based on my knowledge and experience in the field and my review of Horie and Kobayashi, a person of ordinary skill in the art would have been motivated to combine these references. Horie describes the “base” system for processing transaction requests and notifying customers thereof, and Kobayashi discloses a specific technological improvement to that system that a person of ordinary skill in the art would have been motivated to combine with the system disclosed in Horie prior to March 11, 2005.

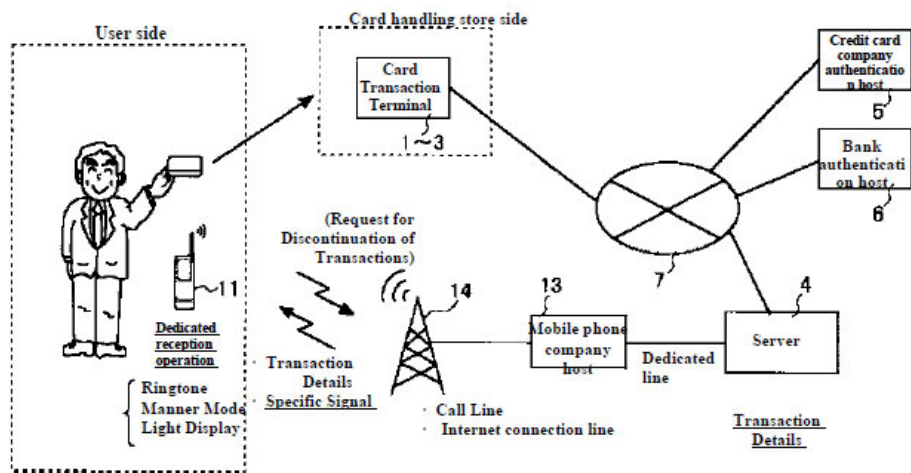
67. More specifically, Horie and Kobayashi both describe systems and methods for settlement of commercial transactions and are within the same technological field. For instance, Horie discloses “a card payment transaction system that enables online card payment transactions.” Ex. 1006, Abstract. Similarly, Kobayashi describes “a method, system, and recording medium suitable for preventing unauthorized use of cards such as credit cards used by card members for product payment, financing, etc.” Ex. 1007, [0001].

68. In addition, the hardware described in both Horie and Kobayashi are similar, if not identical. Horie depicts the use of mobile phones, networks (both

wired and wireless), credit/ATM/debit cards, and devices for processing point-of-sale transactions or banking transactions. *See, e.g.,* Ex. 1006, Figs. 1, 9.



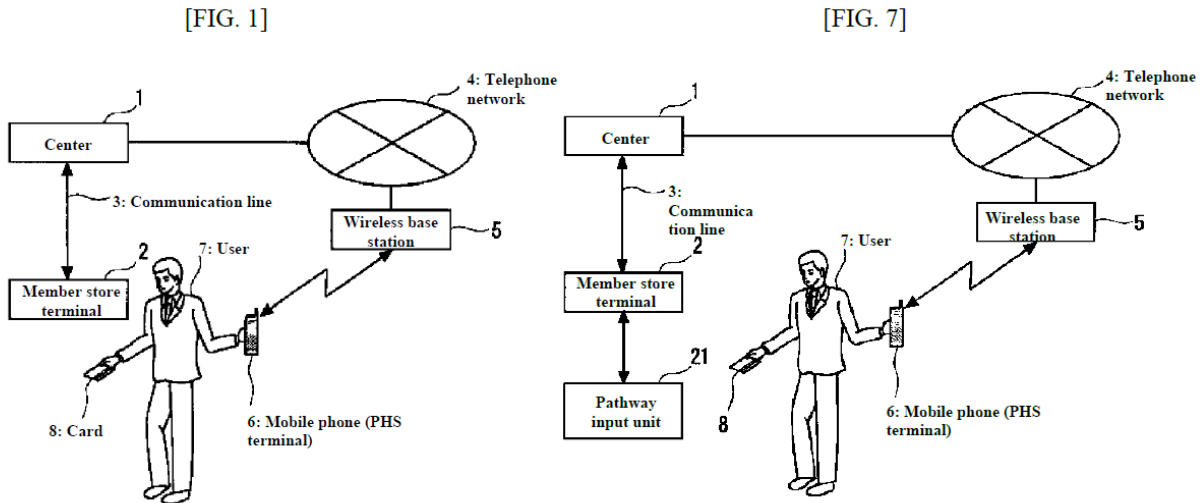
[FIG. 9]



69. Likewise, Kobayashi depicts and describes the use of mobile devices, transaction cards (ATM/debit/credit), and wired/wireless networks for the

processing of those transactions and communications with related mobile devices.

See, e.g., Ex. 1007, Figs. 1, 7.



70. Furthermore, Horie and Kobayashi both address problems and provide complementary solutions related to the usage of credit/debit/ATM cards and unauthorized uses thereof. For example, Horie discloses “a card authentication host is provided with a means to create an email to notify the user of a card payment transaction.” Ex. 1006, Abstract. Kobayashi describes “a method and system that can confirm the user’s identity when the user uses a card and prevent unauthorized use by a third party.” Ex. 1007, Summary.

71. For the reasons stated above, a person of ordinary skill in the art at the time of alleged invention would have considered Horie and Kobayashi to be in the same technical field of art. I have been informed and understand that a person of ordinary skill in the art would generally look to analogous prior art for purposes of

establishing whether there was a motivation to combine certain references. Based on my analysis of Horie and Kobayashi and the reasons I listed above, a person of ordinary skill in the art would have considered Horie and Kobayashi to be analogous prior art.

72. As I stated above, a person of ordinary skill would have considered Horie to be the “base” system, because Horie describes the use of transaction notifications that can be sent to a mobile device belonging to a customer for the purposes tracking transaction activity and preventing fraudulent card use. Ex. 1006, [0073]. With respect to preventing fraudulent card use, Horie explains that “it would be possible to prevent fraudulent card use by making it possible to issue a transaction cancellation request to the authentication hosts 5 to 6 via the mobile phone 11.” *Id.* at [0073]. However, Horie does not describe how to implement a “transaction cancellation request” on a technical level or provide any details as to how such a cancellation request might be sent from a mobile device to an authentication host to prevent fraudulent card usage.

73. Based on my knowledge and experience, a person of ordinary skill in the art who was attempting to practice the system described in Horie would have looked to other known technologies and algorithms for issuing a “transaction cancellation request,” given the absence of this detail from Horie. This would have been nothing more than the application of other known processes in a comparable

system to achieve the predictable result of controlling which transactions may or may not be processed by a system based on the communications between the merchant, the authentication host, and the customer/card holder. Kobayashi discloses one such known technique for doing so.

74. According to Kobayashi, in “a mode in which identity verification is performed by a mobile phone, the phone number of the mobile phone registered corresponding to the card number is searched and obtained from database 12 (step S6), and the phone number of the mobile phone is automatically dialed (step S7).” Ex. 1007, [0057]. Kobayashi further discloses that the “user enters the card acceptability input (number and #, etc. agreed with the card company) from the mobile phone 6 (Step S11). The input information indicating whether the card can be used or not may be a number determined at the time of card creation (for example, 1 for usable and 0 for unusable), or a predetermined operation button.” *Id.* at [0060]. As a result of the user entering a 1 or 0, for example (or other sufficient input information), Kobayashi states that “center 1 judges the card usage permission information transmitted from the mobile phone 6, determines whether the card can be used (step S12), and notifies the member store terminal 2 of the determination result of the usage permission.” *Id.* at [0061]. In other words, Kobayashi discloses a simple solution for issuing a transaction

cancellation/approval through a mobile device in response to receipt of a notification via the mobile device that a transaction is occurring.

75. Given the simplicity and efficiency of Kobayashi's disclosed implementation of a way to issue a transaction cancellation/approval, a person of ordinary skill in the art would have been motivated to look to Kobayashi's disclosure as an implementation detail that would have supplemented and complemented the technical details provided by Horie in order to practice Horie's system. This would have been the simple use of the same types of hardware, in the same technological context, to achieve the very predictable result of sending an input via conventional mobile device hardware features (such as a 0 or 1 button) to a remote system and configuring the remote system to respond to such an input. Because Horie and Kobayashi describe the same hardware being used in the same technical field, a person of ordinary skill in the art would have expected the implementation details described in Kobayashi to be successful when employed in conjunction with the system described in Horie.

76. In addition, Kobayashi's solution for issuing a transaction cancellation/authorization would have been efficient and easy for a person of ordinary skill to implement in the system described in Horie. The two references describe the same types of hardware, used in similar contexts. Kobayashi's solution could have been implemented in Horie's system without any changes to

that hardware, and minimal software changes would have been needed to implement Kobayashi's solution in Horie's system with no significant added expense. Because Kobayashi's technical details provided a simple, inexpensive means to implement Horie's disclosed goal of issuing transaction cancellation/authorization requests, a person of ordinary skill in the art would have been motivated to combine the disclosures of those references, based on my knowledge and experience.

XII. The Claims of the '310 Patent are Invalid

77. As I explained above, I have been informed and understand that Askeladden asserts the following grounds of invalidity against the claims of the '310 patent:

U.S. 7,357,310			
Ground	35 U.S.C.	Claims	References
1	§ 102	1-4	Horie
2	§ 103	1-4	Horie in view of the knowledge of a POSITA

78. For the reasons I explain below, every limitation of every claim of the '310 patent is disclosed and/or rendered obvious by the cited prior art.

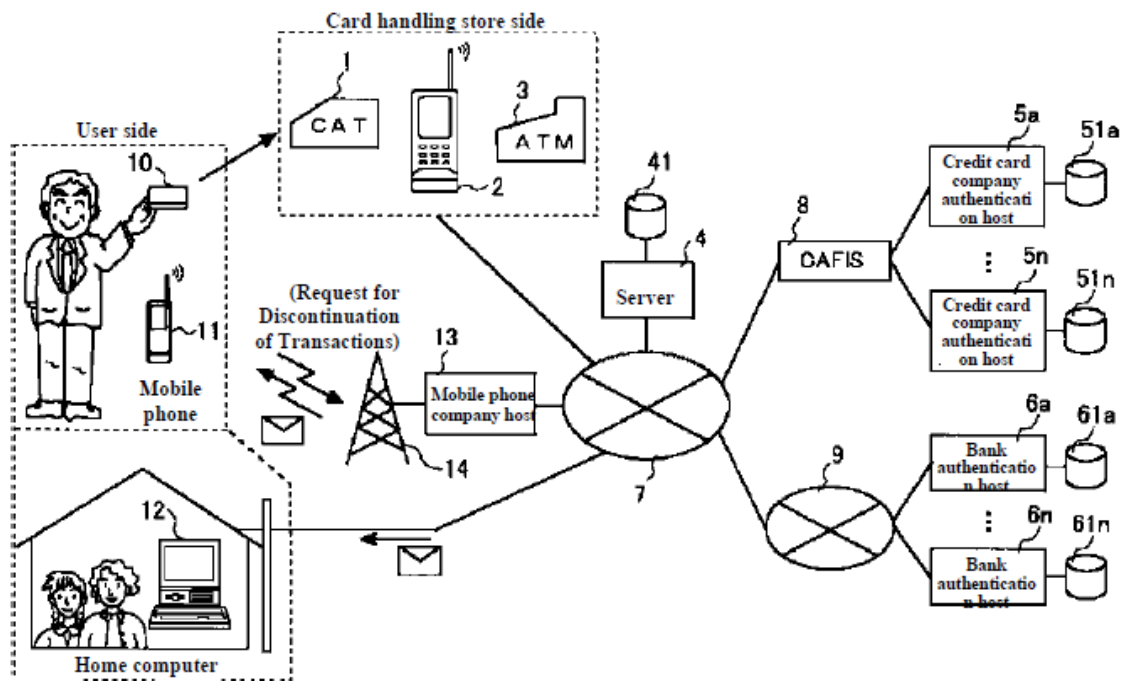
A. Independent claim 1

1. Preamble: A payment authorization method, which comprises:

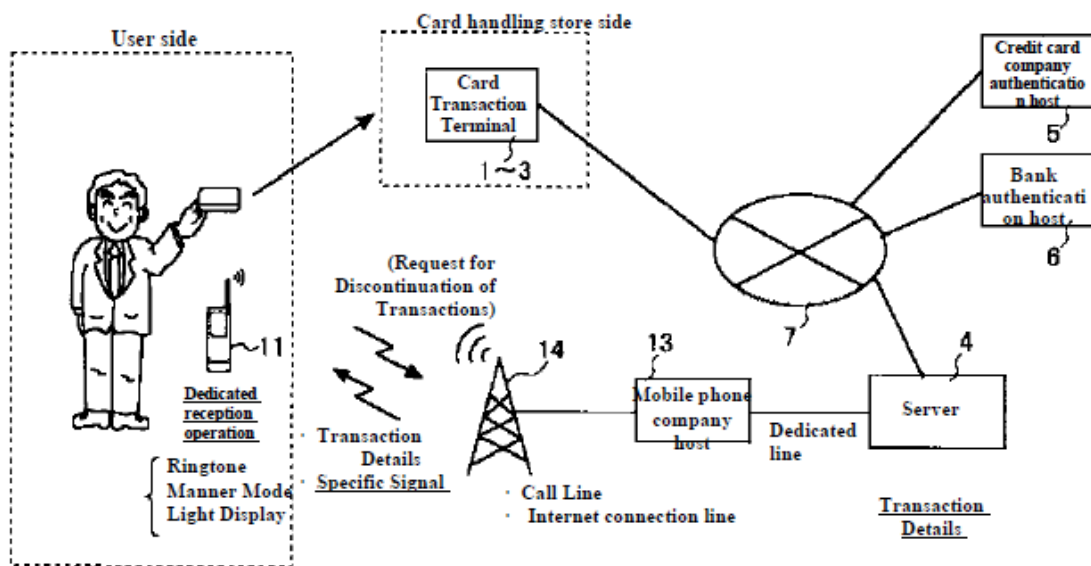
79. I have been informed and understand that the preamble of a claim is generally not limiting. However, to the extent that the preamble is a limitation, this limitation is disclosed by Horie.

80. Horie states that it “relates to a card usage status notification method that automatically notifies a card user, etc. that a card payment transaction has occurred via a network, and a card payment transaction system using the same method.” Ex. 1006, [0001].

81. Figures 1 and 9 of Horie also show a schematic for a system that provides a payment authorization method.



[FIG. 9]



2. Element [1a]: gathering, at a merchant's, account information for payment of a customer's purchase;

82. Horie discloses gathering, at a merchant's terminal, account information for payment of a customer's purchase.

83. Horie discloses the use of a "transaction terminal device" which collects "card information, transaction details information, and other necessary information." Ex. 1006, [0046]. Horie explains that "card information includes card number information," which a person of ordinary skill would have considered to be one example of "account information" as recited by the claim. *Id.* at [0047]. Horie also discloses that "[t]ransaction details information" includes "transaction type," "transaction amount," and "payment method," for example, which a person of ordinary skill would have considered to be additional examples of account information for payment of a customer's purchase. Ex. 1006, [0047]. As Horie explains, "when card 10 owned by a card user is used for payment transactions via card transaction terminal devices 1 to 3, card authentication processing is performed between card transaction terminal devices 1 to 3 and each authentication host" *Id.* at [0044]. Horie says a "card transaction terminal device" includes "CAT (wireless CAT etc. may also be used), ATM, Kiosk terminal device, etc." *Id.* at [0025]. Horie additionally discloses that the "card transaction terminal device[s] . . . [are] installed on the card handling store side." *Id.* at [0076]. Horie further describes that the CAT, which can be installed at a "card handling store" is

for a “product purchase.” *Id.*, at [0039], [0047]. Thus, the account information is gathered “at a merchant’s.”

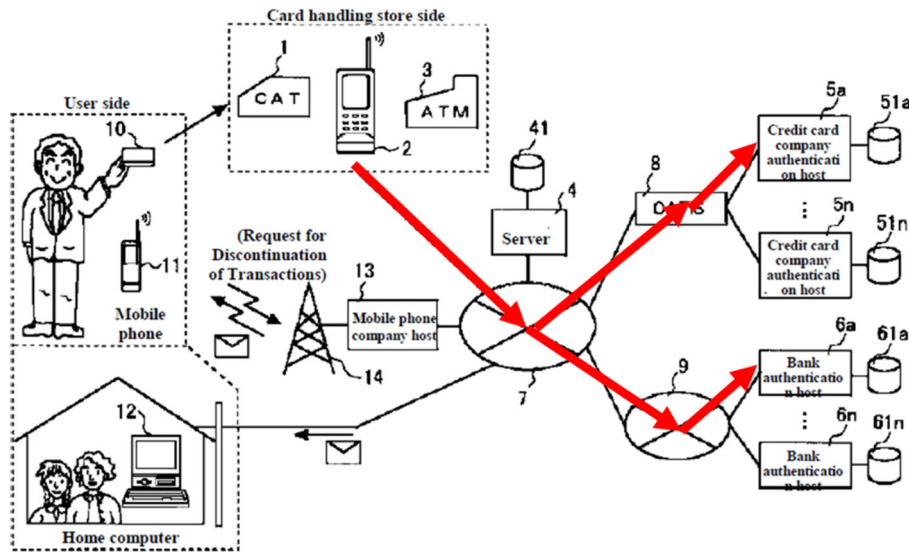
3. Element [1b]: transmitting an authorization request to a financial authorization system requesting payment authorization for the customer’s purchase via a first transmission channel;

84. Horie discloses transmitting an authorization request to a financial authorization system requesting payment authorization for the customer’s purchase via a first transmission channel.

85. Horie describes a “card authentication processing request” from a “card transaction terminal device” to a “card authentication host.” Ex. 1006, [0046] – [0048]. This processing request, according to Horie, is sent through a “a network” that connects “a card transaction terminal device” to “a credit card company authentication host” or a “bank authentication host.” *Id.* at [0076].

86. Horie depicts the first transmission channel in, for example, Figure 1.

[FIG. 1]



Ex. 1006, Fig. 1 (annotated).

87. As shown in the annotated figure above, Horie’s first transmission channel is comprised of “CAT 1 installed in a card handling store, [or] a portable wireless CAT 2...[or] an ATM 3 installed in a bank” (Ex. 1006, [0039]; through the “server 4” (*Id.* at [0040]); the “network 7” (*Id.* at [0039]); the “CAFIS 8” (*Id.* at [0054]); and finally to the “credit card company authentication host 5a to 5n” (*Id.*). However, Horie also describes and depicts the first transmission channel as including “an interbank network, which connects the network 7 and each bank authentication host 6 to 6n” instead of the CAFIS and credit card authentication hosts. *Id.* at [0042].

88. The processing request disclosed in Horie is sent via this channel to the card/bank authentication host, which performs the processing necessary to authorize the transaction. *Id.* at [0054].

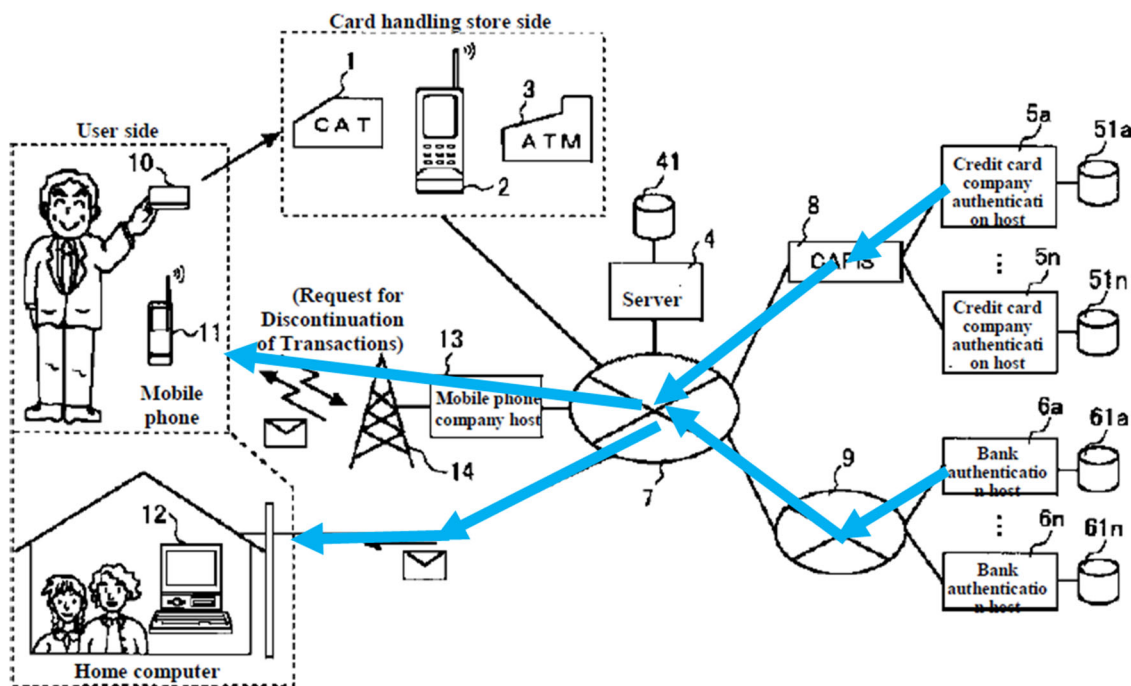
4. **Element [1c]: notifying the customer that the authorization request has been received by transmitting, via a second transmission channel independent of and separate from the first transmission channel between the merchant's and the financial institution, a notification to a communications device associated with the customer; and**

89. Horie discloses notifying the customer that the authorization request has been received by transmitting, via a second transmission channel independent of and separate from the first transmission channel between the merchant's terminal and the financial institution, a notification to a communications device associated with the customer.

90. Horie explains that “when [a] card 10 owned by a card user is used for payment transactions via card transaction terminal devices 1 to 3, card authentication processing is performed between card transaction terminal devices 1 to 3 and each authentication host via CAFIS 8, and an email is sent from the side of sever 4 to the mobile phone 11 owned by the card user and the PC 12 owned by the card user at home to notify the user that there was a card payment transaction.” Ex. 1006, [0044].

91. Horie depicts the second transmission channel in, for example, Figure 1.

[FIG. 1]



Ex. 1006, Fig. 1 (annotated).

92. As shown above, the second transmission channel in Horie is the communication line(s) from the credit card or bank authentication hosts; through the CAFIS or interbank network, respectively; through the network 7 and server 4; and then through the “mobile phone company host 13” (*Id.* at [0076]) via a “relay base station 14” to the customer’s “mobile phone 11” (*Id.* at [0041]). However, Horie also describes and depicts the second transmission channel as including “a personal computer 12 owned by the card user at home [] connected to the network 7.” *Id.* at [0041].

93. The mobile phone 11 and personal computer 12 described in Horie are each examples of a communications device associated with the customer.

94. The first and second transmission channels described and depicted in Horie are “independent of and separate from” each other for several reasons, as would have been understood by a person of ordinary skill. Each of those channels uses different hardware and network connections. For example, the first transmission channel uses CAT / wireless CAT / ATM, and the wired/wireless connection between those devices and the network 7, and does not include the wired/wireless connections between network 7 and the customer’s home computer 12 or the mobile phone company host 13, relay base station 14, or the customer’s mobile phone 11. Meanwhile, the second transmission channel uses the wired/wireless connections between network 7 and the customer’s home computer 12 or the mobile phone company host 13, relay base station 14, or the customer’s mobile phone 11, and excludes the CAT / wireless CAT / ATM, and the wired/wireless connection between those devices and the network 7.

95. In addition, Horie specifically states that “mobile phone company host 13 is connected to the server 4 via a dedicated line,” which would have been understood by a person of ordinary skill to mean that the line would not be used for other communications—*i.e.*, independent of and separate from other communications.

96. The first and second transmission channels that are depicted and described in Horie include separate hardware components, including CATs (both

wired and wireless); ATMs; servers; relay base stations; mobile phones; and home computers. Because each of these devices would have at least its own processor(s), memory, and network/cellular connections, and each of these devices would have operated independent of one another in the sending/receiving of a particular network transmission of data to another device along the channel, a person of ordinary skill would have considered the channels to be independent of and separate from each other.

i. Obviousness

97. As explained above, Horie discloses this element. However, in the event that a finder of fact decides that Horie does not expressly disclose that the second transmission channel is independent of and separate from the first transmission channel, this element would have been obvious to a person of ordinary skill in view of the disclosure of Horie.

98. Horie's "first transmission channel" includes the CAT / wireless CAT / ATM, and the wired/wireless connection between those devices and the network 7, and does not include the wired/wireless connections between network 7 and the customer's home computer 12 or the mobile phone company host 13, relay base station 14, or the customer's mobile phone 11, as I explained above. Horie's second transmission channel" includes the wired/wireless connections between network 7 and the customer's home computer 12 or the mobile phone company

host 13, relay base station 14, or the customer's mobile phone 11, and excludes the CAT / wireless CAT / ATM, and the wired/wireless connection between those devices and the network 7. These differences between the channels described in Horie would have suggested to a person of ordinary skill in the art that separate and independent lines of communication could be employed in Horie's system for the sending/receiving of requests and notifications. For example, Horie explicitly describes "mobile phone company host 13 is connected to the server 4 via a dedicated line." *Id.* at [0076]. A dedicated line, as would have been understood by a person of ordinary skill in the art, would provide an independent, separate line of communication from other lines. This could have been implemented at the time as a dedicated communications port, for example.

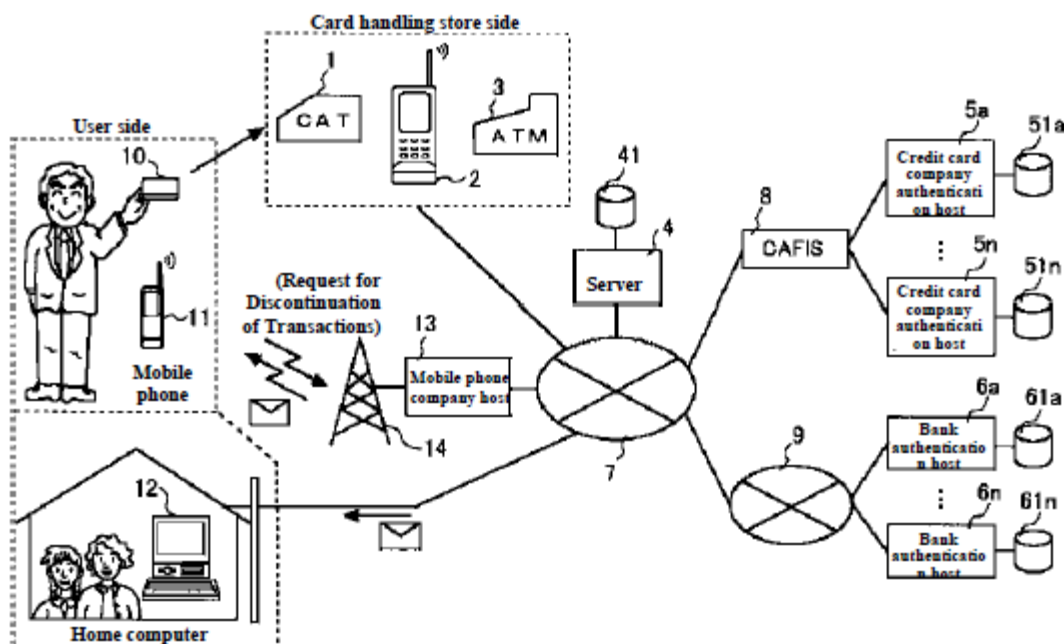
99. Moreover, Horie depicts separate and independent hardware that comprises the first and second transmission channels, and a person of ordinary skill would have considered these individual components, such as CATs (both wired and wireless); ATMs; servers; relay base stations; mobile phones; and home computers to be a means for providing separate and independent first and second transmission channels. This is because those hardware devices would each have at least its own processor(s), memory, and network/cellular connections, and each of these devices would have operated independent of one another in the

sending/receiving of a particular network transmission of data to another device along the channel.

5. **Element [1d]: processing the transaction for payment authorization substantially without requiring a direct communications link between the communications device associated with the customer and the merchant's and substantially without requiring a response to the notification from the communications device associated with the customer.**

100. Horie discloses processing the transaction for payment authorization substantially without requiring a direct communications link between the communications device associated with the customer and the merchant's terminal and substantially without requiring a response to the notification from the communications device associated with the customer.

101. There are no direct links depicted or described between the customer's communications devices (mobile phone 11 and home computer 12) and the merchant's terminals (CAT 1, wireless CAT 2, ATM 3) in Horie. This is evident in, for example, Horie's Figure 1.



Ex. 1006, Fig. 1.

102. Furthermore, the processing described in Horie for payment authorization is performed without the requirement for a response from the customer to the notification of the transaction. According to Horie, “when a payment transaction is made using a card owner by the card user or a family member, the card user can be informed of the fact via e-mail, and can also receive notification of the transaction.” *Id.* at [0071]. Horie further discloses that either “an e-mail is sent to notify the user after the card authentication process in the card payment transaction, [or] the e-mail can also be sent, for example, during the card authentication process.” *Id.* at [0073].

103. Regarding the second embodiment described in Horie above, Horie discloses that “[i]n such a case, for example, it would be possible to prevent

fraudulent card use by making it possible to issue a transaction cancellation request to the authentication hosts 5 and 6 via the mobile phone 11.” *Id.* at [0073]. Neither of these embodiments require any affirmative action on the part of the customer to process a transaction in response to the notification. Horie only discloses an option for the user to cancel a transaction—*i.e.*, stop the processing—by issuing a transaction cancellation request from the mobile phone.

B. Dependent claim 2: The method according to claim 1, wherein the authorization request includes the account information and a monetary amount, and the notification to the communications device associated with the customer includes the monetary amount.

104. Because claim 2 depends from claim 1, I incorporate by reference my analysis for claim 1 of the ’310 patent above.

105. Horie discloses the authorization request includes the account information and a monetary amount, and the notification to the communications device associated with the customer includes the monetary amount.

106. As explained above, Horie discloses a “transaction terminal device” that reads “card information, transaction details information, and other necessary information” and sends the information to a “card authentication host.” Ex. 1006, [0046]-[0048]. The “card information includes card number information,” which is an example of account information. *Id.* at [0047]. And according to Horie, “[t]ransaction details information” includes “transaction type,” “transaction

amount,” and “payment method,” for example, which are examples of account information and a monetary amount. *Id.* at [0047].

107. In Horie, the notification to the communications device associated with the customer includes the monetary amount. Horie discloses that “the email sent to the user shows...payment amount.” *Id.* at [0069]; *see also* Fig. 8.

[FIG. 8]

Card usage information	
About the card used by Mr. <u>Horie</u>	
The following card payment transactions have been confirmed:	
Cards used: ☐ Bank / debit card	
Card Number: 1234-5678-9012-1234	
Transaction date and time: ☐ month ☐ day ☐ hour ☐ minute	
Name of store: Axxess	
Terminal No.: 000000	
Processing number: 6 7 8 9 0 - 1	
Approval Number: 0 0 0 0 0 0 1	
Product classification: Electrical appliances	
Transaction type: ¥ Purchase	
Amount paid:	
Contact information for the above transactions	
Tel: 0 3 - 1 2 3 4 - 0 0 0 0	
Email: . . . @ co . jp	
Web : http://www.acac.co.jp	

C. Independent claim 3

- 1. Preamble: In a charge card payment authorization method, wherein a charge is requested at a merchant's, account information for payment of a customer's purchase is acquired at the merchant's, an authorization request is transmitted from a terminal associated with the merchant's to a remote charge processing facility, and the charge request is processed, the improvement which comprises:**

108. Horie discloses a charge card payment authorization method, wherein a charge is requested at a merchant's terminal, account information for payment of a customer's purchase is acquired at the merchant's terminal, an authorization request is transmitted from a terminal associated with the merchant's to a remote charge processing facility, and the charge request is processed. I have been informed and understand that independent claim 3 is a *Jepson* claim, which recites elements in the preamble that are prior art. However, I note that the prior art discloses the elements of the preamble as I explain below.

109. I incorporate by reference my analysis for claim 1 of the '310 patent, preamble; claim [1a] of the '310 patent; claim [1b] of the '310 patent; and claim [1d] of the '310 patent, above.

- 2. Element 3[a]: processing the charge request substantially exclusively through communication between the merchant's and the remote processing facility and substantially without requiring activity on the part of the customer,**

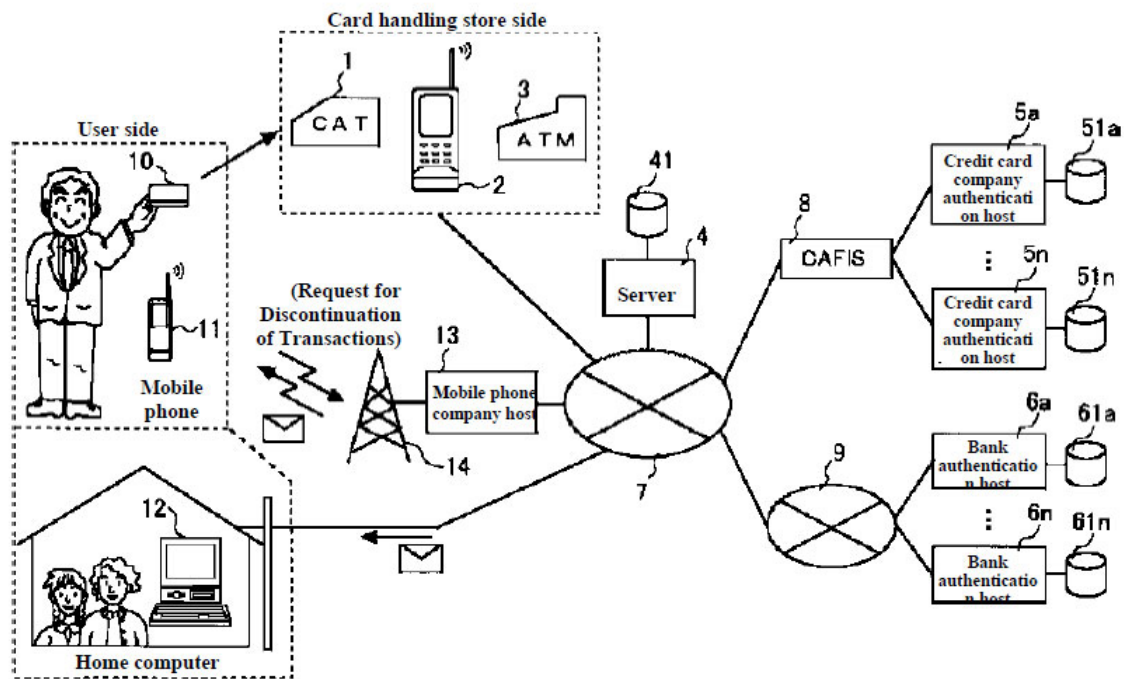
110. Horie discloses processing the charge request substantially exclusively through communication between the merchant's terminal and the

remote processing facility and substantially without requiring activity on the part of the customer.

111. I incorporate by reference my analysis for claim [1b] of the '310 patent above.

112. Horie discloses that the charge request between the merchant's terminal and the remote processing facility is processed substantially exclusively through communication between the merchant's terminal and the remote processing facility because none of that communication occurs or otherwise involves the customer. As one example, Horie explains that "when [a] card 10 owned by a card user is used for payment transactions via card transaction terminal devices 1 to 3, card authentication processing is performed between card transaction terminal devices 1 to 3 and each authentication host via CAFIS 8." Ex. 1006, [0044].

113. Furthermore, the figures in Horie do not show any direct connections between the customer's devices (computer, mobile phone), and the merchant's terminal (ATM, CAT, wireless CAT).

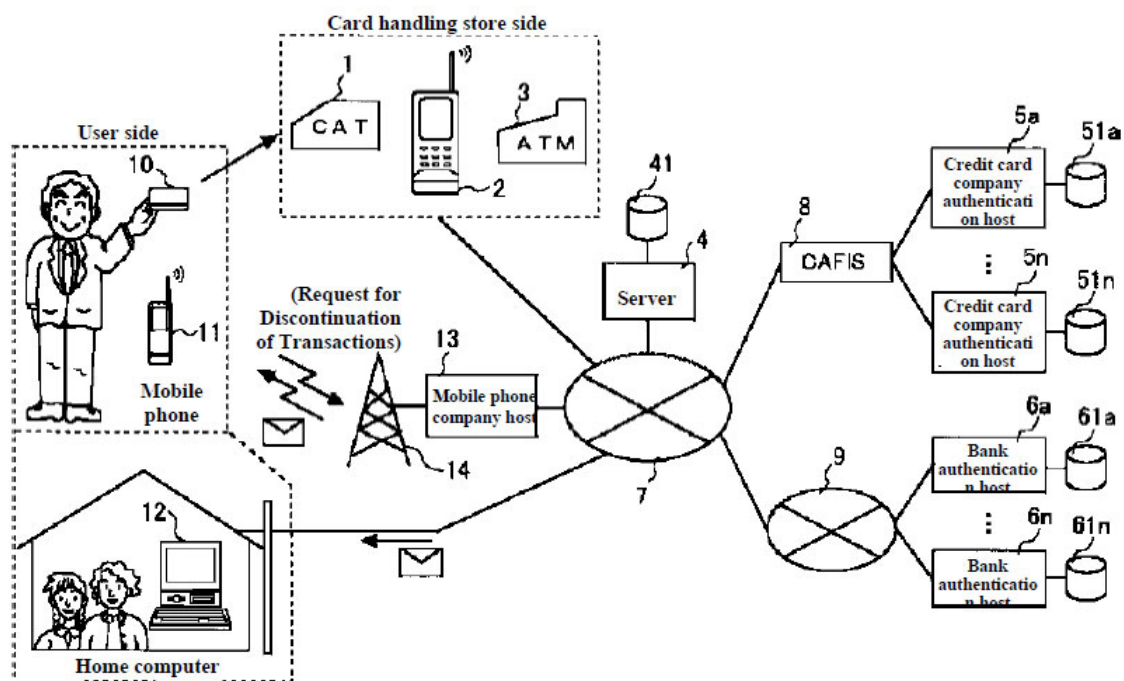


114. As I explained above with respect to claim [1d], Horie does not require any activity by the customer for processing the request. I incorporate by reference my analysis with respect to claim [1d] of the '310 patent above.

i. Obviousness

115. As explained above, Horie discloses this element. However, in the event that a finder of fact decides that Horie does not expressly disclose processing the charge request substantially exclusively through communication between the merchant's terminal and the remote processing facility and substantially without requiring activity on the part of the customer, this element would have been obvious to a person of ordinary skill in view of the disclosure of Horie.

116. As depicted and described in Horie, for example in Figure 1, the customer's devices (mobile phone, home computer) are not shown or discussed as being involved in the communications between the merchant's terminal (CAT, wireless CAT, ATM), and the authentication hosts.



Ex. 1006, Fig. 1.

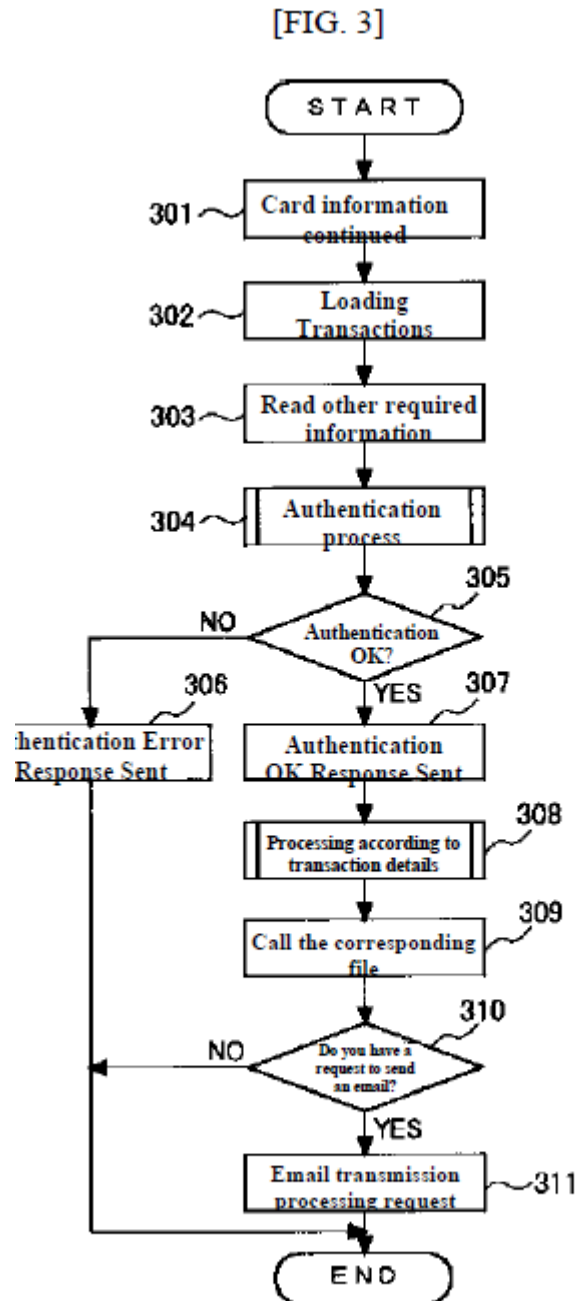
117. Although Horie discloses that the request for transaction processing and the customer notification are both transmitted through “network 7”, among other elements, a person of ordinary skill would not have considered the use of the network for these purposes to be any less “exclusive” of each other, particularly because of the nature of network / Internet communications.

118. Network communications such as Horie describes were, at the time of the alleged invention, transmitted as individually packetized and routed pieces of data, each of which was separately addressed to its final destination. Horie additionally discloses that “one host does not necessarily indicate one device or computer,” and “it is possible to realize the host of said [one] by connecting multiple devices to computer, etc. scattered over a network.” Ex. 1006, [0026]. As such, a person of ordinary skill would not have considered Horie’s schematic in Figure 1, where “network 7” is depicted as a single icon, to mean that any traffic passing within would be any less “substantially exclusive” of any other network traffic.

3. Element 3[b]: and transmitting a notification of the charge request to a wireless device associated with the customer no later than immediately after authorizing the charge request.

119. Horie discloses transmitting a notification of the charge request to a wireless device associated with the customer no later than immediately after authorizing the charge request. As Horie explains, “when using card payment transactions, both normal card authentication and card usage status notification via email are performed simultaneously.” Ex. 1006, [0043]. Horie discloses “an e-mail is sent to notify the user *after* the card authentication process in the card payment transaction.” *Id.* at [0073]. And as shown in Figure 3 of Horie, after the transaction is processed according to the transaction details (Step 308), Horie’s

system then determines whether the customer requested notifications and, if so, begins the email transmission processing request to send to the customer (Steps 309-311).



Flowchart showing card authentication host side processing

Ex. 1006, Fig. 3.

120. Horie emphasizes the notification occurring immediately. “[W]hen a payment transaction is made using a card that the card user owns, the card user can immediately know through the mobile phone 11 that the card payment transaction has been made.” *Id.* at [0072].

D. Dependent claim 4: The method according to claim 3, which comprises transmitting the notification immediately upon receiving the charge request and prior to authorizing the charge request.

121. Horie discloses transmitting the notification immediately upon receiving the charge request and prior to authorizing the charge request.

122. As Horie describes, “when using card payment transactions, both normal card authentication and card usage status notification via email are performed simultaneously.” Ex. 1006, [0043]. One embodiment of Horie is disclosed in which “the e-mail can also be sent, for example, *during* the card authentication process.” *Id.* at [0073]. Horie discloses that “[i]n such a case, for example, it would be possible to prevent fraudulent card use by making it possible to issue a transaction cancellation request to the authentication hosts 5 and 6 via the mobile phone 11.” Based on this description, a person of ordinary skill would have understood that sending the e-mail notification during the card authentication process in Horie would have been prior to the conclusion of the process where the

charge is authorized, because that would have been the only way in which fraudulent card use could have been *prevented*.

XIII. The Claims of the '706 Patent are Invalid

123. As I explained above, I have been informed and understand that Askeladden asserts the following grounds of invalidity against the claims of the '706 patent:

U.S. 7,954,706			
Ground	35 U.S.C.	Claims	References
1	§ 102	1-2	Horie
2	§ 103	1-2	Horie in view of the knowledge of a POSITA
3	§ 103	3-5	Horie in view of Kobayashi and the knowledge of a POSITA
4	§ 102	6-7	Kano
5	§ 103	6-7	Kano in view of the knowledge of a POSITA

124. For the reasons I explain below, every limitation of every claim of the '706 patent is disclosed and/or rendered obvious by the cited prior art.

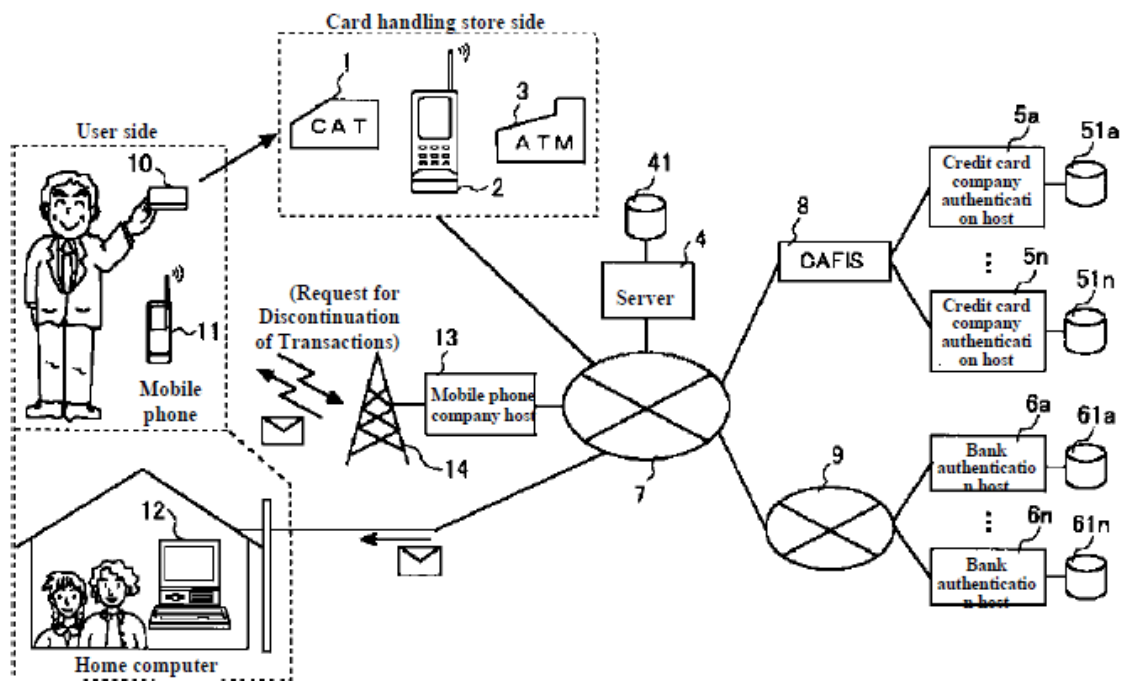
A. Independent claim 1

1. Preamble: A payment authorization method, which comprises:

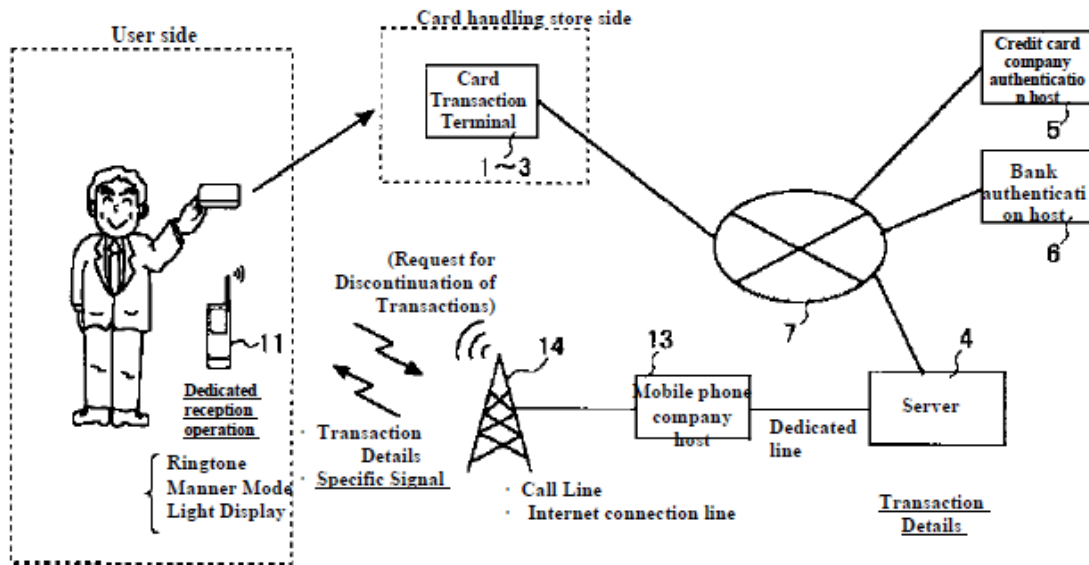
125. I have been informed and understand that the preamble of a claim is generally not limiting. However, to the extent that the preamble is a limitation, this limitation is disclosed by Horie.

126. Horie states that it “relates to a card usage status notification method that automatically notifies a card user, etc. that a card payment transaction has occurred via a network, and a card payment transaction system using the same method.” Ex. 1006, [0001].

127. Figures 1 and 9 of Horie also show a schematic for a system that provides a payment authorization method.



[FIG. 9]



2. Element [1a]: gathering, at a merchant's, account information for payment of a customer's purchase;

128. Horie discloses gathering, at a merchant's terminal, account information for payment of a customer's purchase.

129. Horie discloses the use of a "transaction terminal device" which collects "card information, transaction details information, and other necessary information." Ex. 1006, [0046]. Horie explains that "card information includes card number information," which a person of ordinary skill would have considered to be one example of "account information" as recited by the claim. *Id.* at [0047]. Horie also discloses that "[t]ransaction details information" includes "transaction type," "transaction amount," and "payment method," for example, which a person

of ordinary skill would have considered to be additional examples of account information for payment of a customer's purchase. *Id.* at [0047].

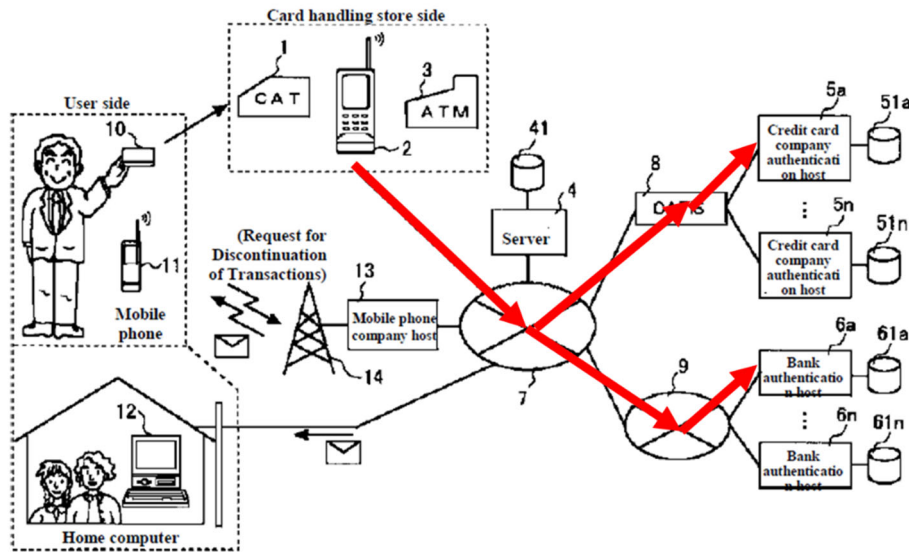
3. Element [1b]: transmitting an authorization request from the merchant's to a financial authorization system requesting payment authorization for the customer's purchase

130. Horie discloses transmitting an authorization request from the merchant's terminal to a financial authorization system requesting payment authorization for the customer's purchase.

131. Horie describes a "card authentication processing request" from a "card transaction terminal device" to a "card authentication host." Ex. 1006, [0046] – [0048]. This processing request, according to Horie, is sent through a "a network" that connects "a card transaction terminal device" to "a credit card company authentication host" or a "bank authentication host." *Id.* at [0076].

132. Horie depicts the means for transmission of the authorization request in, for example, Figure 1.

[FIG. 1]



Ex. 1006, Fig. 1 (annotated).

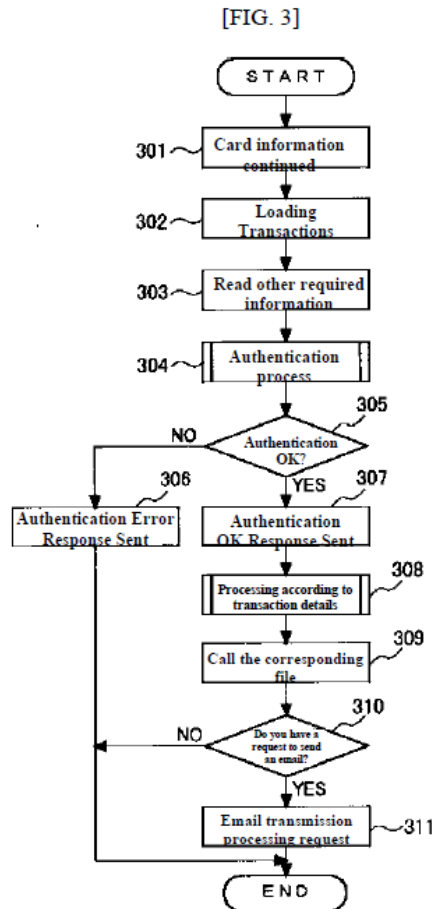
133. As shown in the annotated figure above, Horie describes transmitting an authorization request via “CAT 1 installed in a card handling store, [or] a portable wireless CAT 2...[or] an ATM 3 installed in a bank” (*Id.* at [0039]; through the “server 4” (*Id.* at [0040]); the “network 7” (*Id.* at [0039]); the “CAFIS 8” (*Id.* at [0054]); and finally to the “credit card company authentication host 5a to 5n” (*Id.*). However, Horie also describes and depicts the transmission channel as including “an interbank network, which connects the network 7 and each bank authentication host 6 to 6n” instead of the CAFIS and credit card authentication hosts. *Id.* at [0042].

134. The processing request disclosed in Horie is sent via this channel to the card/bank authentication host, which performs the processing necessary to authorize the transaction. *Id.* at [0054].

4. Element [1c]: checking whether or not a profile is present with regard to the customer and, if the profile is present, checking whether or not the customer has requested notification regarding the authorization request;

135. Horie discloses checking whether or not a profile is present with regard to the customer and, if the profile is present, checking whether or not the customer has requested notification regarding the authorization request.

136. When a customer uses their card to make a transaction, Horie discloses that “a predetermined file is called for determining whether or not to notify the user of the card payment transaction” at the “card authentication hosts.” Ex. 1006, [0057]. According to Horie, “the presence or absence of the email transmission is identified from the card number information received in step 301 and the file.” *Id.* at [0058]; *see also Id.* at Fig. 3.



Flowchart showing card authentication host side processing

137. According to Horie, “[i]f the email notification service is not requested here (step 310 NO), the processing is terminated. That is, in this case, a normal card payment transaction is performed as usual and the process ends. On the other hand, if the email notification service has been applied for (step 310 YES), a request for email transmission processing is made to the server 4 via the network 7 (step 311). That is, in this example, processing for sending e-mail is performed on the server 4 side.” *Id.* at [0059].

138. Horie's call to the predetermined file associated with the customer is thus an example of checking whether or not a profile is present with regard to the customer. Horie explains that "when creating a card, the user must indicate on the application form whether or not to use a mobile phone to verify their identity, and if they wish to use a mobile phone to verify their identity, the telephone number and password of the mobile possessed by the user are recorded in the database 12, and the telephone number of the mobile phone and, if necessary, the password are also associated with the card number (ID) and registered in the database 12. *Id.* at [0050]. Horie further discloses that "[c]ardholders who already have a card can receive the service of the system according to the invention by simply notifying the card company of the mobile phone number owned by the cardholder, and there is no need to issue a new card." *Id.* at [0051]. Horie's further check of whether the user requested an email notification is an example of checking whether or not the customer has requested notification regarding the authorization request.

5. **Element [1d]: if the customer has requested notification, notifying the customer that the authorization request has been received by transmitting a notification to a cell phone or a cellular network-connected communications device associated with the customer; and**

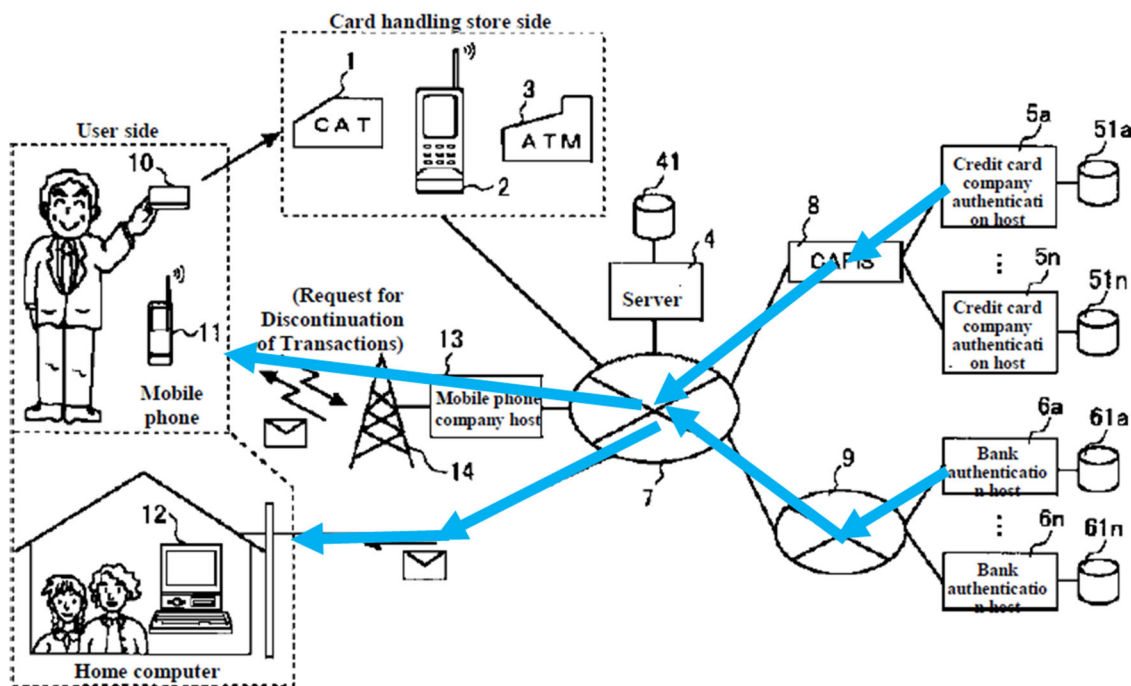
139. Horie discloses if the customer has requested notification, notifying the customer that the authorization request has been received by transmitting a

notification to a cell phone or a cellular network-connected communications device associated with the customer.

140. Horie explains that “when [a] card 10 owned by a card user is used for payment transactions via card transaction terminal devices 1 to 3, card authentication processing is performed between card transaction terminal devices 1 to 3 and each authentication host via CAFIS 8, and an email is sent from the side of sever 4 to the mobile phone 11 owned by the card user and the PC 12 owned by the card user at home to notify the user that there was a card payment transaction.” Ex. 1006, [0044].

141. Horie depicts the means of transmitting the notification in, for example, Figure 1.

[FIG. 1]



Ex. 1006, Fig. 1 (annotated).

142. As shown above, the transmission channel in Horie is the communication line(s) from the credit card or bank authentication hosts; through the CAFIS or interbank network, respectively; through the network 7 and server 4; and then through the “mobile phone company host 13” (*Id.* at [0076]) via a “relay base station 14” to the customer’s “mobile phone 11” (*Id.* at [0041]). However, Horie also describes and depicts the transmission channel as including “a personal computer 12 owned by the card user at home [] connected to the network 7.” *Id.* at [0041]. According to Horie, “specific data indicating the content of card payment transactions can be transmitted from the mobile phone company host to the mobile phone 12, and the mobile phone 12 can display the content of the display by text,

etc.” *Id.* at [0079]. A person of ordinary skill in the art would have considered the display “by text” of “specific data indicating the content of card payment transactions” to be an example of sending a notification including the monetary amount via an SMS message.

143. As explained above, Horie discloses that the email notification is only sent if the user requested such a notification. When a customer uses their card to make a transaction, Horie discloses that “a predetermined file is called for determining whether or not to notify the user of the card payment transaction” at the “card authentication hosts.” *Id.* at [0057]. According to Horie, “the presence or absence of the email transmission is identified from the card number information received in step 301 and the file.” *Id.* at [0058]; *see also Id.* at Fig. 3. The mobile phone 11 described in Horie is an example of a cell phone or a cellular network-connected communications device associated with the customer.

6. Element [1e]: processing the transaction for payment authorization and, if the purchase is authorized, notifying the merchant substantially contemporaneously with the step of transmitting the notification to the cell phone or the communications device associated with the customer.

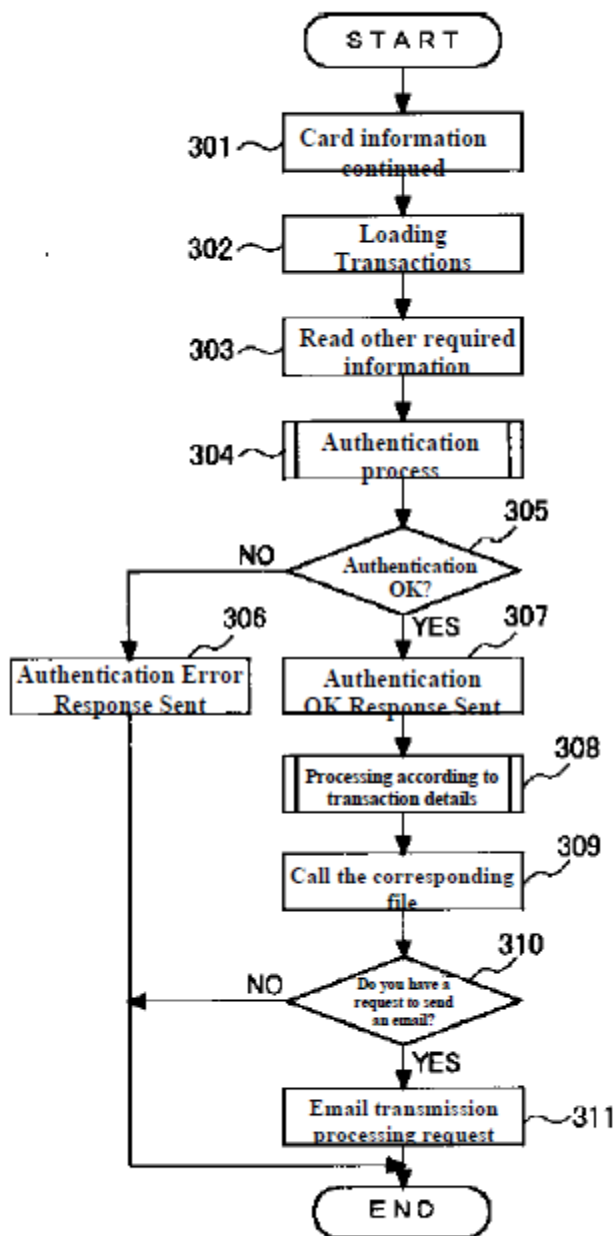
144. Horie discloses processing the transaction for payment authorization and, if the purchase is authorized, notifying the merchant substantially contemporaneously with the step of transmitting the notification to the cell phone or the communications device associated with the customer.

145. According to Horie, “[t]he various types of information that have been read are sent as data to each card authentication host 5-6 (or CAFIS 8), thereby issuing a card authentication processing request (step 204).” Ex. 1006, [0048]. “Thereafter, the response is waited until it is received from the side of each card authentication host (step 205 No, step 206), but when the response is received (step 205 YES), then the content of the response is determined (step 207).” *Id.* at [0049]. “If the received response indicates that authentication is not possible (step 208 NO), a predetermined error processing is performed (step 210), but if authentication is successful (step 208 YES), processing is performed according to the response content, and (step 209) processing is completed.” *Id.* at [0050].

146. Horie further discloses that “[t]he authentication process is then performed based on the received information (step 304)” and that the “card authentication process is actually executed via the CAFIS 8.” *Id.* At [0054].

147. Horie also states that “when using card payment transactions, both normal card authentication processing and card usage status notification via email are performed simultaneously.” *Id.* at [0043]. As depicted in Figure 3 of Horie, the “authentication OK” response is sent to the merchant terminal, and the email notification to the customer is sent.

[FIG. 3]



Flowchart showing card authentication host side processing

148. Horie's disclosure that the authentication processing and email notification processing occur "simultaneously" would have been considered to be

“substantially contemporaneously” by a person of ordinary skill, given that these processes would not require any significant machine time to execute and would have been performed instantaneously by typical computing equipment at the time of the alleged invention.

B. Dependent claim 2: The method according to claim 1, wherein authorization request includes the account information and a monetary amount, and the notification to the communications device associated with the customer in an SMS message including the monetary amount.

149. Because claim 2 depends from claim 1, I incorporate by reference my analysis for claim 1 of the '706 patent above.

150. Horie discloses authorization request includes the account information and a monetary amount, and the notification to the communications device associated with the customer in an SMS message including the monetary amount.

151. As explained above, Horie discloses a “transaction terminal device” that reads “card information, transaction details information, and other necessary information” and sends the information to a “card authentication host.” Ex. 1006, [0046]-[0048]. The “card information includes card number information,” which is an example of account information. *Id.* at [0047]. And according to Horie, “[t]ransaction details information” includes “transaction type,” “transaction amount,” and “payment method,” for example, which are examples of account information and a monetary amount. *Id.* at [0047].

152. In Horie, the notification to the communications device associated with the customer includes the monetary amount. Horie discloses that “the email sent to the user shows...payment amount.” *Id.* at [0069]; *see also* Fig. 8.

[FIG. 8]

The screenshot displays a notification titled "Card usage information" about a card used by Mr. Horie. It lists confirmed card payment transactions, including the card type (Bank / debit card), card number (1234-5678-9012-1234), transaction date and time (month, day, hour, minute), store name (Acess), terminal number (00000), processing number (67890-1), approval number (0000001), product classification (Electrical appliances), transaction type (Purchase), and amount paid. It also provides contact information for the above transactions, including a telephone number (03-1234-0000), an email address (***@***.co.jp), and a website (http://www.acac.co.jp).

Card usage information
About the card used by Mr. Horie

The following card payment transactions have been confirmed:

Cards used: ☐ Bank / debit card

Card Number: 1234-5678-9012-1234

Transaction date and time: ☐ month ☐ day ☐ hour ☐ minute

Name of store: Acess

Terminal No.: 00000

Processing number: 67890-1

Approval Number: 0000001

Product classification: Electrical appliances

Transaction type: ¥ Purchase

Amount paid:

Contact information for the above transactions

Tel: 03-1234-0000

Email: ***@***.co.jp

Web: http://www.acac.co.jp

153. Although one embodiment of Horie describes sending the notification to the customer via email, Horie also discloses “when a card payment transaction occurs, the user is automatically notified of the transaction via a wireless

information terminal device such as a pre-specified mobile phone.” *Id.* at [0018]. Horie states that this is performed “by sending and receiving specific data via a normal phone line of a mobile phone” *Id.* at [0020]. According to Horie, “specific data indicating the content of card payment transactions can be transmitted from the mobile phone company host to the mobile phone 12, and the mobile phone 12 can display the content of the display by text, etc.” *Id.* at [0079]. A person of ordinary skill in the art would have considered the display “by text” of “specific data indicating the content of card payment transactions” to be an example of sending a notification including the monetary amount via an SMS message.

154. At the time of the alleged invention, SMS (short message service) was a de-facto standard for the sending and receiving of text messages between mobile phones. *See, e.g.*, Ex. 1008, at 1:53-63. A person of ordinary skill would have understood Horie’s second embodiment, in which the notification to the customer takes a more simplistic form compared to email (*i.e.*, “an incoming melody, vibration in manner mode, lighting of a light” (Ex. 1006, [0079])) to describe the use of SMS for sending the notification “by text.”

i. Obviousness

155. As explained above, Horie discloses this element. However, in the event that a finder of fact decides that Horie does not expressly disclose

notification to the communications device associated with the customer in an SMS message including the monetary amount, this element would have been obvious to a person of ordinary skill in view of the disclosure of Horie.

156. As I explained above, SMS (short message service) was a de-facto standard for the sending and receiving of text messages between mobile phones. *See, e.g.*, Ex. 1008, at 1:53-63. Based on the disclosure for Horie's second embodiment, in which the notification to the customer takes a more simplistic form compared to email (*i.e.*, "an incoming melody, vibration in manner mode, lighting of a light" (Ex. 1006, [0079])), a person of ordinary skill would have considered it obvious to use an SMS as the manner to send "specific data indicated the content of card payment transactions" from the card authentication host to the customer's mobile phone "by text." Ex. 1006, [0079]. This would not have required any alterations to the hardware of the phone, or any changes to the phone's software. This would have simply been the use of an existing feature common to all mobile phones at the time of the alleged invention to receive and display text-based data.

C. Dependent claim 3: The method according to claim 1, which further comprises prompting the customer to return a response to the notification and authorizing the purchase only when a proper response is returned.

157. Because claim 3 depends from claim 1, I incorporate by reference my analysis for claim 1 of the '706 patent above.

158. Horie and Kobayashi render obvious prompting the customer to return a response to the notification and authorizing the purchase only when a proper response is returned.

159. According to Horie, “although an email is sent to notify the user after the card authentication process in the card payment transaction, the e-mail can also be sent, for example, during the card authentication process. In such a case, for example, it would be possible to prevent fraudulent card use by making it possible to issue a transaction cancellation request to the authentication hosts 5 to 6 via the mobile phone 11.” Ex. 1006, [0073]. As such, Horie provides the customer a means to provide a response “via the mobile phone” to the notification for the purpose of cancelling the transaction.

160. Kobayashi also discloses that “[w]hen set to a mode in which identity verification is performed by a mobile phone, the phone number of the mobile phone registered corresponding to the card number is searched and obtained from database 12 (step S6), and the phone number of the mobile phone is automatically dialed (step S7).” Ex. 1007, [0057]. Then “[i]f the user presses the call button (off-hook) in response to the ringing, etc., of the mobile phone 6 (step S8), the center 1 receives this response (“response received” in step S9) and sends guidance (step S10). The guidance may be audio or text information.” *Id.* at [0058].

161. According to Kobayashi, “[t]he user enters the card acceptability input (number and #, etc. agreed with the card company) from the mobile phone 6 (Step S11). The input information indicating whether the card can be sued or not may be a number determined at the time of card creation (for example, 1 for usable and 0 for unusable), or a predetermined operation button.” *Id.* at [0060]. Finally, “[t]he center 1 judges the card usage permission information transmitted from the mobile phone 6, determines whether the card can be used (step S12), and notifies the member store terminal 2 of the determination result of the usage permission.” *Id.* at [0061].

162. In the context of Horie’s system, Kobayashi thus discloses “prompting the customer to return a response to the notification and authorizing the purchase only when a proper response is returned.” Kobayashi describes the center sending “guidance” (*i.e.*, a prompt to return a response to the notification) to the user’s mobile phone, and the user then enters “card acceptability input” (*i.e.*, a response to the notification). Based on the user’s input, the transaction is either accepted (*i.e.*, authorizing the purchase only when a proper response is returned) or declined.

D. Dependent claim 4: The method according to claim 3, wherein the response includes a personal identifier associated with the customer.

163. Because claim 4 depends from claim 3, I incorporate by reference my analysis for claim 3 of the '706 patent above.

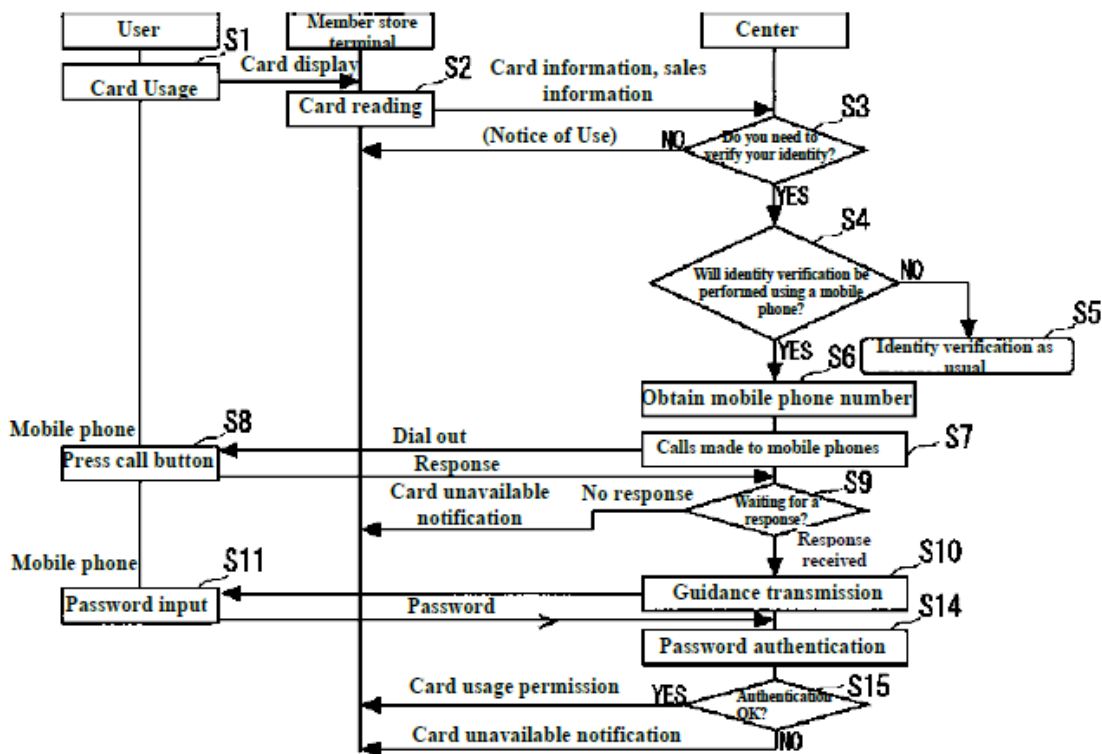
164. Horie and Kobayashi render obvious the response includes a personal identifier associated with the customer.

165. As I explained above, Horie discloses “although an email is sent to notify the user after the card authentication process in the card payment transaction, the e-mail can also be sent, for example, during the card authentication process. In such a case, for example, it would be possible to prevent fraudulent card use by making it possible to issue a transaction cancellation request to the authentication hosts 5 to 6 via the mobile phone 11.” Ex. 1006, [0073].

166. Kobayashi discloses “an example of the configuration of the database 12 that manages card members in an embodiment of the present invention. Referring to Fig. 3, in addition to the card number (identification information) and personal information such as the card member’s name, gender, age, and address, each entry includes information on whether or not to use a mobile phone to verify the identity of the member when using the card, the phone number of the member’s mobile phone if the member’s identity is verified using the mobile phone, and password information.” Ex. 1007, [0052].

167. Furthermore, Kobayashi discloses “[t]he user enters the card acceptability input (number and #, etc. agreed with the card company) from the mobile phone 6 (Step S11). The input information indicating whether the card can be used or not may be a number determined at the time of card creation (for example, 1 for usable and 0 for unusable), or a predetermined operation button.” *Id.* at [0060]. A person of ordinary skill would have considered the “card acceptability input (number and #, etc. agreed with the card company)” to be examples of a personal identifier associated with the customer. For example, Figure 6 of Kobayashi depicts this process and shows a “password input” entered by the user, which a person of ordinary skill would have considered to be an example of a personal identifier.

[FIG. 6]



Ex. 1007, Fig. 6.

E. Independent claim 5

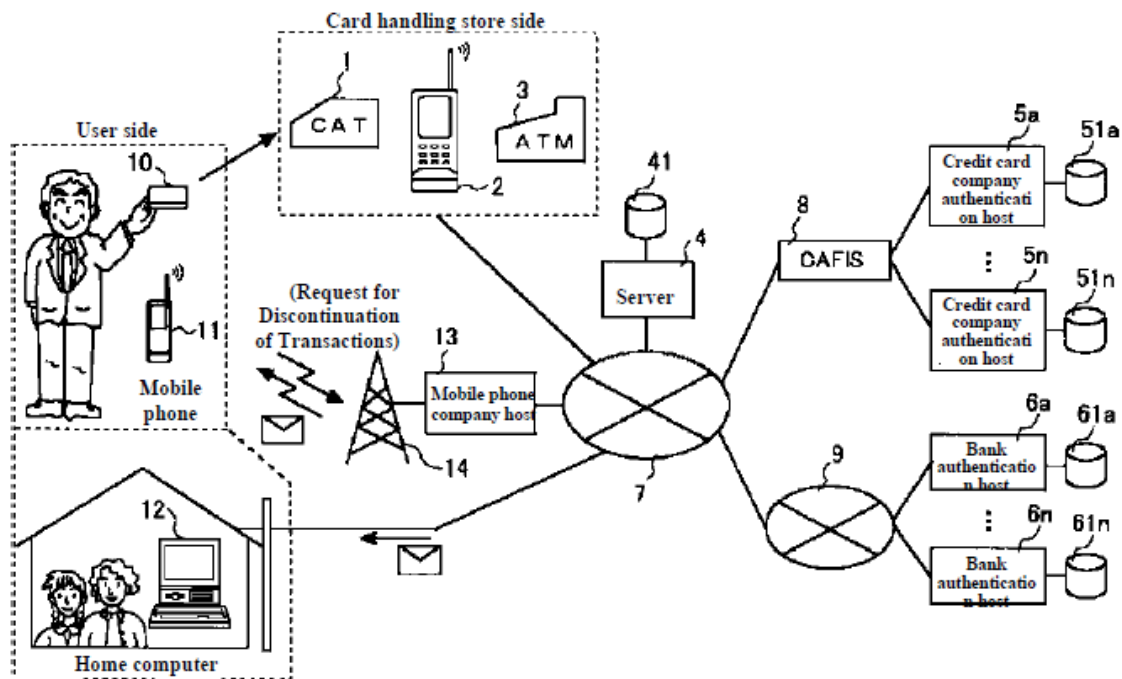
1. Preamble: A charge card processing method, which comprises:

168. I have been informed and understand that the preamble of a claim is generally not limiting. However, to the extent that the preamble is a limitation, this limitation is disclosed by Horie.

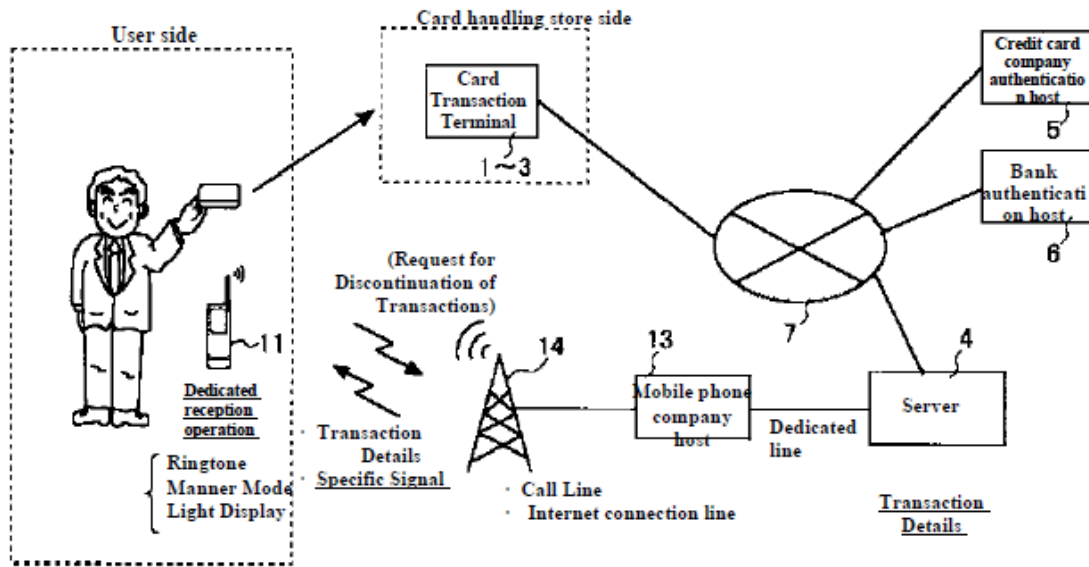
169. Horie states that it “relates to a card usage status notification method that automatically notifies a card user, etc. that a card payment transaction has

occurred via a network, and a card payment transaction system using the same method.” Ex. 1006, [0001].

170. Figures 1 and 9 of Horie also show a schematic for a system that provides a payment authorization method for a charge card.



[FIG. 9]



2. Element [5a]: inputting a transaction request to a stationary merchant terminal disposed at a merchant location;

171. Horie discloses inputting a transaction request to a stationary merchant terminal disposed at a merchant location.

172. According to Horie, “when [a] card 10 owned by a card user is used for payment transactions via card transaction terminal devices 1 to 3, card authentication processing is performed between card transaction terminal devices 1 to 3 and each authentication host via CAFIS 8, and an email is sent from the side of sever 4 to the mobile phone 11 owned by the card user and the PC 12 owned by the card user at home to notify the user that there was a card payment transaction.” Ex. 1006, [0044]. Horie discloses that the “card payment transaction system according to the first embodiment of the present invention includes a CAT 1

installed in a card handling store” and “an ATM 3 installed in a bank.” *Id.* at [0039].

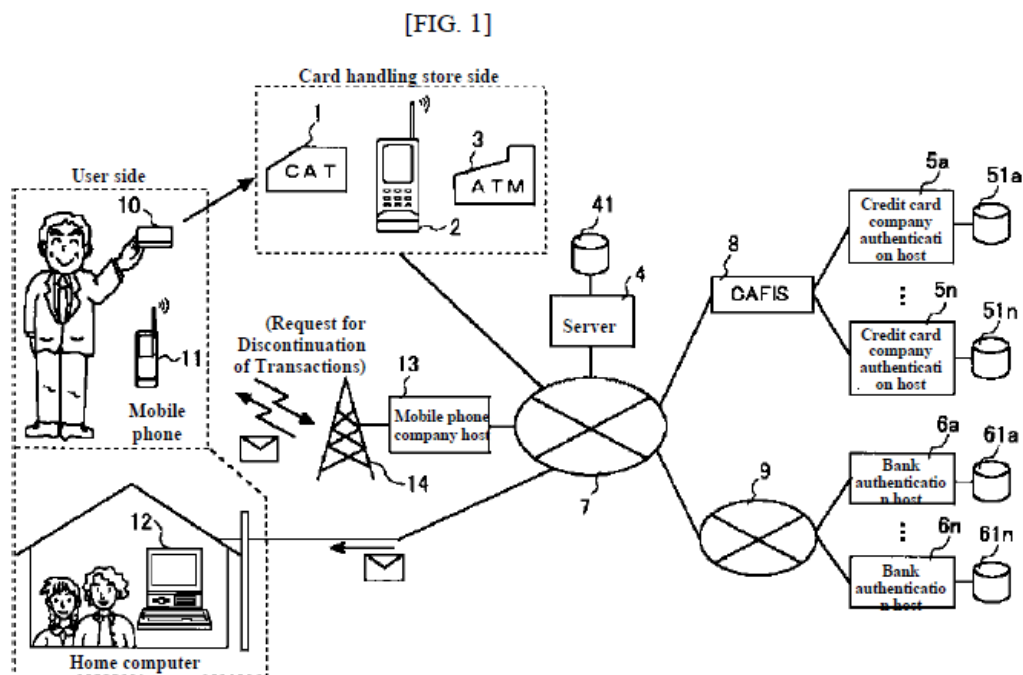
173. A person of ordinary skill would have considered each of the CAT, wireless CAT, or ATM to be an example of a merchant terminal disposed at a merchant location. The swiping of a card in conjunction with the purchase of an item would be the transaction request that is inputted to the terminal.

3. Element [5b]: processing the transaction request with the merchant terminal, including a transmission of a first authorization request to a remote processing facility and receipt of a notification that authorization has been accepted or declined;

174. Horie discloses processing the transaction request with the merchant terminal, including a transmission of a first authorization request to a remote processing facility and receipt of a notification that authorization has been accepted or declined.

175. As Horie explains, “a card payment transaction system . . . [that] includes a CAT 1 installed in a card handling store, a portable wireless CAT 2 suitable for use in door-to-door sales, etc., and an ATM 3 installed in a bank etc., an information processing company server (hereinafter simply referred to as server) 4 that executes various processes for notifying card usage status” and “credit card authentication host[s] 5a to 5n that perform[] card authentication processing when using a credit card, bank authorization hosts 6a to 6n for

performing card authentication processing when using a debit card (cash card), and a network 7 that connects them.” Ex. 1006, [0039]; *see also Id.* at Fig. 1.

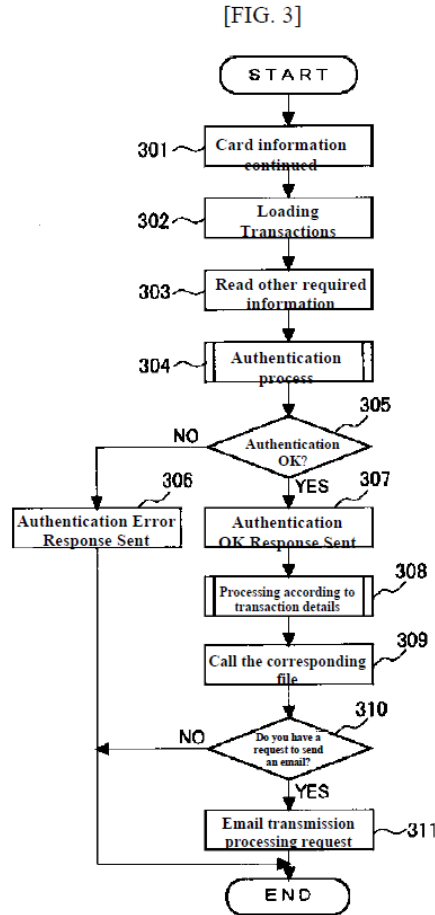


176. The “remote processing facility” described in Horie is the combination of the server/network, CAFIS, and card authentication hosts and/or the server/network, interbank network 9, and bank authentication hosts depicted above.

177. Horie further discloses that “Fig. 3 shows the processing on the card authentication host side when using a card payment transaction.” *Id.* at [0052]. “As shown in Fig. 3, based on the authentication processing request from the side of the card transaction terminal device, card information, transaction content information, and other necessary information transmitted from the side of the card

transaction terminal device are sequentially received and loaded on the side of the card authentication host (steps 301, 302, and 303).” *Id.* at [0053]. According to Horie, “[t]he authentication process is then performed based on the received information (step 304).” *Id.* at [0054]. “If the authentication is not successful (step 305 NO), a signal indicating an authentication error is sent to the card transaction terminal devices 1 to 3 as a response to the authentication request (step 306), and the process ends. On the other hand, when authentication is successful (step 305 YES), a signal indicating authentication OK or data, etc., required for processing on the side of the card transaction terminal device is transmitted to the side of the card transaction terminal device 1-3 (step 307), and various processing is then performed according to the transaction content (step 308).” *Id.* at [0055]-[0056].

178. Based on at least this disclosure, the first authorization request in Horie is the disclosed authentication processing request. The merchant terminal receives the notification that authorization has been accepted or declined from the signal sent back to the merchant terminal in Horie.



Flowchart showing card authentication host side processing

Ex. 1006, Fig. 3.

4. **Element [5c]: transmitting a second authorization request from a remote processing facility to a mobile communication device of a customer associated with the requested transaction through a cellular network; and**

179. Horie and Kobayashi disclose transmitting a second authorization request from a remote processing facility to a mobile communication device of a customer associated with the requested transaction through a cellular network.

180. As explained above, Horie discloses a method where “a predetermined file is called for determining whether or not to notify the user of the card payment transaction via email (step 309).” Ex. 1006, [0057]. “This file is a file stored in each of the recording devices 51 to 61 of the card authentication hosts 5 to 6 . . . [and] the corresponding electronic data is stored for each card number. Whether or not notification is to be provided by email is recorded in advance.” *Id.* According to Horie, “although an email is sent to notify the user after the card authentication process in the card payment transaction, the e-mail can also be sent, for example, during the card authentication process. In such a case, for example, it would be possible to prevent fraudulent card use by making it possible to issue a transaction cancellation request to the authentication hosts 5 to 6 via the mobile phone 11.” *Id.* at [0073]. Horie’s email is one example of a second authorization request.

181. Similarly, Kobayashi discloses “an example of the configuration of the database 12 that manages card members in an embodiment of the present invention. Referring to Fig. 3, in addition to the card number (identification information) and personal information such as the card member’s name, gender, age, and address, each entry includes information on whether or not to use a mobile phone to verify the identity of the member when using the card, the phone

number of the member's mobile phone if the member's identity is verified using the mobile phone, and password information." Ex. 1007, [0052].

182. Finally, Kobayashi discloses "[t]he user enters the card acceptability input (number and #, etc. agreed with the card company) from the mobile phone 6 (Step S11). The input information indicating whether the card can be used or not may be a number determined at the time of card creation (for example, 1 for usable and 0 for unusable), or a predetermined operation button." *Id.* at [0060]. Kobayashi thus discloses "transmitting a second authorization request" because the card company calls or otherwise contacts the customer (*e.g.*, via a text message) for authorization and in response the customer enters information as to "whether the card can be used or not."

5. Element [5d]: authorizing the requested transaction only if authorization has been accepted for the first authorization request and a proper response has been received by the remote processing facility to the second authorization request.

183. Horie and Kobayashi disclose authorizing the requested transaction only if authorization has been accepted for the first authorization request and a proper response has been received by the remote processing facility to the second authorization request.

184. Horie explains that "when [a] card 10 owned by a card user is used for payment transactions via card transaction terminal devices 1 to 3, card

authentication processing is performed between card transaction terminal devices 1 to 3 and each authentication host via CAFIS 8, and an email is sent from the side of sever 4 to the mobile phone 11 owned by the card user and the PC 12 owned by the card user at home to notify the user that there was a card payment transaction.” Ex. 1006, [0044].

185. As I explained above, Horie discloses that “although an email is sent to notify the user after the card authentication process in the card payment transaction, the e-mail can also be sent, for example, during the card authentication process. In such a case, for example, it would be possible to prevent fraudulent card use by making it possible to issue a transaction cancellation request to the authentication hosts 5 to 6 via the mobile phone 11.” *Id.* at [0073]. Horie thus discloses first (the charge request) and second (the subsequent notification) authorization requests.

186. Kobayashi also discloses this element. According to Kobayashi, “[w]hen set to a mode in which identity verification is performed by a mobile phone, the phone number of the mobile phone registered corresponding to the card number is searched and obtained from database 12 (step S6), and the phone number of the mobile phone is automatically dialed (step S7).” Ex. 1007, [0057]. Then “[i]f the user presses the call button (off-hook) in response to the ringing, etc., of the mobile phone 6 (step S8), the center 1 receives this response (“response

received” in step S9) and sends guidance (step S10). The guidance may be audio or text information.” *Id.* at [0058]. Kobayashi discloses that “[t]he user enters the card acceptability input (number and #, etc. agreed with the card company) from the mobile phone 6 (Step S11). The input information indicating whether the card can be used or not may be a number determined at the time of card creation (for example, 1 for usable and 0 for unusable), or a predetermined operation button.” *Id.* at [0060]. “The center 1 judges the card usage permission information transmitted from the mobile phone 6, determines whether the card can be used (step S12), and notifies the member store terminal 2 of the determination result of the usage permission.” *Id.* at [0061]. A person of ordinary skill would have understood this disclosure to describe a second authorization request, which required a response for which the first authorization request (the charge request described in either of Horie or Kobayashi) would have been processed only if a proper (*e.g.*, a “yes”) response was received.

F. Independent claim 6

1. Preamble: A charge card processing method, which comprises:

187. I have been informed and understand that the preamble of a claim is generally not limiting. However, to the extent that the preamble is a limitation, this limitation is disclosed by Kano.

188. Kano discloses “[t]he present invention relates to a commercial transaction method, a commercial transaction device and a commercial transaction system that can be used for payment of products purchased at various stores such as supermarkets, electronic stores, opened on Internet servers, or vending machines such as for potable drinking water, using terminals that can be connected to a network such as via mobile phones.” Ex. 1011, 6:51-7:3.

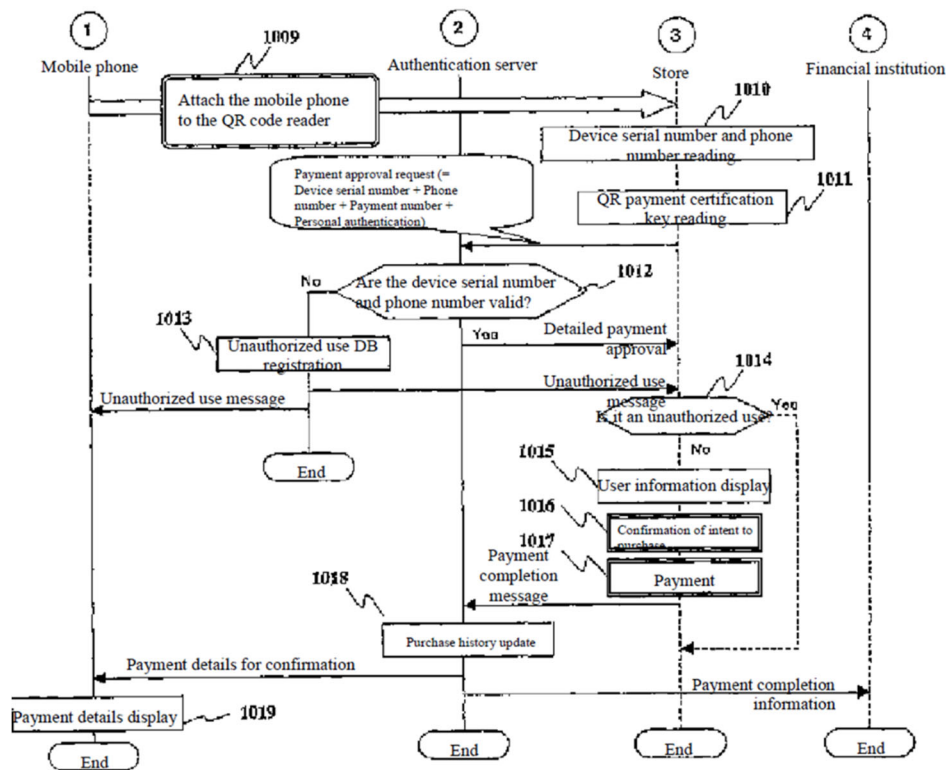
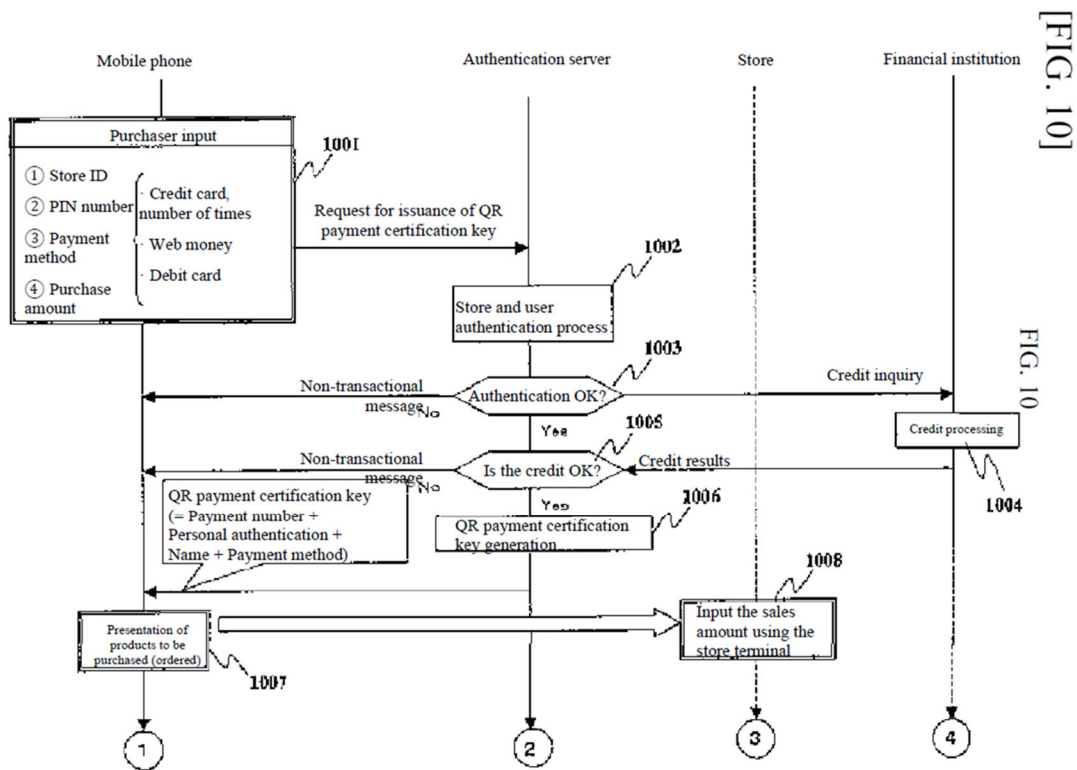
189. According to Kano, “regarding the payment method, there are the options of credit card payments, web money payments, and debit card payments.” *Id.* at 13:39-41.

2. Element [6a]: preauthorizing an imminent given transaction by transmitting a preauthorization for the imminent given transaction from a customer to a financial authorization system;

190. Kano discloses preauthorizing an imminent given transaction by transmitting a preauthorization for the imminent given transaction from a customer to a financial authorization system.

191. Kano provides “flowcharts illustrating how decisions are made when purchasing products using a mobile phone 1 at general stores such as supermarkets.” Ex. 1011, 13:31-32. According to Kano, “the user (product purchaser) sets the mobile phone 1 that he or she owns to the mobile shopping mode, and then uses the input means 14 to enter the store ID as the identification information of the store from which he or she intends to purchase the product. The

user then inputs his or her personal ID number . . . , the payment method, and the purchase price of the product (step 1001).” *Id.* at 13:33-37. Kano explains that the payment method can be a “credit card payment[], web money payment[], [or] debit card payment[], and if the credit card payment is selected, the number of payments and the credit card number are inputted.” *Id.* at 13:39-41. When the user completes the input, Kano discloses that “the transmission operation is performed. Then the information input in step 1001 is sent to the authentication server 41 as the QR authorized certification key issuance request.” *Id.* at 13:46-47. *See* Figs. 10 and 11 below.

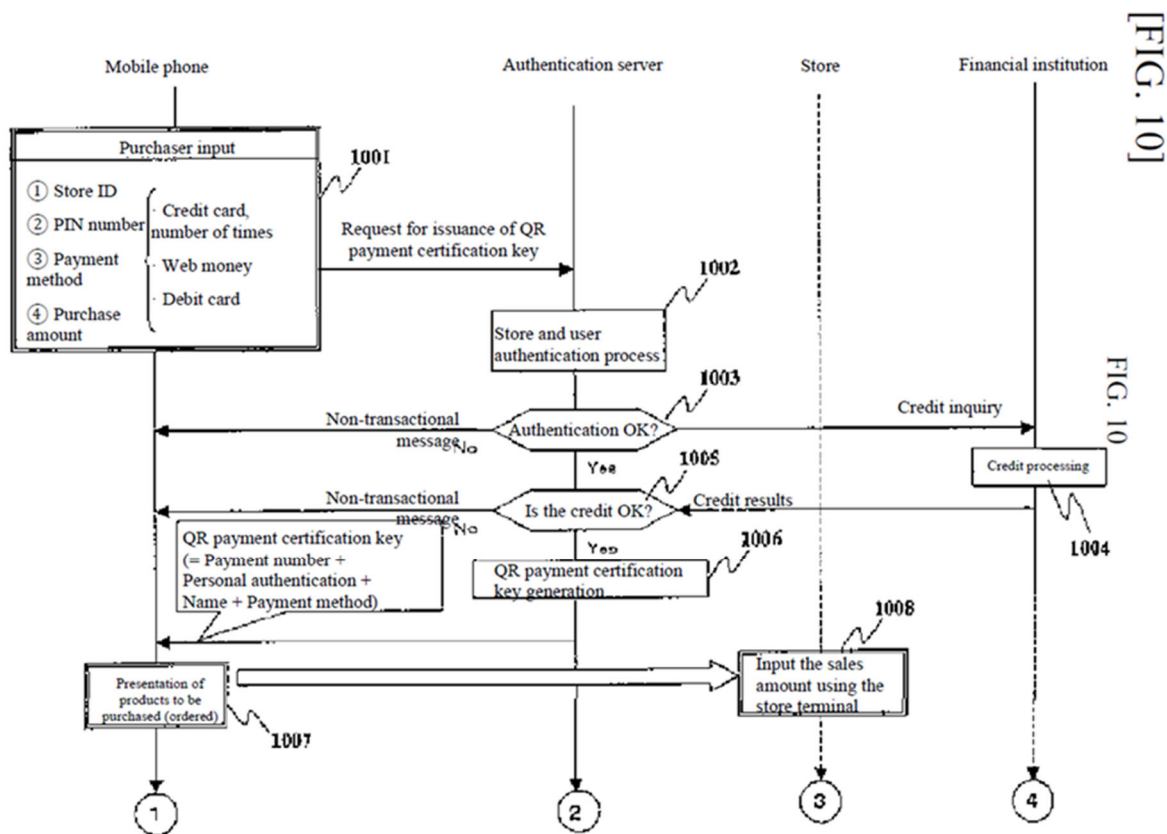


192. Thus, in Kano, the “imminent transaction” is the product the customer intends to purchase. The preauthorization is the user’s entry of those details and the request for issuance of a QR payment certification key, as depicted above.

3. Element [6b]: subsequently inputting a transaction request concerning the given transaction at a merchant terminal disposed at a merchant location;

193. Kano discloses subsequently inputting a transaction request concerning the given transaction at a merchant terminal disposed at a merchant location.

194. According to Kano, when the transaction is authorized, “a QR authorized certification key consisting of a two-dimensional code as shown in Fig. 3(d) is generated (step 1006) and transmitted to the mobile phone 1. This QR authorized certification key consists of at least information on the approval number, personal identification, name, and a method of authorization.” Ex. 1011, 14:12-15. Then “the user presents the pre-selected desired product to the store staff at the store terminal 22 and places an order for the desired product (step 1007). The store staff enters the price of the desired purchase item using the store terminal (step 1008).” *Id.* at 14:20-22. In Kano, the user’s selection of a product and placement of an order is the claimed “inputting a transaction request.”



Ex. 1011, Fig. 10.

4. Element [6c]: processing the transaction request at the merchant terminal, including a transmission of an authorization request for the given transaction to the financial authorization system

195. Kano discloses processing the transaction request at the merchant terminal, including a transmission of an authorization request for the given transaction to the financial authorization system.

196. Kano discloses that “the user inserts and attaches the mobile phone 1 with the QR authorized key 1201 displayed to the reader portion of the QR code

reader 21 attached to the store terminal 22 (step 1009). “The QR code reader 21 then reads the QR authorized certification key 1201 displayed on the display 11 of the mobile phone 1 (step 1011), and reads the mobile phone serial number and the mobile phone number from the signs 19, 20 (step 1010), and forwards the information to the store terminal 22.” Ex. 1011, 14:23-27. “The store terminal 22 then sends the mobile phone serial number, the mobile phone number, and the QR authorized certification key 1201 read from the mobile phone 1 to the authentication server 41 as a payment approval request.” *Id.* at 14:28-30.

197. Kano’s disclosed sending of the “mobile phone serial number, the mobile phone number, and the QR authorized certification key 1201 read from the mobile phone 1 to the authentication server 41 as a payment approval request” is an example of “transmission of an authorization request for the given transaction to the financial authorization system.”

5. Element [6d]: transmitting a response to the authorization request from the financial authorization system to the merchant terminal, and thereby authorizing the transaction request at the merchant’s if the preauthorization from the customer is available in the financial authorization system, and otherwise contacting the customer for authorization or declining the authorization request.

198. Kano discloses transmitting a response to the authorization request from the financial authorization system to the merchant terminal, and thereby authorizing the transaction request at the merchant’s terminal if the

preauthorization from the customer is available in the financial authorization system, and otherwise contacting the customer for authorization or declining the authorization request.

199. As Kano explains, “in the event that both the mobile phone serial number and the mobile phone number are legitimate, and the information (all or part) on the QR authorized certification key 1201 received from the store terminal 22 is recognized as a genuine one issued by the store terminal 22, the authentication server 41 returns the detailed settlement approval to the store terminal 22.” *Id.* at 14:47-50. “The store terminal 22 displays all or part of the received detailed authorization information on the display unit as user information (step 1015).” *Id.* at 14:54-55. Then “[t]he store staff confirms the purchase intention with the user themselves by looking at the contents of the display and the contents and the price of the products they wish to purchase (step 1016). If there is a response confirming the purchase intention from the person, the transaction is completed by operating the transaction button (step 1017).” *Id.* at 14:55-59. The return of the detailed settlement approval described in Kano is an example of a response to the authorization request that authorizes the transaction.

200. Kano also discloses that “[t]he store terminal 22, which receives the detailed approval, displays all or part of the received detailed approval information as user information in the display unit (step 1614). The store staff confirms the

purchase intention with the user themselves by looking at the contents of the display and the contents and price of the products they wish to purchase (step 1615).” *Id.* at 18:44-47. The store staff’s confirmation of the customer’s purchase intention is an example of “contact the customer for authorization or declining the authorization request.”

G. Dependent claim 7: The method according to claim 6, wherein the preauthorization from the customer includes a maximum amount to be authorized for the transaction and a time period within which the preauthorization is valid.

201. Because claim 7 depends from claim 6, I incorporate by reference my analysis for claim 6 of the ’706 patent above.

202. Kano discloses the preauthorization from the customer includes a maximum amount to be authorized for the transaction and a time period within which the preauthorization is valid.

203. According to Kano, “the user (product purchaser) sets the mobile phone 1 that he or she owns to the mobile shopping mode, and then uses the input means 14 to enter the store ID as the identification information of the store from which he or she intends to purchase the product. The user then inputs his or her personal ID number . . . , the payment method, and the purchase price of the product (step 1001).” *Id.* at 3:33-37. Further, Kano discloses that when the transaction is authorized, “a QR authorized certification key consisting of a two-dimensional code as shown in Fig. 3(d) is generated (step 1006) and transmitted to

the mobile phone 1. This QR authorized certification key consists of at least information on the approval number, personal identification, name, and a method of authorization.” *Id.* at 14:12-15. Kano further discloses that “since the QR authorized certification key 1301 is only valid once, it is automatically deleted after a predetermined period of time. In addition, the financial institution 42 that receives the approval completion information performs procedures to withdraw the amount from the user’s designated account.” *Id.* at 15:7-8.

204. The claimed maximum amount is, for example, the purchase price input by the user according to Kano. And the claimed time period is the “predetermined period of time,” as Kano discloses.

i. Obviousness

205. As explained above, Kano discloses this element. However, in the event that a finder of fact decides that Kano does not expressly disclose the preauthorization from the customer includes a maximum amount to be authorized for the transaction and a time period within which the preauthorization is valid, this element would have been obvious to a person of ordinary skill in view of the disclosure of Kano.

206. As Kano describes, part of the initial inputs from the user include “the payment method” and “the purchase price of the product.” *Id.* at 13:37. When the transaction is authorized, Kano discloses that “a QR authorized certification key

consisting of a two-dimensional code . . . is generated . . . and transmitted to the mobile phone 1. This QR authorized certification key consists of at least information on the approval number, personal identification, name, and a method of authorization.” *Id.* 14:12-15. Therefore, the QR code will include “a maximum amount to be authorized” because it will only allow for approval of the “purchase price of the product” that was inputted by the user. This would be considered a “maximum amount” by a person of ordinary skill because a purchaser would clearly not agree to buy a product for more than what was previously authorized.

XIV. The Claims of the ’564 Patent are Invalid

207. As I explained above, I have been informed and understand that Askeladden asserts the following grounds of invalidity against the claims of the ’564 patent:

U.S. 8,783,564			
Ground	35 U.S.C.	Claims	References
1	§ 102	1-9	Horie
2	§ 103	1-9	Horie in view of the knowledge of a POSITA
3	§ 103	10-19	Horie in view of Kobayashi and the knowledge of a POSITA

208. For the reasons I explain below, every limitation of every claim of the ’564 patent is disclosed and/or rendered obvious by the cited prior art.

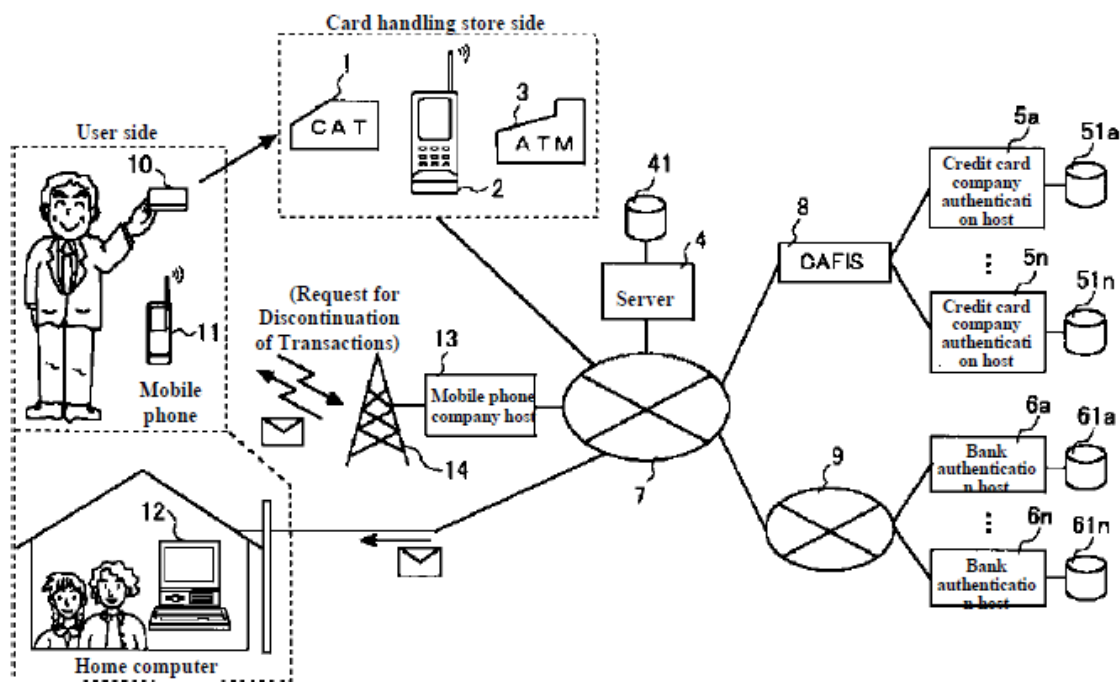
A. Independent claim 1

1. Preamble: A method for processing a transaction, comprising the steps of:

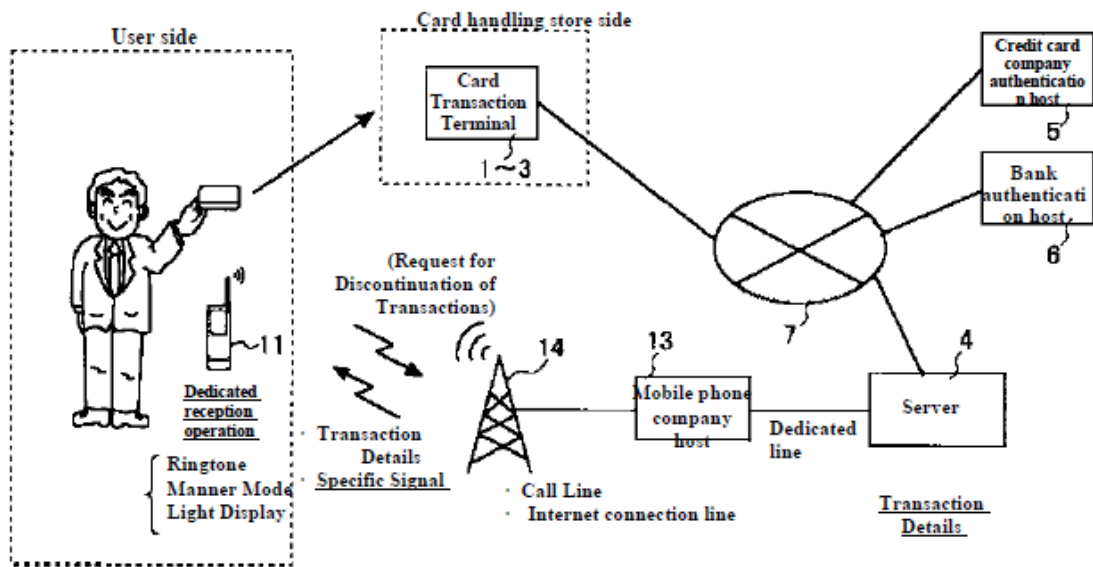
209. I have been informed and understand that the preamble of a claim is generally not limiting. However, to the extent that the preamble is a limitation, this limitation is disclosed by Horie.

210. Horie states it “relates to a card usage status notification method that automatically notifies a card user, etc. that a card payment transaction has occurred via a network, and a card payment transaction system using the same method.” Ex. 1006, [0001].

211. Figures 1 and 9 of Horie also show a schematic for a system that provides for a method of processing a transaction.



[FIG. 9]



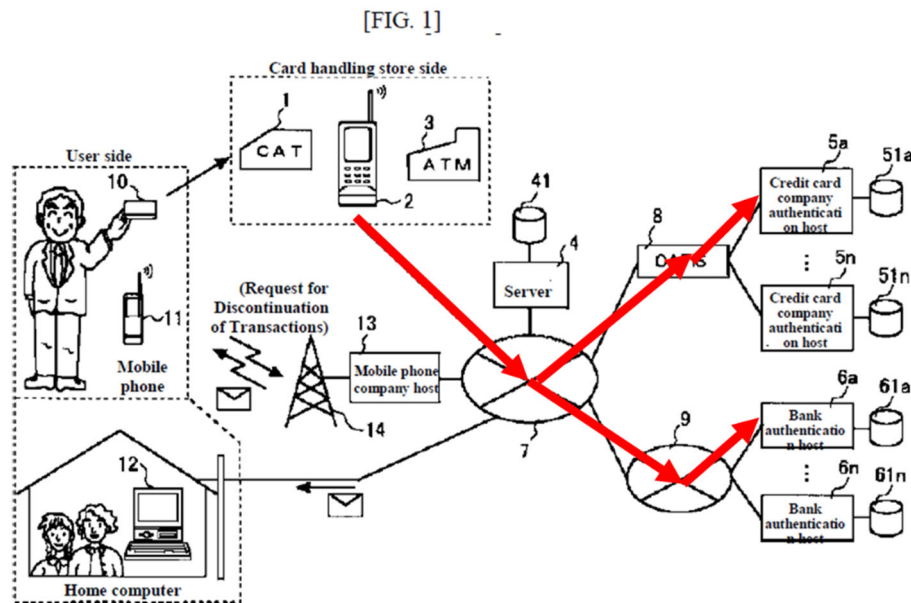
2. Element [1a]: receiving a request for authorizing a transaction account, said request received via a first transmission channel, said request including at least an identification of the customer's account;

212. Horie discloses receiving a request for authorizing a transaction account, said request received via a first transmission channel, said request including at least an identification of the customer's account.

213. According to Horie, "a card authorization processing request" where a "transaction terminal device" reads "card information, transaction details information, and other necessary information" and sends the information to a "card authentication host." Ex. 1006, [0046]-[0048]. Horie discloses "a network" that connects "a card transaction terminal device" to "a credit card company authentication host" or a "bank authentication host." *Id.* at [0076]. As Horie explains, "card information" and "necessary information" would have been understood by a person of ordinary skill as an identification of a customer's account, since a card is uniquely tied to a specific customer and the information is stored by computer and organized by customer and account.

214. Horie states that "when [a] card 10 owned by a card user is used for payment transactions via card transaction terminal devices 1 to 3, card authentication processing is performed between card transaction terminal devices 1 to 3 and each authentication host via CAFIS 8, and an email is sent from the side of sever 4 to the mobile phone 11 owned by the card user and the PC 12 owned by

the card user at home to notify the user that there was a card payment transaction.” *Id.* at [0044]. See Fig. 1 below. The “first transmission channel” disclosed by Horie is the communication line(s) from the “CAT 1 installed in a card handling store, [or] a portable wireless CAT 2...[or] an ATM 3 installed in a bank” (*Id.* at [0039]; through the “server 4” (*Id.* at [0040]); the “network 7” (*Id.* at [0039]); the “CAFIS 8” (*Id.* at [0054]); and finally to the “credit card company authentication host 5a to 5n” (*Id.*). Alternatively, Horie discloses a “first transmission channel” that includes “an interbank network, which connects the network 7 and each bank authentication host 6 to 6n” instead of the CAFIS and credit card authentication hosts. *Id.* at [0042].



Ex. 1006, Fig. 1 (annotated).

215. Horie also discloses the use of a “transaction terminal device” which collects “card information, transaction details information, and other necessary information.” *Id.* at [0046]. According to Horie, “card information includes card number information,” which a person of ordinary skill would have considered to be one example of “account information” as recited by the claim. *Id.* at [0047]. Horie also discloses that “[t]ransaction details information” includes “transaction type,” “transaction amount,” and “payment method,” for example, which a person of ordinary skill would have considered to be additional examples of account information for payment of a customer’s purchase. *Id.* at [0047].

3. Element [1b]: determining whether or not the account includes a request for notification to the customer of any transactions;

216. Horie discloses determining whether or not the account includes a request for notification to the customer of any transactions.

217. As Horie explains, during the transaction “a predetermined file is called for determining whether or not to notify the user of the card payment transaction” Ex. 1006, [0057]. Horie’s call to the predetermined file associated with the customer is thus an example of checking whether or not a profile is present with regard to the customer. Horie explains that “when creating a card, the user must indicate on the application form whether or not to use a mobile phone to verify their identity, and if they wish to use a mobile phone to verify their

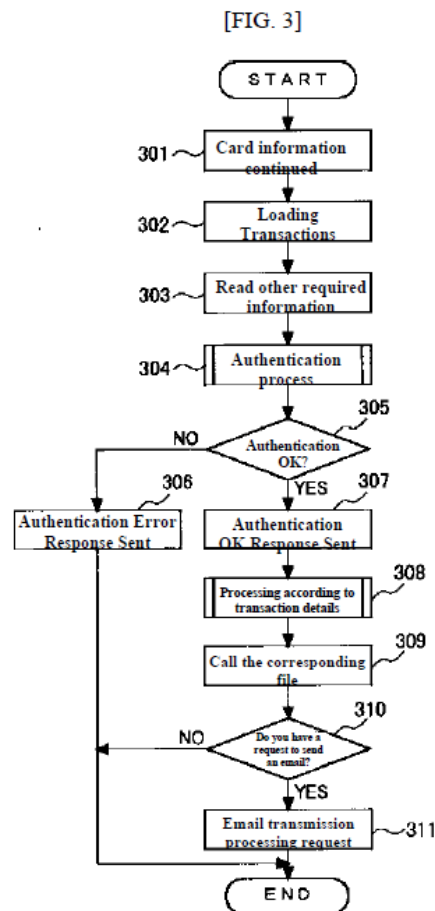
identity, the telephone number and password of the mobile possessed by the user are recorded in the database 12, and the telephone number of the mobile phone and, if necessary, the password are also associated with the card number (ID) and registered in the database 12. *Id.* at [0050]. Horie further discloses that “[c]ardholders who already have a card can receive the service of the system according to the invention by simply notifying the card company of the mobile phone number owned by the cardholder, and there is no need to issue a new card.” *Id.* at [0051]. Horie’s further check of whether the user requested an email notification is an example of checking whether or not the customer has requested notification regarding the authorization request. A person of ordinary skill would have considered this to be an example of a determination whether or not the account includes a request for notification to the customer of any transactions.

4. Element [1c]: notifying the customer via a second transmission channel only if the account includes a request for notification of any transactions;

218. Horie notifying the customer via a second transmission channel only if the account includes a request for notification of any transactions.

219. When a customer uses their card to make a transaction, Horie discloses that “a predetermined file is called for determining whether or not to notify the user of the card payment transaction” at the “card authentication hosts.” Ex. 1006, [0057]. According to Horie, “the presence or absence of the email

transmission is identified from the card number information received in step 301 and the file.” *Id.* at [0058]; *see also Id.* at Fig. 3.



Flowchart showing card authentication host side processing

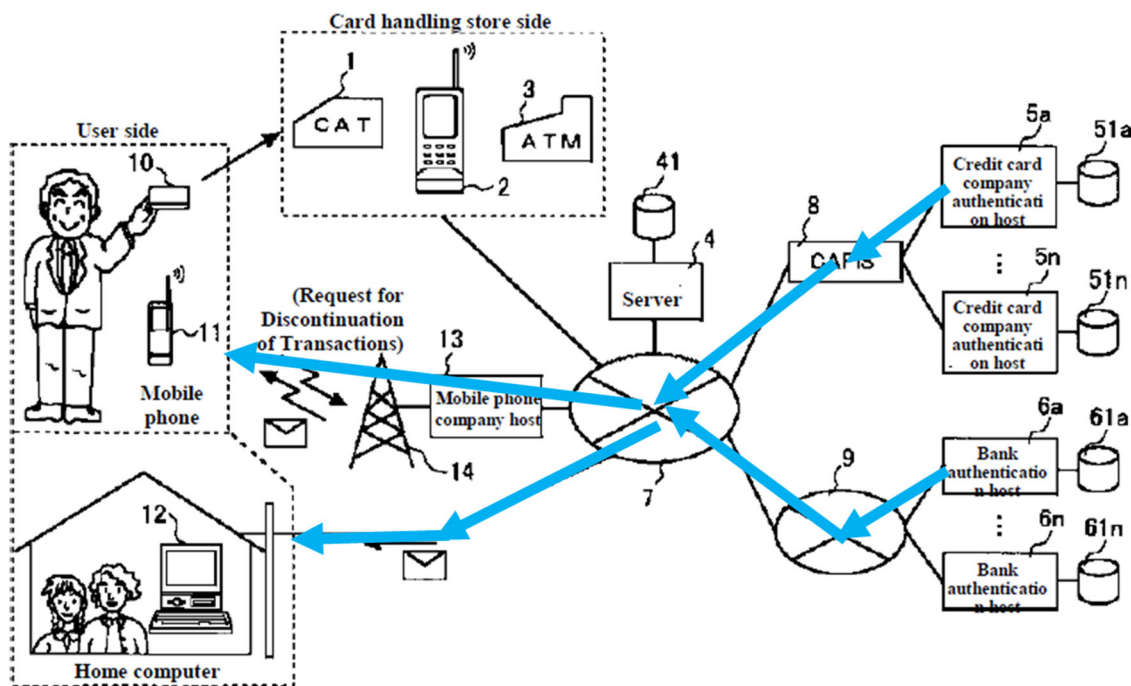
220. According to Horie, “[i]f the email notification service is not requested here (step 310 NO), the processing is terminated. That is, in this case, a normal card payment transaction is performed as usual and the process ends. On the other hand, if the email notification service has been applied for (step 310 YES), a request for email transmission processing is made to the server 4 via the

network 7 (step 311). That is, in this example, processing for sending e-mail is performed on the server 4 side.” *Id.* at [0059].

221. Regarding the “second transmission channel,” Horie explains that “when [a] card 10 owned by a card user is used for payment transactions via card transaction terminal devices 1 to 3, card authentication processing is performed between card transaction terminal devices 1 to 3 and each authentication host via CAFIS 8, and an email is sent from the side of sever 4 to the mobile phone 11 owned by the card user and the PC 12 owned by the card user at home to notify the user that there was a card payment transaction.” *Id.* at [0044].

222. Horie depicts the second transmission channel in, for example, Figure 1.

[FIG. 1]



Ex. 1006, Fig. 1 (annotated).

223. As shown above, the second transmission channel in Horie is the communication line(s) from the credit card or bank authentication hosts; through the CAFIS or interbank network, respectively; through the network 7 and server 4; and then through the “mobile phone company host 13” (*Id.* at [0076]) via a “relay base station 14” to the customer’s “mobile phone 11” (*Id.* at [0041]). However, Horie also describes and depicts the second transmission channel as including “a personal computer 12 owned by the card user at home [] connected to the network 7.” *Id.* at [0041].

5. Element [1d]: the second transmission channel being distinct from the first transmission channel; and

224. Horie discloses the second transmission channel being distinct from the first transmission channel.

225. The first and second transmission channels described and depicted in Horie are “distinct” from each other for several reasons, as would have been understood by a person of ordinary skill. Each of those channels uses different hardware and network connections. For example, the first transmission channel uses CAT / wireless CAT / ATM, and the wired/wireless connection between those devices and the network 7, and does not include the wired/wireless connections between network 7 and the customer’s home computer 12 or the mobile phone company host 13, relay base station 14, or the customer’s mobile phone 11. Meanwhile, the second transmission channel uses the wired/wireless connections between network 7 and the customer’s home computer 12 or the mobile phone company host 13, relay base station 14, or the customer’s mobile phone 11, and excludes the CAT / wireless CAT / ATM, and the wired/wireless connection between those devices and the network 7.

226. In addition, Horie specifically states that “mobile phone company host 13 is connected to the server 4 via a dedicated line,” which would have been understood by a person of ordinary skill to mean that the line would not be used for other communications—*i.e.*, distinct from other communications.

227. The first and second transmission channels that are depicted and described in Horie include separate hardware components, including CATs (both wired and wireless); ATMs; servers; relay base stations; mobile phones; and home computers. Because each of these devices would have at least its own processor(s), memory, and network/cellular connections, and each of these devices would have operated independent of one another in the sending/receiving of a particular network transmission of data to another device along the channel, a person of ordinary skill would have considered the channels to be distinct from each other.

i. Obviousness

228. As explained above, Horie discloses this element. However, in the event that a finder of fact decides that Horie does not expressly disclose that the second transmission channel being distinct from the first transmission channel, this element would have been obvious to a person of ordinary skill in view of the disclosure of Horie.

229. Horie's "first transmission channel" includes the CAT / wireless CAT / ATM, and the wired/wireless connection between those devices and the network 7, and does not include the wired/wireless connections between network 7 and the customer's home computer 12 or the mobile phone company host 13, relay base station 14, or the customer's mobile phone 11, as I explained above. Horie's

second transmission channel” includes the wired/wireless connections between network 7 and the customer’s home computer 12 or the mobile phone company host 13, relay base station 14, or the customer’s mobile phone 11, and excludes the CAT / wireless CAT / ATM, and the wired/wireless connection between those devices and the network 7. These differences between the channels described in Horie would have suggested to a person of ordinary skill in the art that separate lines of communication could be employed in Horie’s system for the sending/receiving of requests and notifications. For example, Horie explicitly describes “mobile phone company host 13 is connected to the server 4 via a dedicated line.” *Id.* at [0076]. A dedicated line, as would have been understood by a person of ordinary skill in the art, would provide a distinct line of communication from other lines. This could have been implemented at the time as a dedicated communications port, for example.

230. Moreover, Horie depicts distinct hardware that comprises the first and second transmission channels, and a person of ordinary skill would have considered these individual components, such as CATs (both wired and wireless); ATMs; servers; relay base stations; mobile phones; and home computers to be a means for providing distinct first and second transmission channels. This is because those hardware devices would each have at least its own processor(s), memory, and network/cellular connections, and each of these devices would have

operated independent of one another in the sending/receiving of a particular network transmission of data to another device along the channel.

6. Element [1e]: authorizing the transaction without requiring a response from the customer.

231. Horie discloses authorizing the transaction without requiring a response from the customer.

232. The processing described in Horie for payment authorization is performed without the requirement for a response from the customer to the notification of the transaction. According to Horie, “when a payment transaction is made using a card owner by the card user or a family member, the card user can be informed of the fact via e-mail, and can also receive notification of the transaction.” Ex. 1006, [0071]. Horie further discloses that either “an e-mail is sent to notify the user after the card authentication process in the card payment transaction, [or] the e-mail can also be sent, for example, during the card authentication process.” *Id.* at [0073].

233. Regarding the second embodiment described in Horie above, Horie discloses that “[i]n such a case, for example, it would be possible to prevent fraudulent card use by making it possible to issue a transaction cancellation request to the authentication hosts 5 and 6 via the mobile phone 11.” *Id.* at [0073]. Neither of these embodiments require any affirmative action on the part of the customer to process a transaction in response to the notification. Horie only

discloses an option for the user to cancel a transaction—*i.e.*, stop the processing—by issuing a transaction cancellation request from the mobile phone.

B. Dependent claim 2: The method according to claim 1, wherein the notifying step comprises sending an SMS message to the customer.

234. Because claim 2 depends from claim 1, I incorporate by reference my analysis for claim 1 of the '564 patent above.

235. Horie discloses the notifying step comprises sending an SMS message to the customer.

236. In Horie, the notification to the communications device associated with the customer includes the monetary amount. Horie discloses that “the email sent to the user shows...payment amount.” Ex. 1006, [0069]; *see also* Fig. 8.

[FIG. 8]

Card usage information
About the card used by Mr. Horie

The following card payment transactions have been confirmed:

Cards used: ☐ Bank / debit card

Card Number: 1234-5678-9012-1234

Transaction date and time: ☐ month ☐ day ☐ hour ☐ minute

Name of store: Axxess

Terminal No.: 000000

Processing number: 67890-1

Approval Number: 0000001

Product classification: Electrical appliances

Transaction type: ¥ Purchase

Amount paid:

Contact information for the above transactions

Tel: 03-1234-0000

Email: . . . @ co. jp

Web: <http://www.acac.co.jp>

237. Although one embodiment of Horie describes sending the notification to the customer via email, Horie also discloses “when a card payment transaction occurs, the user is automatically notified of the transaction via a wireless information terminal device such as a pre-specified mobile phone.” *Id.* at [0018]. Horie states that this is performed “by sending and receiving specific data via a

normal phone line of a mobile phone” *Id.* at [0020]. According to Horie, “specific data indicating the content of card payment transactions can be transmitted from the mobile phone company host to the mobile phone 12, and the mobile phone 12 can display the context of the display by text, etc.” *Id.* at [0079]. A person of ordinary skill in the art would have considered the display “by text” of “specific data indicating the content of card payment transactions” to be an example of sending a notification including the monetary amount via an SMS message.

238. At the time of the alleged invention, SMS (short message service) was a de-facto standard for the sending and receiving of text messages between mobile phones. *See, e.g.*, Ex. 1008, at 1:53-63. A person of ordinary skill would have understood Horie’s second embodiment, in which the notification to the customer takes a more simplistic form compared to email (*i.e.*, “an incoming melody, vibration in manner mode, lighting of a light” (Ex. 1006, [0079])) to describe the use of SMS for sending the notification “by text.”

i. Obviousness

239. As explained above, Horie discloses this element. However, in the event that a finder of fact decides that Horie does not expressly disclose notification to the communications device associated with the customer in an SMS

message including the monetary amount, this element would have been obvious to a person of ordinary skill in view of the disclosure of Horie.

240. As I explained above, SMS (short message service) was a de-facto standard for the sending and receiving of text messages between mobile phones. *See, e.g.*, Ex. 1008, at 1:53-63. Based on the disclosure for Horie's second embodiment, in which the notification to the customer takes a more simplistic form compared to email (*i.e.*, "an incoming melody, vibration in manner mode, lighting of a light" (Ex. 1006, [0079]), a person of ordinary skill would have considered it obvious to use an SMS as the manner to send "specific data indicated the content of card payment transactions" from the card authentication host to the customer's mobile phone "by text." *Id.* at [0079]. This would not have required any alterations to the hardware of the phone, or any changes to the phone's software. This would have simply been the use of an existing feature common to all mobile phones at the time of the alleged invention to receive and display text-based data.

C. Dependent claim 3: The method according to claim 1, wherein the request is from the group consisting of a customer, an account holder, an authorized person, and an unauthorized person.

241. Because claim 3 depends from claim 1, I incorporate by reference my analysis for claim 1 of the '564 patent above.

242. I have been informed and understand that claim 3 is drafted in the form of a Markush claim. I have further been informed and understand that a

Markush claim uses the signal “group of” and lists alternatives that fulfill the claim limitation. I have been informed and understand that Markush group lists specified alternatives in a patent claim, typically in the form: a member selected from the group consisting of A, B, and C. I have further been informed and understand that the Federal Circuit has held that “the entire element [of a Markush claim] is disclosed by the prior art if one alternative in the Markush group is in the prior art.” I have been informed and understand that based on patent law, disclosure in the prior art of one member of the group is sufficient to render the claim invalid as anticipated.

243. Horie discloses the request is from the group consisting of a customer, an account holder, an authorized person, and an unauthorized person.

244. Horie discloses that it is “possible to know that a payment transaction was performed with a card that is owned by the customer or his family via an information terminal device such as a mobile phone . . . so it is possible to detect the unauthorized use of the card early, etc...” Ex. 1006, [0081]. As one example, Horie provides “a father, etc., who is the holder of an automatic debit account for credit card transactions, [who] wants to keep track of the card usage status of his wife and children at all times.” *Id.* at [0004]. Horie states that it “provide[s] a card usage status notification method that more quickly and reliably notifies a user . . . thereby enabling early detection of card fraud” *Id.* at [0006].

245. Based on this disclosure, a person of ordinary skill would have understood that Horie describes either of a “customer” or an “account holder” (*i.e.*, “holder of an automatic debit account”) expressly. This would meet the elements of the Markush claim, as I have been informed and understand under patent law.

D. Dependent claim 4: The method according to claim 1, wherein the request is provided from the group consisting of an ATM, a POS terminal, a telephone and a device for virtual communication.

246. Because claim 4 depends from claim 1, I incorporate by reference my analysis for claim 1 of the '564 patent above.

247. Horie discloses the request is provided from the group consisting of an ATM, a POS terminal, a telephone and a device for virtual communication.

248. As I noted above with respect to claim 3 of the '564 patent, this is a Markush claim and I incorporate by reference my explanation above of my understanding and information regarding the law as it relates to Markush claims.

249. Horie discloses that “when the process is started, card information, transaction details information, and other necessary information are sequentially read on the card transaction terminal device side.” Ex. 1006, [0046]. The “various type of information that have been read are [then] sent as data to each card authentication host . . . thereby issuing a card authentication processing request.” *Id.* at [0048].

250. Horie states that “examples of [a] ‘card transaction terminal device’ includes CAT (wireless CAT etc. may also be used), ATM, Kiosk terminal device, etc.” *Id.* at [0025]. Horie further states that transaction details from a CAT include the “product purchase[d]” and the “purchase amount.” *Id.* at [0047]. An ATM is one of the group recited in the Markush claim, and thus Horie discloses this limitation based on the information and understanding of patent law provided to me.

E. Dependent claim 5: The method according to claim 1, wherein the request is a virtual request provided via the Internet.

251. Because claim 5 depends from claim 1, I incorporate by reference my analysis for claim 1 of the ’564 patent above

252. Horie discloses the request is a virtual request provided via the Internet. According to Horie, “in another aspect of the card payment transaction system of the first embodiment of the present invention, a server is further connected through a network in a card payment transaction system that enables online card payment transactions through data communication between the card transaction terminal device and the card authentication host, and the server is provided with a means for creating an email to notify the user of such a card payment transaction, and a means for sending said created email to a destination designated in advance for each card.” Ex. 1006, [0029]. A person of ordinary skill in the art would have understood that a server, connected to a “network,” providing

services for geographically disparate devices such as merchant terminals, bank authentication hosts, mobile phones, and home computers would have been a reference to the Internet.

F. Dependent claim 6: The method according to claim 1, wherein the transaction is selected from the group consisting of credit card, debit card, charge card, and ATM.

253. Because claim 6 depends from claim 1, I incorporate by reference my analysis for claim 1 of the '564 patent above.

254. Horie discloses the transaction is selected from the group consisting of credit card, debit card, charge card, and ATM.

255. As I noted above with respect to claim 3 of the '564 patent, this is a Markush claim and I incorporate by reference my explanation above of my understanding and information regarding the law as it relates to Markush claims.

256. Horie states a “‘card’ includes, for example, a credit card, a debit card, and the like” as well as “cash advance cards issued by consumer financial institutions.” Ex. 1006, [0009]. Horie also describes an “ATM” as a card transaction terminal device. *Id.* at [0025].

257. As such, Horie discloses this claim element because it discloses expressly each of a credit cards or debit cards, which is sufficient to disclose this element based on the information and understanding of patent law provided to me.

G. Dependent claim 7: The method according to claim 1, wherein the first transmission channel is selected from the group consisting of wireless and landline channels.

258. Because claim 7 depends from claim 1, I incorporate by reference my analysis for claim 1 of the '564 patent above.

259. Horie discloses the first transmission channel is selected from the group consisting of wireless and landline channels.

260. According to Horie, there is a “a card authorization processing request” where a “transaction terminal device” reads “card information, transaction details information, and other necessary information” and sends the information to a “card authentication host.” Ex. 1006, [0046]-[0048]. Horie further describes “a network” that connects “a card transaction terminal device” to “a credit card company authentication host” or a “bank authentication host.” *Id.* at [0076]. And Horie discloses that a “‘card transaction terminal device’ [can] include[] CAT (wireless CAT etc. may also be used), ATM, Kiosk terminal device, etc.” *Id.* at [0025].

261. As I noted above with respect to claim 3 of the '564 patent, this is a Markush claim and I incorporate by reference my explanation above of my understanding and information regarding the law as it relates to Markush claims.

262. Horie discloses that both wireless and landline transmission channels are disclosed as comprising the “first transmission channel.” Horie specifically

discloses that a “wireless CAT, etc. may also be used.” *Id.* at [0025]. A person of ordinary skill would have understood the “wireless CAT” to be a card access terminal with a wireless connection to a network, based on Horie’s description. As one example, Horie describes that device as a “portable wireless CAT 2 suitable for use in door-to-door sales.” *Id.* at [0039]. Since the wireless CAT sends a request for authorization through the network to the card/bank authentication hosts, and because the CAT does so through a wireless connection, a person of ordinary skill would have understood Horie to expressly describe that the “first transmission channel” includes a wireless channel.

263. As an alternative, Horie discloses a “CAT 1 installed in a card handling store” and “an ATM 3 installed in a bank.” *Id.* at [0039]. A person of ordinary skill would have understood that an “installed” device in a store or bank would be connected to the network by a wired (*i.e.* landline) connection. For example, Horie’s distinction between a “CAT” and a “wireless CAT” shows that the “CAT 1” would have had a wired landline.

H. Dependent claim 8: The method according to claim 1, which comprises receiving the request at a remote processing facility.

264. Because claim 8 depends from claim 1, I incorporate by reference my analysis for claim 1 of the ’564 patent above.

265. Horie discloses receiving the request at a remote processing facility.

266. Horie describes “a card payment transaction system . . . [that] includes a CAT 1 installed in a card handling store, a portable wireless CAT 2 suitable for use in door-to-door sales, etc., and an ATM 3 installed in a bank etc., an information processing company server (hereinafter simply referred to as server) 4 that executes various processes for notifying card usage status” Ex. 1006, [0039]. Horie further discloses “a credit card authentication host 5a to 5n that performs card authentication processing when using a credit card, bank authentication hosts 6a to 6n for performing card authentication processing when using a debit card (cash card), and a network 7 that connects them.” Ex. 1006, [0039]. A person of ordinary skill would have considered these further examples of receiving the request at a remote processing facility.

267. A person of ordinary skill would have understood that the server and/or authentication host disclosed in Horie is “remote” in the sense that it is described and depicted as systemically and geographically separate from the CAT, ATM, *etc.*

I. Dependent claim 9: The method according to claim 1, wherein said steps of notifying and authorizing are performed substantially concurrently.

268. Because claim 9 depends from claim 1, I incorporate by reference my analysis for claim 1 of the ’564 patent above.

269. Horie discloses the steps of notifying and authorizing are performed substantially concurrently.

270. According to Horie, “when using card payment transactions, both normal card authentication processing and card usage status notification via email are performed simultaneously.” Ex. 1006, [0043].

J. Independent claim 10

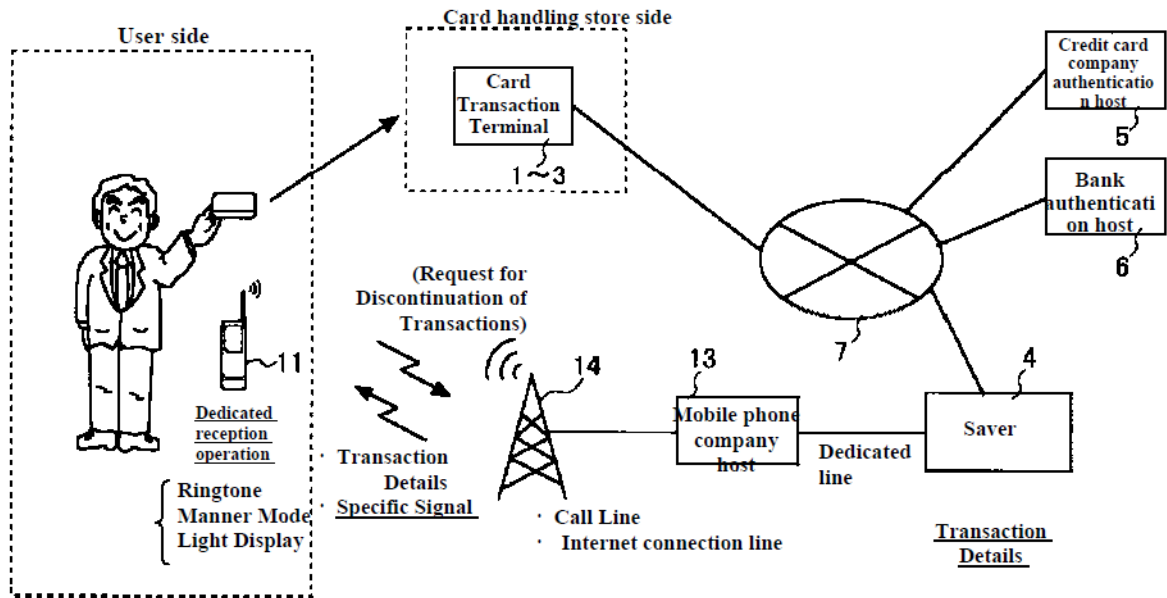
1. Preamble: A method for processing a transaction, comprising the steps of:

271. I have been informed and understand that the preamble of a claim is generally not limiting. However, to the extent that the preamble is a limitation, this limitation is disclosed by Horie and Kobayashi.

272. Horie “relates to a card usage status notification method that automatically notifies a card user, etc. that a card payment transaction has occurred via a network, and a card payment transaction system using the same method.” Ex. 1006, [0001].

273. This method is shown in Figure 9 of Horie, below:

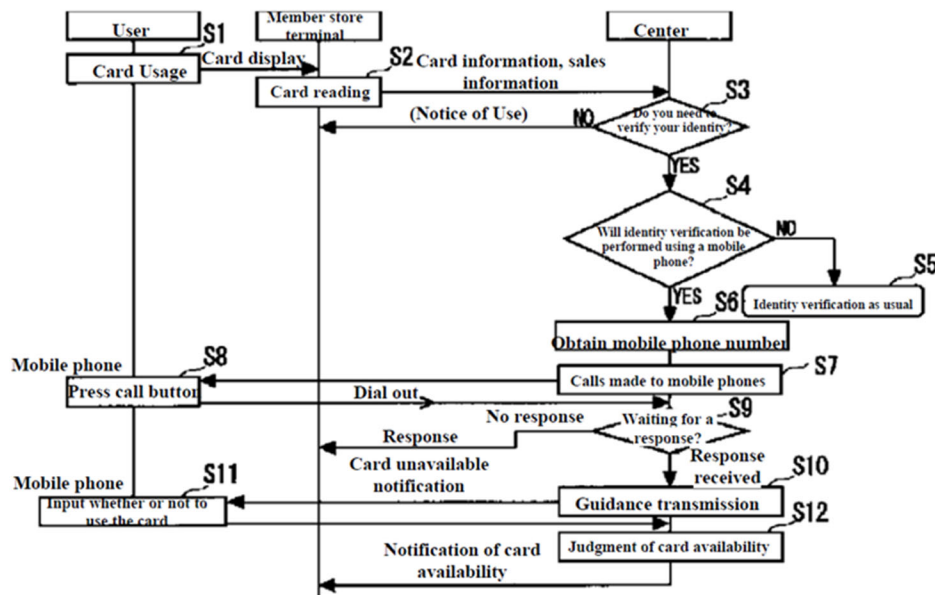
[FIG. 9]



Ex. 1006, Fig. 9.

274. Kobayashi also “relates to the unauthorized use prevention method and system of a card” when “a card user uses a card.” Ex. 1007, at [0001], [0014]. Kobayashi’s method is shown in Figure 4 of Kobayashi.

[FIG. 4]



Ex. 1007, Fig. 4.

2. **Element [10a]: a. receiving a request for authorizing a transaction for an account, said request received via a first transmission channel, said request including at least an identification of the customer's account;**

275. I incorporate by reference my analysis for claim 1 of the '564 patent, element [1a] above, as if fully stated herein.

3. Element [10b]: b. determining if the account includes a request for notification to the customer of any transactions;

276. I incorporate by reference my analysis for claim 1 of the '564 patent, element [1b] above, as if fully stated herein.

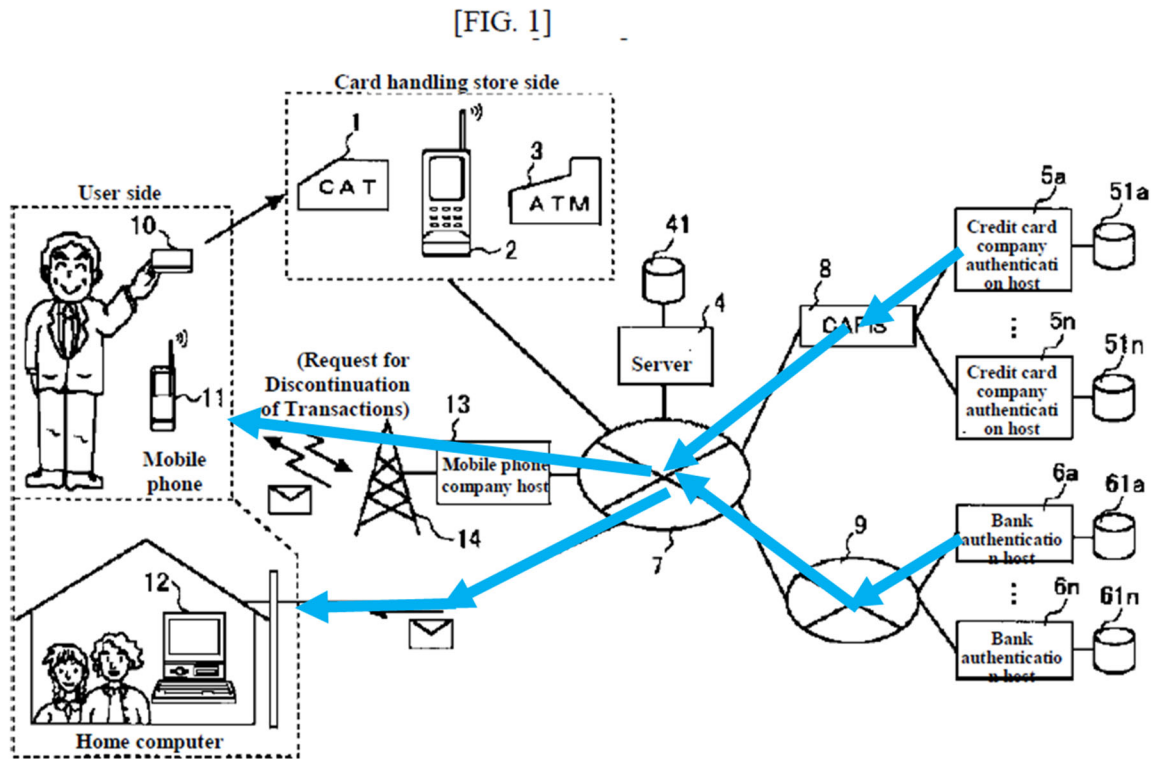
4. Element [10c]: c. sending a notification to the customer via a second transmission channel only if the account includes a request for notification of at least one form of transaction;

277. Horie and Kobayashi disclose sending a notification to the customer via a second transmission channel only if the account includes a request for notification of at least one form of transaction.

278. According to Kobayashi, when a “center 1 receives the [card and transaction] information from the member store terminal . . . and in the case where the identification is not required . . . [the terminal] is notified that the card can be used, and the normal card settlement processing is performed.” Ex. 1007, [0055]. But “[w]hen a mode for performing identity confirmation by a portable telephone set is set, . . . the telephone number of the portable telephone set is automatically dialed” in order to notify the card user. *Id.* at [0057].

279. Similarly, Horie discloses that “when [a] card 10 owned by a card user is used for payment transactions via card transaction terminal devices 1 to 3 card authentication processing is performed between card transaction terminal devices 1 to 3 and each authentication host via CAFIS 8, and an email is sent from the side of server 4 to the mobile phone 11 owned by the card user and the PC 12

owned by the card user at home to notify the user that there was a card payment transaction.” Ex. 1006, [0044]. See Fig. 1 below.



Ex. 1006, Fig. 1 (annotated).

280. For these reasons at least, Horie discloses notification via “a second transmission channel” because the notification in Horie is sent through the wired/wireless connections between network 7 and the customer’s home computer 12 or the mobile phone company host 13, relay base station 14, or the customer’s mobile phone 11, and excludes the CAT / wireless CAT / ATM, and the wired/wireless connection between those devices and the network 7. Horie also discloses that when the method determines if a notification should be sent, if a “notification service is not requested . . . the processing is terminated. That is . . . a

normal card payment transaction is performed as usual.” Ex. 1006, [0059]. Conversely, if the “notification service has been applied for [], a request for email transmission processing is made” and the notification is sent.” *Id.* Horie’s notification system includes mobile phone notification, since Horie describes “the special processing for notification is continued until the specific signal and/or specific data is sent from the mobile phone company host 13 to the mobile phone 11.” *Id.* at [0078].

5. Element [10d]: d. the second transmission channel being distinct from the first transmission channel;

281. I incorporate by reference my analysis for claim 1 of the ’564 patent, element [1d] above, as if fully stated herein.

6. Element [10e]: e. receiving a response to the notification; and

282. Horie and Kobayashi disclose receiving a response to the notification.

283. As Horie explains, “[i]n addition, in the embodiment described above, although an e-mail is sent to notify the user after the card authentication process in the card payment transaction, the e-mail can also be sent, for example, during the card authentication process. In such a case, for example, it would be possible to prevent fraudulent card use by making it possible to issue a transaction cancellation request to the authentication hosts 5 to 6 via the mobile phone 11.” Ex. 1006, [0073]. Horie’s two embodiments are (1) an e-mail is sent after the

authentication process has been completed, and (2) where the authentication process includes the customer authorizing (or not authorizing) the transaction. In Horie's second embodiment, the customer must provide a response to the notification from the server, and so Horie discloses that the process "receive[s] a response to the notification."

284. Kobayashi also discloses that "[w]hen [a] user 7 uses a card at a member store (step S1), the member store terminal 2 reads the card (step S2), and card information and sales information are transmitted to the center 1." Ex. 1007, [0054]. "When set to a mode in which identity verification is performed by a mobile phone, the phone number of the mobile phone registered corresponding to the card number is searched and obtained from database 12 (step S6), and the phone number of the mobile phone is automatically dialed (step S7)." *Id.* at [0057]. "If the user presses the call button (off-hook) in response to the ringing, etc., of the mobile phone 6 (step S8), the center 1 receives this response ("response received" in step S9) and sends guidance (step S10)." *Id.* at [0058]. Based on this disclosure, a person of ordinary skill would also understand that Kobayashi discloses that the process "receive[s] a response to the notification."

7. Element [10f]: f. authorizing the transaction only if the response is proper.

285. Horie and Kobayashi disclose receiving a response to the notification.

286. As Horie explains, “[i]n addition, in the embodiment described above, although an e-mail is sent to notify the user after the card authentication process in the card payment transaction, the e-mail can also be sent, for example, during the card authentication process. In such a case, for example, it would be possible to prevent fraudulent card use by making it possible to issue a transaction cancellation request to the authentication hosts 5 to 6 via the mobile phone 11.” Ex. 1006, [0073]. Horie’s two embodiments are (1) an e-mail is sent after the authentication process has been completed, and (2) where the authentication process includes the customer authorizing (or not authorizing) the transaction. In Horie’s second embodiment, the customer must provide a response to the notification from the server, and so Horie discloses that the process “receive[s] a response to the notification.”

287. Kobayashi also states that when the password entered by the user does not match the password on file, even after multiple retries “it is determined that the card cannot be used. Based on the determination result of the password authentication unit 19, the card usage permission notification unit 17 notifies the member store terminal 2 whether the card can be used or not.” Ex. 1007, [0070]. However, if the passwords match, “it is determined that the user’s identity has been verified and that the card can be used.” *Id.* at [0069]. Kobayashi therefore

describes that the card transaction will only be authorized if it receives a proper response.

K. Dependent claim 11: The method according to claim 10, wherein the request is from the group consisting of a customer and an authorized person.

288. Because claim 11 depends from claim 10, I incorporate by reference my analysis for claim 10 of the '564 patent above.

289. As I noted above with respect to claim 3 of the '564 patent, this is a Markush claim and I incorporate by reference my explanation above of my understanding and information regarding the law as it relates to Markush claims.

290. I incorporate by reference my analysis for claim 3 of the '564 patent above.

L. Dependent claim 12: The method according to claim 10, wherein the request is provided from the group consisting of an ATM, a POS terminal, a telephone and virtual.

291. Because claim 12 depends from claim 10, I incorporate by reference my analysis for claim 10 of the '564 patent above.

292. As I noted above with respect to claim 3 of the '564 patent, this is a Markush claim and I incorporate by reference my explanation above of my understanding and information regarding the law as it relates to Markush claims.

293. I incorporate by reference my analysis for claim 4 of the '564 patent above.

M. Dependent claim 13: The method according to claim 10, wherein the transaction is selected from the group consisting of credit card, debit card, charge card, and ATM.

294. Because claim 13 depends from claim 10, I incorporate by reference my analysis for claim 10 of the '564 patent above.

295. As I noted above with respect to claim 3 of the '564 patent, this is a Markush claim and I incorporate by reference my explanation above of my understanding and information regarding the law as it relates to Markush claims.

296. I incorporate by reference my analysis for claim 6 of the '564 patent above.

N. Dependent claim 14: The method according to claim 10, wherein the first transmission channel is selected from the group consisting of wireless and landline channels.

297. Because claim 14 depends from claim 10, I incorporate by reference my analysis for claim 10 of the '564 patent above.

298. As I noted above with respect to claim 3 of the '564 patent, this is a Markush claim and I incorporate by reference my explanation above of my understanding and information regarding the law as it relates to Markush claims.

299. I incorporate by reference my analysis for claim 7 of the '564 patent above.

O. Dependent claim 15: The method according to claim 10, wherein the transaction is selected from the group consisting of credit cards, debit cards and ATM cards.

300. Because claim 15 depends from claim 10, I incorporate by reference my analysis for claim 10 of the '564 patent above.

301. As I noted above with respect to claim 3 of the '564 patent, this is a Markush claim and I incorporate by reference my explanation above of my understanding and information regarding the law as it relates to Markush claims.

302. Horie discloses the transaction is selected from the group consisting of credit cards, debit cards and ATM cards.

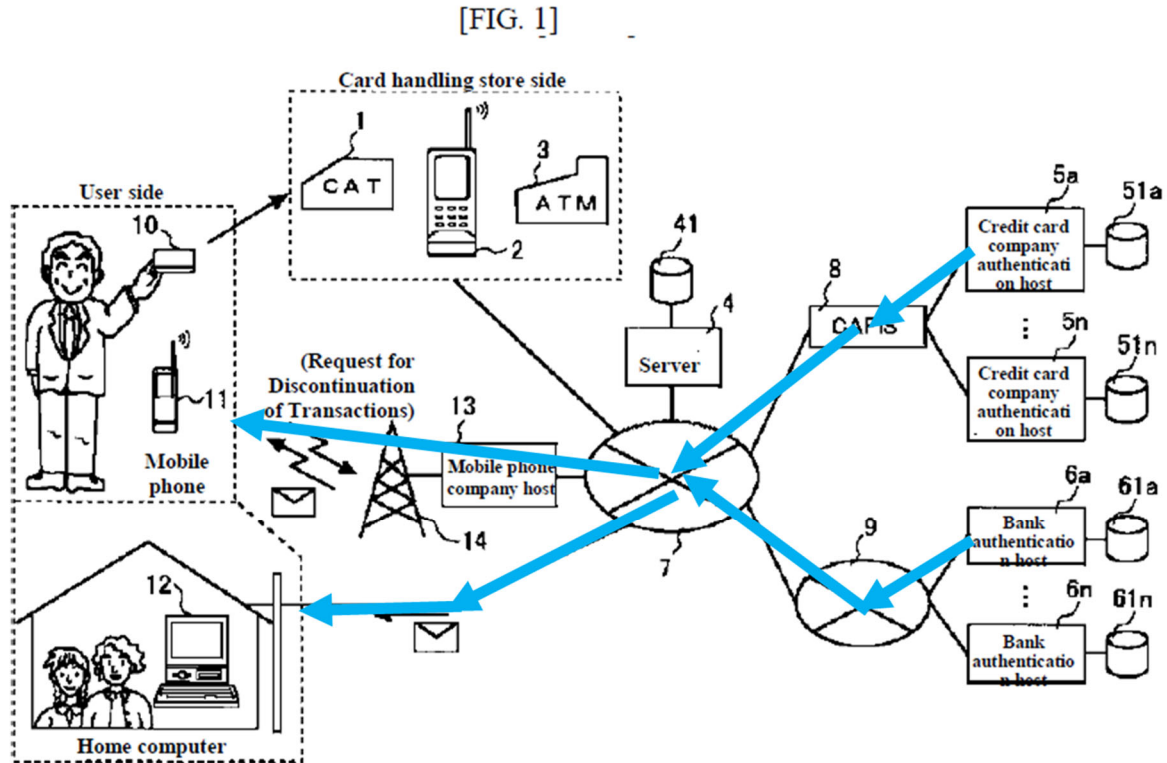
303. Horie states a “‘card’ includes, for example, a credit card, a debit card, and the like” as well as “cash advance cards issued by consumer financial institutions.” Ex. 1006, [0009]. Horie also describes an “ATM” as a card transaction terminal device. *Id.* at [0025].

304. As such, Horie discloses this claim element because it discloses expressly each of a credit cards or debit cards, which is sufficient to disclose this element based on the information and understanding of patent law provided to me.

P. Dependent claim 16: The method according to claim 10, wherein the first and second transmission channels are both wireless channels.

305. Because claim 15 depends from claim 10, I incorporate by reference my analysis for claim 10 of the '564 patent above.

308. Furthermore, Horie discloses a second transmission channel that is also wireless.



Ex. 1006, Fig. 1 (annotated).

309. The first transmission channel in Horie is wireless since Horie expressly discloses that a “wireless CAT, etc. may also be used.” *Id.* at [0025]. A person of ordinary skill would have understood a “wireless CAT” to be a card access terminal with a wireless connection to a network. For example, Horie describes that device as a “portable wireless CAT 2 suitable for use in door-to-door sales.” *Id.* at [0039]. The wireless CAT sends a request for authorization through the network to the card/bank authentication hosts, and because the CAT does so

through a wireless connection the “first transmission channel” includes a wireless channel.

310. Horie further discloses a wireless “second transmission channel.” Horie discloses that, as an option, the notification email of the second transmission channel is sent to “a wireless information terminal device such as a mobile phone having an email receiving function.” *Id.* at [0014]. Horie also discloses that in another embodiment, the notification is sent “to the side of the wireless information terminal device specified in advance for notifying.” *Id.* at [0032]. A person of ordinary skill would have considered either of the sending of the wireless notification to a mobile phone or the device specified in advance as the sending via a second wireless transmission channel.

Q. Dependent claim 17: The method according to claim 10, wherein the request for authorizing a transaction is received from a merchant.

311. Because claim 17 depends from claim 10, I incorporate by reference my analysis for claim 10 of the ’564 patent above.

312. Horie and Kobayashi disclose the request for authorizing a transaction is received from a merchant.

313. According to Kobayashi, “[w]hen a user 7 uses the card to pay for products purchased at a member store, the user 7 hands the card 8 of the member store to a clerk (not shown) at the member store, and the card information is read

by the member store terminal 2. The card information and sales information are transmitted from the member store terminal 2 to the center 1 via the communication line 3.” Ex. 1007, [0042]. Kobayashi further describes that “member store terminal” is one that is “equipped with a credit card reading device” and that the “existing terminals at members stores [can be] used as they are.” *Id.* at [0040]. Thus, the “merchant” of Kobayashi is the store belonging to the merchant and the merchant’s card reading machines that handle the transaction and sending the information to the authentication center. Horie also discloses this element, since “when card 10 owned by a card user is used for payment transactions via card transaction terminal devices 1 to 3, card authentication processing is performed between card transaction terminal devices 1 to 3 and each authentication host” Ex. 1006, [0044]. Horie also defines “card transaction terminal device” as including “CAT (wireless CAT etc. may also be used), ATM, Kiosk terminal device, etc.” *Id.* at [0025]. Thus, in Horie, the merchant sends the request via a CAT, wireless CAT, *etc.*, which are from a merchant.

R. Dependent claim 18: The method according to claim 10, wherein the request for authorizing a transaction is received from the group consisting of a merchant and a customer.

314. Because claim 18 depends from claim 10, I incorporate by reference my analysis for claim 10 of the ’564 patent above.

315. I incorporate by reference my analysis for claim 17 of the '564 patent above.

S. Dependent claim 19: The method according to claim 10, wherein the response is selected from the group consisting of a reply to an SMS message, a key depressed during a telephone call, a PIN, a password, and a voice reply.

316. Because claim 19 depends from claim 10, I incorporate by reference my analysis for claim 10 of the '564 patent above.

317. As I noted above with respect to claim 3 of the '564 patent, this is a Markush claim and I incorporate by reference my explanation above of my understanding and information regarding the law as it relates to Markush claims.

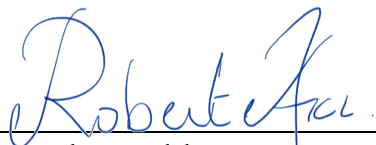
318. Kobayashi states “the password is entered from the mobile phone 6, the telephone terminal interface 15, which received the password as a PB (push button) signal from the telephone network 4, supplies the received password (converted to a text code) to the password authentication unit 19 via the telephone call and response control unit 14.” *Id.* at [0068]. A person of ordinary skill would have understood this to be a key depressed during a telephone call.

XV. Conclusion

319. I note that my analysis is continuing and that I may modify or supplement my conclusions as I receive additional information. I declare under penalty of perjury that the foregoing Declaration is true and correct.

I hereby declare that all statements made are of my own knowledge are true and that all statements made on information and belief are believed to be true. I further declare that these statements 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 the Title 18 of the United States Code and that such willful false statements may jeopardize the validity of this proceeding.

Dated: December 28, 2023

By: 
Dr. Robert Akl, D.Sc.
Dallas, Texas

Appendix A

Professor Robert Akl, D.Sc.



Professional Summary

Dr. Akl has over 28 years of industry and academic experience. He is currently a Tenured Professor at the University of North Texas and a Senior Member of IEEE. He has designed, implemented, and optimized both hardware and software aspects of several wireless communication systems for CDMA, Wi-Fi, and sensor networks. Dr. Akl has broad expertise in wireless communication, Bluetooth, CDMA/WCDMA network optimization, GSM, LTE, VoIP, telephony, computer architecture, and computer networks. He is a very active researcher and is well published and cited. He has been awarded many research grants by leading companies in the industry and the National Science Foundation. He has developed and taught over 100 courses in his field. Dr. Akl has received several awards and commendations for his work, including the 2008 IEEE Professionalism Award and was the winner of the 2010 Tech Titan of the Future Award.

Dr. Akl has extensive experience with patents in the wireless and networking industry. In the past ten years, he has worked as a technical expert in dozens of patent related matters, involving thousands of hours of research, investigation, and study. He has repeatedly been qualified as an expert by Courts, and has provided numerous technology tutorials to Courts, and given testimony by deposition and at trial. He has worked with companies large and small, both for and against the validity and infringement of patents, and has also helped counsel and Courts to understand technology that often seems complex. In doing so, he has become familiar with, and actively worked with, the legal principles that underlie patentability and validity and claim interpretation in the wireless and networking industries.

Areas of Expertise

2G, 3G, 4G, 5G, CDMA/WCDMA, GPS, GSM, UMTS, LTE, Ad-hoc Networks, Antenna Design, Bluetooth, Call Admission Control, Channel Coding, Channel Estimation, Communication Interfaces and Standards, Compression, Computer Architecture, Internet protocols, MIMO Systems, Multi-cell Network Optimization, Network Security, Packet-networks, Ring-networks, Switches and Routers, Telephony, VoIP, VPLS, Wi-Fi, Wireless Communication, Wireless Sensors.

Education

<u>Year</u>	<u>College/University</u>	<u>Degree</u>	<u>GPA</u>
2000	Washington University in Saint Louis	D.Sc. in Electrical Engineering	4.0 / 4.0
1996	Washington University in Saint Louis	M.Sc. in Electrical Engineering	4.0 / 4.0
1994	Washington University in Saint Louis	B.Sc. in Electrical Engineering	4.0 / 4.0
1994	Washington University in Saint Louis	B.Sc. in Computer Science	4.0 / 4.0

Graduated *summa cum laude* and ranked first in undergraduate class.

Dissertation: “Cell Design to Maximize Capacity in Cellular Code Division Multiple Access (CDMA) Networks.” Advisors: Dr. Manju Hegde and Dr. Paul Min.

Litigation Support and Expert Witness Experience

- L1. 2023 **Kilpatrick Townsend & Stockton LLP**
Case: Askeladden LLC v. Calabrese Stemer LLC
IPR2023- To be Assigned; IPR2023-To be Assigned; IPR2023-To be Assigned
Matter: *Inter Partes* Review, secure transactions and payments
Project: Declaration to support three IPR petitions
- L2. 2023 **McGuireWoods LLP**
Case: VoIP-Pal.com, Inc. v. Huawei Technologies Co., Ltd., et al.
Northern district of Texas, Dallas division, Case No. 3:23-cv-0151-X
Matter: Patent infringement, call routing
Project: Declaration regarding 101 Motion
- L3. 2023 **Step toe & Johnson LLP**
Case: Corrigent Corporation v. Cisco Systems, Inc.
Western district of Texas, Waco division, Case No. 6:22-cv-00396-ADA
Matter: Patent infringement, telecommunication systems, switches and routers
Project: Source code review, expert report regarding infringement, expert report regarding validity
- L4. 2023 **Latham & Watkins LLP**
Case: Netgear Inc. v. TP-Link Technologies Co., Ltd., TP-Link Corporation Limited, TP-Link USA Corporation, and TP-Link Research America Corp.
In the Matter of Certain Wi-Fi Routers, Wi-Fi Devices, Mesh Wi-Fi Network Devices, and Hardware and Software Components Thereof, ITC Investigation No. 337-TA-1361
Matter: Patent infringement, Wi-Fi and mesh networks
Project: Source code review, expert report regarding infringement and domestic industry, expert report regarding validity, supplemental expert report, deposition
- L5. 2023 **Devlin Law Firm**
Case: Google, LLC. v. Flypsi, Inc.
IPR2023-00357; IPR2023-00358; IPR2023-00359;
IPR2023-00360; IPR2023-00361
Matter: *Inter Partes* Review, primary and secondary call processing
Project: Five declarations to support five Patent Owner’s responses

- L6. 2023 **Devlin Law Firm**
Case: Google, LLC. v. Flypsi, Inc.
IPR2023-00357; IPR2023-00358; IPR2023-00359;
IPR2023-00360; IPR2023-00361
Matter: *Inter Partes* Review, primary and secondary call processing
Project: Five declarations to support five Patent Owner's responses
- L7. 2023 **Carter Arnett**
Case: Correct Transmission, LLC v. Nokia Corporation, et al.
Eastern district of Texas, Marshall division, Case No. 2:22-cv-00343-JRG-RSP
Matter: Patent infringement, telecommunication systems, switches and routers
Project: Declaration regarding claim construction
- L8. 2023 **Carter Arnett**
Case: Smart Path Connections, LLC v. Nokia Corporation, et al.
Eastern district of Texas, Marshall division, Case No. 2:22-cv-00296-JRG
Matter: Patent infringement, network communication systems, switches and routers
Project: Two declarations regarding claim construction
- L9. 2023 **Devlin Law Firm**
Case: Google, LLC. v. Motion Offense, LLC
IPR2022-01311; IPR2022-01312; IPR2022-01313
Matter: *Inter Partes* Review, cloud storage and file requests
Project: Three declarations to support three Patent Owner's responses, deposition
- L10. 2023 **Carter Arnett**
Case: Cisco Systems, Inc. v. Zilkr Cloud Technologies, LLC
IPR2023-00553; IPR2023-00663; IPR2023-00822
Matter: *Inter Partes* Review, integration of communication services
Project: Two declarations to support two Patent Owner's preliminary responses
- L11. 2023 **Friedman, Suder & Cooke; Kane Russell Coleman Logan PC**
Case: Q Technologies, Inc. v. Walmart Inc.
Western district of Texas, Waco division, Case No. 4W-21-CV-00321-ADA
Matter: Patent infringement, content sharing and payment systems
Project: Validity expert report, deposition

- L12. 2023 **K & L Gates LLP**
Case: STA Group, LLC v. Motorola Solutions, Inc.
Eastern district of Texas, Marshall division, Case No. 2:22-cv-00381-JRG-RSP
Matter: Patent infringement, emergency communication networks
Project: Claim construction and infringement consulting
- L13. 2023 **K & L Gates LLP**
Case: Entropic Communications, LLC v. DirectTV, LLC, Dish Network Corporation et al.
Central district of California, Southern division, Case No. 2:22-cv-07775-JWH-JEM, 2:22-cv-07959
Matter: Patent infringement, satellite and cable receivers and systems
Project: Declaration regarding claim construction, deposition, tech tutorial testimony
- L14. 2023 **Folio Law Group PLLP**
Case: Immersion Corporation v. Meta Platforms, Inc., f/k/a Facebook, Inc.
Western district of Texas, Waco division, Case No. 6:22-cv-00541-ADA
Matter: Patent infringement, virtual reality and augmented reality
Project: Source code review, expert report regarding infringement, supplemental expert report regarding infringement, rebuttal expert report regarding validity, two depositions
- L15. 2023 **Cole Schotz P.C.**
Case: SB IP Holdings, Inc. v. Vivint Smart Home, Inc., Vivint, Inc.
Eastern district of Texas, Sherman division, Case No. 4:20-cv-00886-ALM
Matter: Patent infringement, wireless telecommunication systems
Project: Source code review, expert report regarding infringement, expert report regarding validity, two-day depositions, rebuttal expert report regarding non-infringing alternatives, 2 additional depositions, jury trial testimony
- L16. 2023 **Cole Schotz P.C.**
Case: Vivint Inc. v. SB IP Holdings LLC
IPR2022-00812; IPR2022-01449
Matter: *Inter Partes* Review, wireless telecommunication systems
Project: Two declarations to support Patent Owner's responses, deposition
- L17. 2023 **Carter Arnett**
Case: Samsung Electronics Co., LTD v. G+ Communications, LLC
IPR2022-01598; IPR2023-00171; IPR2023-00665
Matter: *Inter Partes* Review, 4G/5G cellular systems

- Project: Three declarations to support three Patent Owner's preliminary responses, two declarations to support Patent Owner's responses, two depositions
- L18. 2023 **Fish & Richardson, P.C.**
Case: Neo Wireless, LLC v. General Motors Co. et al.;
Neo Wireless, LLC v. Tesla Inc.
Eastern district of Michigan, Southern division, Case No. 2:22-cv-11407-TGB; Case No. 2:22-cv-11408-TGB
Matter: Patent infringement, 4G/LTE wireless communication
Project: Tech tutorial testimony, declaration regarding claim construction
- L19. 2023 **Carter Arnett**
Case: G+ Communications v. Samsung Electronics Co., LTD et al.
Eastern district of Texas, Marshall division, Case No. 2:22-cv-00078-JRG
Matter: Patent infringement, 4G/5G cellular systems
Project: Source code review, declaration regarding claim construction, supplemental declaration regarding claim construction, infringement expert report, rebuttal expert report regarding validity, deposition, two supplemental reports , second deposition
- L20. 2022 **Kilpatrick Townsend & Stockton LLP**
Case: TP-Link Technologies Co., Ltd. and TP-Link Corporation Limited v. Stingray IP Solutions
IPR2022- *To be Assigned*; IPR2022-*To be Assigned*
Matter: *Inter Partes* Review, security and intrusion detection in wireless systems
Project: Two declarations to support two IPR petitions
- L21. 2022 **Devlin Law Firm**
Case: CDN Innovations, LLC v. Mediacom Communication Corporation
Middle district of Georgia, Columbus division
Matter: Patent infringement, telecommunication systems
Project: Declaration to support infringement contentions
- L22. 2022 **Jenner & Block LLP**
Case: WSOU Investments, LLC v. Netgear, Inc.
District of Delaware, Case No. 21-cv-01117-MN-CJB, 21-cv-01119-MN-CJB, 21-cv-01120-MN-CJB
Matter: Patent infringement, adaptive antennas, routers
Project: Declaration regarding claim construction

- L23. 2022 **Simpson Thacher & Bartlett LLP**
Case: XR Communications, LLC. v. Ubiquiti Networks, Inc.
Central district of California, Case No. 2:21-cv-1065-DOC(JDE)
Matter: Patent infringement, Wi-Fi and adaptive antennas
Project: Non-infringement expert report, deposition
- L24. 2022 **Ropes & Gray LLP**
Case: Speir Technologies Ltd. v. Apple Inc.
Western district of Texas, Waco division, Case No. 6:22-cv-00077-
ADA
Matter: Patent infringement, channel estimation
Project: Declaration regarding claim construction
- L25. 2022 **Fish & Richardson, P.C.**
Case: Constellation Designs, LLC v. LG Electronics, Inc. et al.
Eastern district of Texas, Marshall division, Case No. 2:21-cv-448
Matter: Patent infringement, channel coding
Project: Source code review, invalidity expert report, non-infringement expert
report, two-day deposition, jury trial testimony
- L26. 2022 **Calfee, Halter & Griswold LLP**
Case: Resi Media LLC v. BoxCast Inc.
IPR2022-00066; IPR2022-00067
Matter: *Inter Partes* Review, autonomous broadcasting
Project: Combined declaration to support Patent Owner's response, declaration
to support Patent Owner's sur-reply, deposition
- L27. 2022 **Fish & Richardson, P.C.**
Case: FedEx Corporation v. Transcend Shipping Systems, LLC
IPR2022-01117; IPR2022-01219; IPR2022-01252;
IPR2022-01261; IPR2022-01314
Matter: *Inter Partes* Review, location management
Project: Five declarations to support five IPR petitions
- L28. 2022 **Finnegan Henderson Farabow Garrett & Dunner LLP**
Case: Toyota Motor Corp and Continental Automotive Systems. v.
Intellectual Ventures II, LLC
IPR2022-00971; IPR2022-00972; IPR2022-00973; IPR2022-00974;
IPR2022-01130
Matter: *Inter Partes* Review, multicarrier communication
Project: Five declarations to support five IPR petitions, four depositions, three
supplemental declarations, two depositions

- L29. 2022 **Fenwick & West LLP**
Case: TrackThings LLC v. Amazon.com, Inc. et al.
Western district of Texas, Waco division, Case No. 6:21-cv-00720
Matter: Patent infringement, mobile ad-hoc networks
Project: Invalidity consulting
- L30. 2022 **Fenwick & West LLP**
Case: Stingray IP Solutions v. Amazon.com, Inc. et al.
Eastern district of Texas, Marshall division, Case No. 2:21-cv-00193-JRG; Case No. 2:21-cv-00194-JRG
Matter: Patent infringement, mobile ad-hoc networks
Project: Noninfringement consulting
- L31. 2022 **Mayer Brown LLP**
Case: Pantech Corp. v. Coolpad Group Ltd.
Eastern district of Texas, Texarkana division, Case No. 5:21-cv00065
Matter: Patent infringement, LTE wireless communication systems
Project: Infringement consulting
- L32. 2022 **Fitch, Even, Tabin & Flannery**
Case: L2 Mobile Technologies LLC v. Ford Motor Company
District of Delaware, Case No. 1:21-cv-01409-JLH
Matter: Patent infringement, wireless communication systems
Project: Standard essentiality consulting
- L33. 2022 **Susman Godfrey LLP**
Case: California Institute of Technology v. Samsung Electronics Co., Ltd. et al.
Eastern district of Texas, Marshall division, Case No. 2:21-cv-00446-JRG
Matter: Patent infringement, low-density parity-check codes
Project: Source code review, infringement expert report, deposition, supplemental infringement expert report
- L34. 2022 **Devlin Law Firm**
Case: Dropbox, Inc. v. Motion Offense, LLC; Motion Offense, LLC v. Dropbox, Inc.
Western district of Texas, Waco division, Case No. 6:20-cv-00251-ADA; 6:21-cv-00758-ADA
Matter: Patent infringement, telecommunication systems and networking
Project: Source code review, infringement expert report, supplemental infringement expert report, validity expert report, supplemental validity expert report, deposition, jury trial testimony

- L35. 2022 **Bayes PLLC**
Case: Guangdong OPPO Mobile Telecommunications Corp., Ltd. v. Nokia Solutions and Networks Oy
IPR2022-00632
Matter: *Inter Partes* Review, PDU and SDU
Project: Declaration to support IPR petition, deposition, supplemental declaration, second deposition
- L36. 2022 **Finnegan Henderson Farabow Garrett & Dunner LLP**
Case: NetApp, Inc. v. Proven Networks, LLC
IPR2022-00644
Matter: *Inter Partes* Review, allocating resources
Project: Declaration to support IPR petition
- L37. 2022 **Devlin Law Firm**
Case: Motion Offense, LLC v. Google, LLC
Western district of Texas, Waco division, Case No. 6:21-cv-00514-ADA
Matter: Patent infringement, telecommunication systems and networking
Project: Declaration regarding claim construction
- L38. 2022 **Jenner & Block LLP**
Case: Netgear, Inc. v. WSOU Investments, LLC
IPR2022-00516; IPR2022-00606
Matter: *Inter Partes* Review, telecommunication systems
Project: Two declarations to support two IPR petitions
- L39. 2022 **Calfee, Halter & Griswold LLP**
Case: BoxCast Inc. v. Resi Media LLC
Eastern district of Texas, Marshall division, Case No. 2:21-cv-00217-JRG
Matter: Patent infringement, autonomous broadcasting
Project: Source code review, declaration regarding claim construction, declaration regarding validity, declaration regarding infringement, deposition
- L40. 2022 **Fish & Richardson, P.C.**
Case: Apple Inc. v. Ericsson Inc.
IPR2022-00341; IPR2022-00346;
IPR2022-*To be assigned*; IPR2022-*To be assigned*;
IPR2022-*To be assigned*
Matter: *Inter Partes* Review, wireless communication systems
Project: Five declarations to support five IPR petitions, deposition

- L41. 2022 **Ropes & Gray LLP**
Case: Godo Kaisha IP Bridge 1 v. Nokia Corporation, Ericsson Inc. et al.
Eastern district of Texas, Marshall division, Case No. 2:21-CV-213-JRG; Case No. 2:21-CV-215-JRG
Matter: Patent infringement, wireless communication systems
Project: Declaration to support claim construction
- L42. 2022 **Fish & Richardson, P.C.**
Case: Apple Inc. and HP Inc. v. XR Communication Inc
IPR2022-00367; IPR2022-01155; IPR2022-01362
Matter: *Inter Partes* Review, adaptive antennas
Project: Two declarations to support two IPR petitions, deposition, declaration to support petitioners' reply
- L43. 2021 **Fitch, Even, Tabin & Flannery**
Case: L2 Mobile Technologies LLC v. Google LLC
Western district of Texas, Waco division, Case No. 6:21-cv-00358-ADA
Matter: Patent infringement, wireless communication systems
Project: Claim construction consulting
- L44. 2021 **Morgan Lewis & Bockius LLP**
Case: Intellectual Tech LLC v. Zebra Technologies Corporation
Western district of Texas, Waco division, Case No. 6:19-cv-00628-ADA
Matter: Patent infringement, RFID tags
Project: Source code review, claim construction consulting, invalidity expert report
- L45. 2021 **Carter Arnett**
Case: Correct Transmission LLC v. Adtran, Inc.
Northern district of Alabama, Northeastern division, Case No. 5:21-cv-00690-LCB
Matter: Patent infringement, telecommunication systems, switches and routers
Project: Declaration to support claim construction
- L46. 2021 **Carter Arnett**
Case: Juniper Networks, Inc. v. Correct Transmission, LLC
IPR2021-00463; IPR2021-00682; IPR2022-00815
Matter: *Inter Partes* Review, network communication systems, switches and routers
Project: Two declarations to support 2 Patent Owner's responses, two depositions; declaration to support Patent Owner's preliminary response

- L47. 2021 **King & Wood Mallesons LLP**
Case: ToT Power Control, S.L. v. AT&T Mobility et al.; ToT Power Control, S.L. v. T-Mobile USA, Inc. et al.
Western district of Texas, Waco division, Case No. 6:21-CV-00107-ADA; 6:21-CV-00109-ADA
Matter: Patent infringement, WCDMA cellular systems
Project: Declaration regarding claim construction
- L48. 2021 **Finnegan Henderson Farabow Garrett & Dunner LLP**
Case: Xiaomi Communications Co., Ltd. v. Koninklijke KPN N.V.
IPR2022-00025
Matter: *Inter Partes* Review, network communication systems
Project: Declaration to support IPR petition
- L49. 2021 **Carter Arnett**
Case: Juniper Networks, Inc. v. Smart Path Connections, LLC
IPR2021-001170; IPR2021-01356; IPR2022-00240; IPR2022-00815
Matter: *Inter Partes* Review, network communication systems, switches and routers
Project: Declaration to support Patent Owner's preliminary response, three declarations to support three Patent Owner's responses, two depositions
- L50. 2021 **Devlin Law Firm**
Case: Dyfan LLC v. Target Corporation
District of Delaware, Case No. 6:19-cv-00179-ADA
Matter: Patent infringement, network communications
Project: Declaration to support summary judgement, deposition
- L51. 2021 **Alston & Bird LLP**
Case: Stingray IP Solutions v. Signify N.V., et al.
Eastern district of Texas, Marshall division, Case No. 2:21-cv-00043-JRG; Case No. 2:21-cv-00044-JRG
Matter: Patent infringement, mobile ad-hoc networks
Project: Declaration to support claim construction
- L52. 2021 **Cole Schotz P.C.**
Case: SkyBell Technologies, Inc. v. Vivint Smart Home, Inc., SimpliSafe, Inc., and Arlo Technologies Inc
In the Matter of Certain IP Camera Systems Including Video Doorbells and Components Thereof, ITC Investigation No. 337-TA-1242
Matter: Patent infringement, wireless telecommunication systems
Project: Source code review, expert report infringement and domestic industry, rebuttal expert report, three-day deposition

- L53. 2021 **Axinn, Veltrop & Harkrider LLP**
Case: Koninklijke Philips N.V. v. Thales DIS AIS USA, LLC et al.
In the Matter of Certain UMTS and LTE Cellular Communication Modules and Products Containing the Same, ITC Investigation No. 337-TA-1240
Matter: Patent infringement, wireless communication systems
Project: Expert report regarding non-infringement and no domestic industry, deposition, ITC hearing testimony
- L54. 2021 **Morgan Lewis & Bockius LLP**
Case: SIPCO, LLC v. Aruba Networks, LLC and Hewlett Packard Enterprise Company
District of Delaware, Case No. 1:20-cv-00537-MN
Matter: Patent infringement, wireless communication systems
Project: Declaration regarding claim construction
- L55. 2021 **Ropes & Gray LLP**
Case: Palo Alto Networks Inc. v. Centripetal Networks, Inc.
IPR2021-01150, IPR2021-01151, IPR2021-01155, IPR2021-01156, IPR2021-01270, PGR2021-00108, IPR2021-01520, IPR2021-01521
Matter: *Inter Partes* Review, network security systems
Project: Seven declarations to support seven IPR petitions, declaration to support post grant review, deposition
- L56. 2021 **Devlin Law Firm**
Case: CDN Innovations, LLC v. Grande Communications Networks, LLC
Eastern district of Texas, Sherman division, Case No. 4:20-cv-653-SDJ
Matter: Patent infringement, telecommunication systems
Project: Declaration to support infringement contentions
- L57. 2021 **Banner Witcoff**
Case: Sisvel International S.A., 3G Licensing S.A. v. ZTE (USA) Inc. et al.
Northern district of Texas, Case No. 3:20-cv-01289-M
Matter: Patent infringement, wireless communication systems
Project: Declaration to support claim construction, deposition
- L58. 2021 **Paul Hastings LLP**
Case: G. Holdings Ltd. v. Samsung Electronics Co., et al.
Eastern district of Texas, Marshall division, Case No. 2:20-cv-00342-JRG
Matter: Patent infringement, electronic payment systems
Project: Declaration to support claim construction

- L59. 2021 **Morgan Lewis & Bockius LLP**
Case: Aruba Networks, LLC and Hewlett Packard Enterprise Company v. SIPCO, LLC
IPR2021-00787
Matter: *Inter Partes* Review, wireless communication systems
Project: Declaration to support IPR petition
- L60. 2021 **Jenner & Block LLP**
Case: Virentem Ventures LLC D/B/A Enounce v. TiVo Corp and Xperi Holding Corporation
District of Delaware, Case No. 20-787-MN
Matter: Patent infringement, telecommunication systems
Project: Declaration to support claim construction
- L61. 2021 **Carter Arnett**
Case: Correct Transmission LLC v. Adtran, Inc. and Juniper Networks, Inc.
Western district of Texas, Waco division, Case No. 6:20-cv-669-ADA
Matter: Patent infringement, telecommunication systems
Project: Source code review, declaration to support claim construction
- L62. 2021 **Fish & Richardson, P.C.**
Case: Quectel Wireless Solutions Co. Ltd. v. Koninklijke Philips N.V.
IPR2021-00558, IPR2021-00559, IPR2021-00561
Matter: *Inter Partes* Review, wireless communication systems
Project: Three declarations to support three IPR petitions, declaration to support reply, two depositions
- L63. 2021 **Goldberg Kohn Ltd**
Case: United States ex. rel. Todd Heath v. Wisconsin Bell, Inc
District of Columbia, Case No. 11-cv-01897
Matter: Networking systems
Project: Technology consulting
- L64. 2021 **Fish & Richardson, P.C.**
Case: Samsung Electronics Co. Ltd. v. Ericsson Inc.
IPR2021-00447, IPR2021-00588, IPR2021-00613, IPR2021-00614, IPR2021-00643, IPR2021-00645, IPR2021-00684
Matter: *Inter Partes* Review, wireless communication systems
Project: Seven declarations to support seven IPR petitions
- L65. 2020 **Kilpatrick Townsend & Stockton LLP**
Case: GREE Inc. v. Supercell Oy
Eastern district of Texas, Marshall division, Case No. 2:19-cv-00413-JRG-RSP
Matter: Patent infringement, mobile gaming

- Project: Source code review, infringement expert report, supplemental expert report, validity expert report, deposition
- L66. 2020 **Banner Witcoff**
Case: Sisvel International S.A., 3G Licensing S.A. v. ZTE (USA) Inc. et al. Northern district of Texas, Case No. 3:19-cv-01694-N
Matter: Patent infringement, wireless communication systems
Project: Declaration to support claim construction, deposition
- L67. 2020 **Fish & Richardson, P.C.**
Case: Cellco Partnership D/B/A Verizon Wireless v. Huawei Technologies Co., Ltd
IPR2020-01352, IPR202-01356, IPR2020-01357
Matter: *Inter Partes* Review, network communication systems
Project: Three declarations to support 3 Patent Owner' responses
- L68. 2020 **Kilpatrick Townsend & Stockton LLP**
Case: GREE Inc. v. Supercell Oy
Eastern district of Texas, Marshall division, Case No. 2:20-cv-00113-JRG-RSP
Matter: Patent infringement, mobile gaming
Project: Source code review, declaration supporting claim construction, infringement expert report, validity expert report, supplemental report, deposition
- L69. 2020 **Kilpatrick Townsend & Stockton LLP**
Case: GREE Inc. v. Supercell Oy
Eastern district of Texas, Marshall division, Case No. 2:19-cv-00200-JRG-RSP, Case No. 2:19-cv-00237-JRG-RSP, Case No. 2:19-cv-00310-JRG-RSP; Case No. 2:19-cv-00311-JRG-RSP
Matter: Patent infringement, mobile gaming
Project: Source code review, four infringement expert reports, two supplemental infringement expert reports, four validity expert reports, two supplemental expert reports, two second supplemental expert reports, 3-day deposition, jury trial testimony
- L70. 2020 **Sheridan Ross P.C.**
Case: Justservice.net LLC v. Dropbox, Inc.
Western district of Texas, Waco division, Case No. 6:20-CV-00070-ADA
Matter: Patent infringement, computer systems and networking
Project: Source code review, declaration regarding claim construction

- L71. 2020 **Perkins Coie LLP**
Case: Huizhou TCL Mobile Communication Co. Ltd., TCT Mobile (US) Inc., and TCL Mobile Communication (HK) Co., Ltd. v. Wi-LAN Inc.
Matter: *Ex Partes* Reexamination, QoS enhancements for wireless IP networks
Project: Declaration to support Requesters
- L72. 2020 **Perkins Coie LLP**
Case: Intel Corporation v. UNM Rainforest Innovations
IPR2020-01576, IPR2020-01578, IPR2020-*to be assigned*
Matter: *Inter Partes* Review, wireless broadband
Project: Three declarations to support three IPR petitions
- L73. 2020 **Calfee, Halter & Griswold LLP**
Case: Motorola Solutions, Inc. v. Hytera Communications Corp. Ltd. et al.
Northern district of Illinois, Case No. 1:17-cv-01972
Matter: Patent infringement, two-way radios
Project: Declaration regarding claim construction, deposition
- L74. 2020 **Fish & Richardson, P.C.**
Case: Huawei Technologies Co., Ltd et al. v. Verizon Communications, Inc.
et al.
Western district of Texas, Waco division, Case No. 6-20-cv-00090
Matter: Patent infringement, video communication
Project: Source code review, declaration regarding claim construction, infringement expert report, validity expert report, deposition
- L75. 2020 **Kilpatrick Townsend & Stockton LLP**
Case: GREE Inc. v. Supercell Oy
Eastern district of Texas, Marshall division, Case No. 2:19-cv-00070-JRG-RSP, Case No. 2:19-cv-00071-JRG-RSP
Matter: Patent infringement, mobile gaming
Project: Source code review, two infringement expert reports, two supplemental infringement expert reports, two second supplemental infringement expert reports, two rebuttal expert reports on validity, two-day deposition, seven declarations supporting Gree's opposition to Supercell's motions for summary judgement, jury trial testimony
- L76. 2020 **Cooley LLP**
Case: Saint Lawrence Communications, LLC v. Amazon.com, Inc., et al.
Eastern district of Texas, Marshall division, Case No. 2:19-cv-00027-JRG
Matter: Patent infringement, AMR-WB, speech compression, coding and decoding
Project: Invalidity expert report

- L77. 2020 **Prince Lobel Tye LLP**
Case: Intellectual Ventures I and II LLC v. VMware, Inc.
Western district of Texas, Austin division, Case No. 1:19-cv-01075-ADA
Matter: Patent infringement, networking systems
Project: Declaration to support claim construction
- L78. 2020 **Gibson, Dun & Crutcher LLP**
Case: Cellular Evolution LLC v. T-Mobile US, Inc. et al.
Eastern district of Texas, Marshall division, Case No. 2:19-cv-232-JRG
Matter: Patent infringement, cellular systems
Project: Invalidity consulting
- L79. 2020 **Faegre Baker Daniels LLP**
Case: CommScope, Inc. v. Rosenberger Technology, et al.
District of New Jersey, Case No. 19-cv-15962-MCA-LDW
Matter: Trade secret software, base station antenna design
Project: Declaration, deposition
- L80. 2020 **Ropes & Gray LLP**
Case: Canon, Inc. v. TCL Electronics Holdings Ltd., et al.
Eastern district of Texas, Marshall division, Case No. 2:18-cv-546-JRG
Matter: Patent infringement, communication interfaces
Project: Source code review, declaration to support claim construction, deposition
- L81. 2019 **Perkins Coie LLP**
Case: Huizhou TCL Mobile Communication Co. Ltd., TCT Mobile (US) Inc., and TCL Mobile Communication (HK) Co., Ltd. v. Wi-LAN Inc.
IPR2020-00302, IPR2020-00303
Matter: *Inter Partes* Review, QoS enhancements for wireless IP networks
Project: Two declarations to support two IPR petitions
- L82. 2019 **Fish & Richardson**
Case: Bell Northern Research v. Huawei, et al.
Southern district of California, Case No. 3:18-cv-1784-CAB-BLM
Matter: Patent infringement, wireless networks
Project: Invalidity consulting
- L83. 2019 **K & L Gates LLP**
Case: EVS CODEC Technologies, LLC and Saint Lawrence Communications, LLC v. ZTE Corporation, et al.
Northern district of Texas, Dallas division, Case No. 3:19-cv-00385-MBH
Matter: Patent infringement, EVS, speech compression, coding and decoding

- Project: Invalidity expert report
- L84. 2019 **Feinberg Day Alberti Lim & Belloli LLP**
Case: Uniloc 2017 LLC v. AT&T Mobility LLC, et al.
Eastern district of Texas, Marshall division, Case No. 2:18-cv-00514-JRG
Matter: Patent infringement, wireless frequency bands and devices
Project: Two declarations to support claim construction, deposition
- L85. 2019 **Susman Godfrey LLP**
Case: Sol IP, LLC v. AT&T Mobility LLC, et al.
Eastern district of Texas, Marshall division, Case No. 2:18-cv-00526; 2:18-cv-00527; and 2:18-cv-00528
Matter: Patent infringement, Wi-Fi and LTE
Project: Validity consulting
- L86. 2019 **Ropes & Gray LLP**
Case: Huawei Technologies Co. Ltd. v. Harris Global Communications, Inc.
IPR2019-01512, IPR2019-01631
Matter: *Inter Partes* Review, routing and security in wireless networks
Project: Two declarations to support two IPR petitions
- L87. 2019 **Ropes & Gray LLP**
Case: Harris Corporation v. Huawei Device USA, Inc. et al.
Eastern district of Texas, Marshall division, Case No. 2:18-cv-00439-JRG
Matter: Patent infringement, routing and security in wireless networks
Project: Declaration to support claim construction
- L88. 2019 **Erise IP**
Case: Semcon IP Inc. v. ASUSTeK Computer Inc.
Eastern district of Texas, Marshall division, Case No. 2:18-cv-00193-JRG
Matter: Patent infringement, adaptive power control
Project: Non-infringement expert report
- L89. 2019 **Cooley LLP**
Case: Facebook Inc. v. BlackBerry Corp. et al.
Northern District of California, Oakland division, Case No. 4:18-cv-05434-JSW
Matter: Patent infringement, mobile computing
Project: Declaration to support claim construction

- L90. 2019 **Sidley Austin LLP**
Case: Semcon IP Inc. v. Amazon.com, Inc.
Eastern district of Texas, Marshall division, Case No. 2:18-cv-00192-JRG
Matter: Patent infringement, adaptive power control
Project: Expert report regarding patent marking, rebuttal report regarding patent marking, deposition
- L91. 2019 **Oblon, McClelland, Maier & Neustadt, LLP**
Case: MV3 Partners LLC v. Roku, Inc.
Western district of Texas, Waco division, Case No. 6:18-cv-308-ADA
Matter: Patent infringement, mobile set top box
Project: Declaration to support claim construction, deposition, Markman hearing and tech tutorial testimony
- L92. 2019 **Banner & Witcoff, LTD.**
Case: Kathrein USA, Inc. v. Fractus S.A.
IPR2019-00954, IPR2019-00955, IPR2019-00956, IPR2019-00957
Matter: *Inter Partes* Review, multiband antenna arrays
Project: Four declarations to support four IPR petitions
- L93. 2019 **Fish & Richardson, P.C.**
Case: LG Electronics Inc. v. Saint Lawrence Communications LLC
Southern district of New York, Case No. 1:18-cv-11082-DLC
Matter: Patent infringement, EVS, speech compression, coding and decoding
Project: Declaration relating to motion for summary judgment, expert report, deposition
- L94. 2019 **Ropes & Gray LLP**
Case: SIPCO, LLC v. Emerson Electric Co.
In the Matter of Certain Wireless Mesh Networking Products and Related Components Thereof, ITC Investigation No. 337-TA-1131
Matter: Patent infringement, links in wireless networks and remote monitoring
Project: Source code review, declaration to support claim construction, invalidity expert report, rebuttal expert report regarding non-infringement and no domestic industry
- L95. 2019 **Fish & Richardson, P.C.**
Case: Maxell Ltd. v. Huawei Technologies Co. Ltd., ZTE, et al.
Eastern district of Texas, Texarkana division, Case No. 5:18-cv-0033-RWS
Matter: Patent infringement, portable computing devices
Project: Declaration regarding claim construction

- L96. 2019 **Ropes & Gray LLP**
Case: Emerson Electric Co. v. SIPCO, LLC
IPR2019-00548, IPR2019-00549
Matter: *Inter Partes* Review, routing in wireless networks
Project: Two declarations to support two IPR petitions
- L97. 2018 **Mishcon de Reya New York LLP; King & Wood Mallesons LLP**
Case: ChanBond, LLC v. Cox Communications, Inc.
District of Delaware, Case No. 1:15-cv-00849-RGA
Matter: Patent infringement, wideband signal distribution system
Project: Validity expert report, deposition, sur-reply expert report, second sur-reply expert report, second deposition, jury trial with settlement mid-trial
- L98. 2018 **Fish & Richardson, P.C.**
Case: In re: Qualcomm Antitrust Litigation (Client: Apple)
Southern district of California, Case No. 3:17-cv-00108-GPC-MDD
Matter: Qualcomm antitrust litigation
Project: Two expert rebuttal reports, deposition
- L99. 2018 **Susman Godfrey LLP**
Case: In re: Qualcomm Antitrust Litigation (Client: Class Action)
Northern district of California, Case No. 5:17-md-02773-LHK
Matter: Qualcomm antitrust litigation
Project: Expert declaration on standard essential patents, expert report on deemed essential patents, rebuttal expert report, deposition
- L100. 2018 **284 Partners**
Case: Federal Trade Commission. v. Qualcomm Incorporated
Northern district of California, Case No. 5:17-cv-00220
Matter: Qualcomm antitrust litigation
Project: Expert report on standard essential patents, expert rebuttal report, deposition
- L101. 2018 **Vorys, Sater, Seymour and Pease LLP**
Case: Route1 Inc. v. Airwatch LLC
District of Delaware, Case No. 17-331-RGA
Matter: Patent infringement, remote access
Project: Source code review, declaration regarding claim construction, infringement expert report, validity expert report, reply expert report, deposition, three declarations regarding re-exam
- L102. 2018 **Sidley Austin LLP**
Case: Samsung Electronics Co., Ltd v. Huawei Technologies Co., Ltd.
IPR2017-01471, IPR2017-01474, IPR2017-01475
Matter: *Inter Partes* Review, 4G/LTE

- Project: Three declarations to support three Patent Owner's responses, supplemental declaration, deposition
- L103. 2018 **Fitzpatrick Cella Harper & Scinto**
Case: IPC Systems, Inc. v. Cloud9 Technologies, LLC
District of Delaware, Case No. 16-cv-443-GMS
Matter: Patent infringement, telephone stations and trading turrets
Project: Source code review, declaration regarding claim construction, supplemental declaration regarding claim construction
- L104. 2018 **Haynes and Boone, LLP**
Case: LG Electronics Inc., et al. v. Wi-LAN Inc., et al.
IPR2018-00673, IPR2018-00674, IPR2018-00704, IPR2018-00705, IPR2018-00709, IPR2018-00710
Matter: *Inter Partes* Review, bandwidth allocation
Project: Six declarations to support six IPR petitions, two depositions, two reply declarations
- L105. 2018 **Pillsbury Winthrop Shaw Pittman LLP**
Case: Cellular Communications Equipment v. ZTE, HTC Corporation, et al.
Eastern district of Texas, Case No. 6:16-cv-475-RWS
Matter: Patent infringement, LTE, power control, emergency notification
Project: Invalidity expert report, deposition
- L106. 2018 **Finnegan Henderson Farabow Garrett & Dunner LLP**
Case: FanDuel, Inc. DraftKings, Inc., and Bwin.Party Digital Entertainment PLC. v. CG Technology Development, LLC
IPR2017-00902, IPR2017-01333, IPR2017-01491, IPR2017-01532
Matter: *Inter Partes* Review, location-based gaming
Project: Four declarations to support four Patent Owner's responses, two supplemental declarations, four depositions
- L107. 2018 **Calfee, Halter & Griswold LLP**
Case: Hytera Communications Corp. Ltd. v. Motorola Solutions, Inc.
Northern district of Ohio, Case No. 1:17-cv-01794-DNC
Matter: Patent infringement, two-way radios
Project: Source code review, declaration regarding claim construction, rebuttal declaration regarding claim construction, deposition, infringement expert report, validity expert report, two-day deposition
- L108. 2017 **Covington & Burling LLP**
Case: Sharp Corporation, et al. v. Hisense Co., Ltd., et al.
In the Matter of Certain Wi-Fi Enabled Electronic Devices and Components Thereof, ITC Investigation No. 337-TA-1072
Matter: Patent infringement, Wi-Fi, OFDMA
Project: Declaration regarding claim construction

- L109. 2017 **Vorys, Sater, Seymour and Pease LLP**
Case: Airwatch LLC and VMWare Inc. v. Route1 Inc.
IPR2017-02145
Matter: *Inter Partes* Review, remote access
Project: Declaration to support Patent Owner's response
- L110. 2017 **Arnold & Porter Kaye Scholer**
Case: Uniloc USA, Inc. v. Google, Inc.
Eastern district of Texas, Marshall division, Case No. 2:17-cv-0214-JRG, 2:17-cv-0224-JRG, 2:17-cv-0231-JRG, 2:17-cv-0465-JRG, 2:17-cv-0466-JRG, 2:17-cv-0467JRG
Matter: Patent infringement, VoIP messaging
Project: Invalidity consulting
- L111. 2017 **Simpson Thacher & Bartlett LLP**
Case: XR Communications, LLC. v. Ubiquiti Networks, Inc.
Central district of California, Case No. 2:17-cv-02968-AG(JCGx)
Matter: Patent infringement, Wi-Fi and adaptive antennas
Project: Declaration regarding claim construction, deposition
- L112. 2017 **Covington & Burling LLP**
Case: Huawei Device USA Inc. v. Hitachi Maxell, Ltd.
IPR2018-00209, IPR2018-00210
Matter: *Inter Partes* Review, base station selection, GPS/Cellular location
Project: Two declarations to support two IPR petitions
- L113. 2017 **Calfee, Halter & Griswold LLP**
Case: Hytera Communications Corp. Ltd. v. Motorola Solutions, Inc.
IPR2018-00128, IPR2017-02183
Matter: *Inter Partes* Review, two-way radios
Project: Declaration to support IPR petition, deposition, two supplemental declarations, two depositions
- L114. 2017 **Finnegan Henderson Farabow Garrett & Dunner LLP**
Case: Hytera Communications Corp. Ltd. v. Motorola Solutions, Inc.
IPR2017-02179, IPR2017-02183
Matter: *Inter Partes* Review, two-way radios
Project: Two declarations to support two IPR petitions, deposition
- L115. 2017 **Mayer Brown LLP**
Case: Silver Spring Networks, Inc. v. Sunrise Technologies, Inc.
Silver Spring Networks, Inc. v. Weatherproof Wireless, LLC
IPR2017-*To Be Assigned*, IPR2017-*To Be Assigned*
Matter: *Inter Partes* Review, power meter
Project: Two declarations to support two IPR petitions

- L116. 2017 **Covington & Burling LLP**
Case: Hitachi Maxell, Ltd. v. Huawei Device USA Inc. et al.
Eastern district of Texas, Texarkana division, Case No. 5:16-cv-00178-RWS
Matter: Patent infringement, 3G/4G
Project: Source code review, declaration regarding claim construction, invalidity expert report, non-infringement expert report, non-infringing alternatives expert report, two depositions
- L117. 2017 **Finnegan Henderson Farabow Garrett & Dunner LLP**
Case: LG Electronics, Inc. et al. v. BLU Products, Inc. and CT Miami, LLC
In the Matter of Certain LTE Wireless Communication Devices and Components Thereof, ITC Investigation No. 337-TA-1051
Matter: Patent infringement, 4G/LTE
Project: Declaration regarding claim construction, second declaration regarding claim construction
- L118. 2017 **Sidley Austin LLP**
Case: Huawei Technologies Co., Ltd. v. Samsung Electronics Co., Ltd.
IPR2017-01979, IPR2017-01980, IPR2017-01986
Matter: *Inter Partes* Review, 4G/LTE
Project: Three declarations to support three IPR petitions, deposition
- L119. 2017 **Finnegan Henderson Farabow Garrett & Dunner LLP**
Case: Motorola Solutions, Inc. v. Hytera Communications Corp. Ltd. et al.
In the Matter of Certain Two-way Radio Equipment Systems, Related Software and Components Thereof, ITC Investigation No. 337-TA-1053
Matter: Patent infringement, two-way radio
Project: Source code review, declaration regarding claim construction, invalidity expert report, non-infringement expert report, deposition, ITC hearing testimony
- L120. 2017 **Haynes and Boone, LLP**
Case: Rackspace US, Inc. v. Realtime Data LLC
IPR2017-01691
Matter: *Inter Partes* Review, data compression
Project: Declaration to support IPR petition
- L121. 2017 **Pillsbury Winthrop Shaw Pittman LLP**
Case: ZTE (USA), HTC Corporation, et al. v. Cellular Communications Equipment
IPR2017-01508, IPR2017-01509
Matter: *Inter Partes* Review, LTE, power control, emergency notification
Project: Two declarations to support two IPR petitions, two depositions

- L122. 2017 **Alston & Bird LLP; Womble Carlyle Sandridge & Rice LLP**
Case: Itron, Inc. and Duke Energy Corp. v. Smart Meter Technologies
IPR2017-01199
Matter: *Inter Partes* Review, power meter
Project: Declaration to support IPR petition, deposition
- L123. 2017 **Haynes and Boone, LLP**
Case: Ericsson Inc. v. Regents of the University of Minnesota
IPR2017-01186, IPR2017-01200, IPR2017-01213
Matter: *Inter Partes* Review, OFDM and MIMO
Project: Three declarations to support three IPR petitions
- L124. 2017 **Quinn Emanuel Urquhart & Sullivan, LLP**
Case: GENBAND US, LLC v. Metaswitch Networks Ltd, et al.
Eastern district of Texas, Marshall division, Case No. 2:16-cv-582-JRG-RSP
Matter: Patent infringement, Internet protocols and VoIP, switches and routers
Project: Expert report regarding essentiality
- L125. 2017 **Mayer Brown LLP**
Case: Uniloc USA, Inc. et al. v. Avaya Inc., ShoreTel, Inc., et al.
Eastern district of Texas, Tyler division, Case Nos. 6:15-cv-1168-JRG
Matter: Patent infringement, instant messaging and conference calling
Project: Source code review, non-infringement consulting
- L126. 2017 **Fish & Richardson P.C.**
Case: Nokia Solutions and Networks US LLC, et al. v. Huawei Technologies Co. Ltd., et al.
Eastern district of Texas, Marshall division, Case Nos. 2:16-cv-753-JRG-RSP, 2:16-cv-754
Matter: Patent infringement, 4G/LTE
Project: Claim construction, two declarations
- L127. 2017 **Rothwell Figg Ernst & Manbeck, PC; Pepper Hamilton LLP**
Case: Samsung Electronics, et al. v. Rembrandt Wireless Technologies, LP
IPR2015-00555
Matter: *Ex Parte* Reexamination, Bluetooth
Project: Two declarations to support two Patent Owner's responses, supplemental declaration to support Patent Owner's reply

- L128. 2016 **Sidley Austin LLP**
Case: Huawei Technologies Co., et al. v. Samsung Electronics Co, et al. and Samsung Research America v. Hisilicon Technologies Co, LTD
Northern district of California, San Francisco division, Case No. 3:16-cv-2787-WHO
Matter: Patent infringement, 3G/4G/LTE
Project: Source code review, declaration regarding claim construction, declaration opposing summary judgement, infringement expert report, invalidity expert report, non-infringement expert report, validity expert report, two depositions
- L129. 2016 **Bragalone Conroy PC**
Case: Securus Technologies, Inc. v. Global Tel*Link Corporation
CBM2017-00034
Matter: Covered Business Method Review, call monitoring and recording
Project: Declaration to support CBM petition, deposition
- L130. 2016 **Braxton, Hilton & Perrone PLLC**
Case: Biosonix, LLC. v. Hydrowave, LLC et al.
Eastern district of Texas, Case No. 2:16-cv-139-RC
Matter: Patent infringement, underwater transceivers
Project: Claim construction, Markman hearing and tech tutorial testimony
- L131. 2016 **Gray Reed & McGraw**
Case: Optis Cellular Technology, LLC and PanOptis Patent Management, LLC. v. Blackberry Corporation, et al.
Eastern district of Texas, Marshall division, Case No. 2:16-cv-59-JRG-RSP, Case No. 2:16-cv-61-JRG-RSP, Case No. 2:16-cv-62-JRG-RSP
Matter: Patent infringement, LTE
Project: Claim construction, three declarations regarding claim construction, deposition
- L132. 2016 **Ropes & Gray LLP; Davidson Berquist Jackson & Gowdey**
Case: SIPCO, LLC et al v. Emerson Electric Co. et al
Eastern district of Texas, Tyler division, Case No. 6:15-cv-907
Emerson Electric Co. et al v. SIPCO, LLC et al.
Northern district of Georgia, Atlanta division, Case No. 1:15-cv-00319-AT
Matter: Patent infringement, links in wireless networks and remote monitoring
Project: Source code review, invalidity consulting
- L133. 2016 **McKool Smith**
Case: Regents of University of Minnesota v. AT&T Mobility LLC, et al.
District of Minnesota, Case No. 0:14-cv-04666-JRT-TNL
Matter: Patent infringement, LTE and MIMO

- Project: Non-infringement and invalidity consulting
- L134. 2016 **EIP US LLP**
Case: GENBAND US, LLC et al. v. Metaswitch Networks Ltd
IPR2015-01456, IPR2015-01457
Matter: *Inter Partes* Review, media gateways, switches and routers
Project: Two declarations to support Patent Owner's responses, two depositions
- L135. 2016 **Haynes and Boone, LLP**
Case: Cox Communications, Inc. v. AT&T Intellectual Property I, II, LP
IPR2015-01187, IPR2015-01227, IPR2015-01273, IPR2015-01536
Matter: *Inter Partes* Review, cable networks
Project: Four declarations to support Patent Owner's responses, four depositions
- L136. 2016 **Mayer Brown LLP**
Case: Odyssey Wireless v. Motorola Mobility LLC
Eastern district of North Carolina, Western division, Case No. 5:14-cv-491-D
Southern district of California, Case No. 3:15-cv-01741-H-RBB
Matter: Patent infringement, LTE
Project: Source code review, non-infringement consulting
- L137. 2016 **Cooley LLP; Finnegan LLP**
Case: Saint Lawrence Comm. LLC v. Motorola Mobility LLC, ZTE (USA) Inc., et al.
Eastern district of Texas, Marshall division, Case No. 2:15-cv-000351-JRG, Case No. 2:15-cv-000349-JRG
Matter: Patent infringement, speech compression, coding and decoding
Project: Invalidity expert report, expert report regarding AMR-WB standard, expert report regarding Opus and Silk, supplemental expert report regarding invalidity, two-day depositions, jury trial testimony for Motorola
- L138. 2015 **Sidley Austin LLP**
Case: Evolved Wireless, LLC v. Microsoft Corp., et al.
District of Delaware, Case No. 15-cv-546
Matter: Patent infringement, LTE
Project: Prior art and invalidity consulting

- L139. 2015 **McKool Smith**
Case: Optis Wireless Technology, LLC and PanOptis Patent Management, LLC v. ZTE Corporation and ZTE (USA) Inc.
Eastern district of Texas, Marshall division, Case No. 2:15-cv-300-JRG-RSP
Matter: Patent infringement, cellular messages and multimedia attachments
Project: Source code review, claim construction, declaration
- L140. 2015 **Fish & Richardson, P.C.**
Case: Saint Lawrence Comm. LLC v. LG Elec., Inc. et al.
Eastern district of Texas, Marshall division, Case No. 2:14-cv-1055-JRG
Matter: Patent infringement, speech compression, coding and decoding
Project: Invalidity expert report
- L141. 2015 **Finnegan Henderson Farabow Garrett & Dunner LLP**
Case: LG Electronics, Inc. v. Cellular Communications Equipment LLC
IPR2016-00178
Matter: *Inter Partes* Review, LTE
Project: Declaration to support IPR petition
- L142. 2015 **McKool Smith**
Case: AT&T, et al. v. Cox Communication, Inc., et al.
District of Delaware, Case No. 14-1106-GMS
Matter: Patent infringement, cable networks
Project: Claim construction, declaration
- L143. 2015 **McKool Smith**
Case: Ericsson Inc., et al. v. TCL Communication, et al.
Eastern district of Texas, Marshall division, Case No. 2:15-cv-00011-RSP
Matter: Patent infringement, wireless devices and systems
Project: Source code review, claim construction, declaration, infringement expert report, validity expert report, two-day depositions
- L144. 2015 **Foley & Lardner LLP**
Case: Kyocera Communications, Inc. v. Cellular Communications Equipment LLC
IPR2015-01559, IPR2015-01564
Matter: *Inter Partes* Review, LTE, power control, emergency notification
Project: Two declarations to support two IPR petitions
- L145. 2015 **Fish & Richardson, P.C.**
Case: Fairfield Industries Inc. v. Wireless Seismic, Inc.
Southern district of Texas, Case No. 4:14-cv-02972-KPE
Matter: Patent infringement, wireless sensor networks

- Project: Non-infringement expert report
- L146. 2015 **Quinn Emanuel Urquhart & Sullivan, LLP**
Case: GENBAND US, LLC v. Metaswitch Networks Ltd, et al.
Eastern district of Texas, Marshall division, Case No. 2:14-cv-33-JRG-RSP
Matter: Patent infringement, Internet protocols and VoIP, switches and routers
Project: Expert report regarding essentiality, non-infringement expert report, rebuttal expert report regarding non-practice, supplemental rebuttal expert report, three-day depositions, jury trial testimony
- L147. 2015 **Duane Morris LLP; Foley & Lardner LLP**
Case: Mobile Telecommunications Technologies, LLC v. Leap Wireless International, Cricket Communications, Inc.
Eastern district of Texas, Marshall division, Case No. 2:13-cv-00885-RSP
Matter: Patent infringement, OFDM and MIMO
Project: Non-infringement expert report, deposition
- L148. 2015 **Hogan Lovells US LLP; Kenyon & Kenyon LLP**
Case: One-E-Way v. Beats Electronics, LLC, Sony Corporation, et al.
In the Matter of Certain Wireless Headsets, ITC Investigation No. 337-TA-943
Matter: Patent infringement, wireless communication
Project: Claim construction, declaration
- L149. 2015 **McKool Smith**
Case: Solocron Media, LLC v. AT&T Inc., et al.
Eastern district of Texas, Marshall division, Case No. 2:13-cv-1059-JRG
Matter: Patent infringement, ringtone download
Project: Claim construction, invalidity expert report
- L150. 2015 **EIP US LLP**
Case: Good Technology Software, Inc. v. Mobile Iron, Inc.
IPR2015-00833, IPR2015-00836, IPR2015-01090
Matter: *Inter Partes* Review, software management in wireless devices
Project: Three declarations to support three IPR petitions
- L151. 2015 **McKool Smith**
Case: AirWatch LLC v. Good Technology Corp
Northern district of Georgia, Case No. 1:14-cv-02281-SCJ
Matter: Patent infringement, software management in wireless devices
Project: Claim construction, declaration

- L152. 2015 **Simpson Thacher & Bartlett LLP**
Case: IXI Mobile (R&D) Ltd. et al. v. Apple Inc.
 Southern district of New York, Case No. 14-cv-7594-RJS
Matter: Patent infringement, PDA and Bluetooth
Project: Invalidity consulting
- L153. 2014 **Bragalone Conroy PC**
Case: Global Tel*Link Corporation v. Securus Technologies, Inc.
 IPR2014-00785, IPR2014-00810, IPR2014-00824, IPR2014-00825,
 IPR2014-01278, IPR2014-01282, IPR2014-01283
Matter: *Inter Partes* Review, VoIP call monitoring and recording, allocating
 telecommunication resources and information systems
Project: Seven declarations to support seven Patent Owner's responses, five
 depositions
- L154. 2014 **Orrick, Herrington & Sutcliffe LLP**
Case: Shopkick, Inc. v. Novitaz, Inc.
 IPR2015-00277, IPR2015-00278
Matter: *Inter Partes* Review, wireless customer service management
Project: Two declarations to support two IPR petitions
- L155. 2014 **Paul Hastings LLP**
Case: Cellular Communications Equipment LLC v. AT&T, et al.
 Eastern district of Texas, Tyler division, Case No. 6:13-cv-507-LED
 (Lead Case for Consolidation)
Matter: Patent infringement, 3G cellular communication
Project: Claim construction, declaration
- L156. 2014 **Baker Botts LLP**
Case: Orlando Communications LLC v. AT&T, et al.
 M.D. Florida, Case No. 6:14-cv-01021
Matter: Patent infringement, 3G/4G cellular communication
Project: Non-infringement and claim construction consulting
- L157. 2014 **EIP US LLP**
Case: Good Technology Software, Inc. v. AirWatch, LLC
 IPR2015-00248, IPR2015-00875
Matter: *Inter Partes* Review, software management in wireless devices
Project: Two declarations to support two IPR petitions
- L158. 2014 **Bragalone Conroy PC**
Case: Securus Technologies, Inc. v. Global Tel*Link Corporation
 IPR2015-00153, IPR2015-00155, IPR2015-00156
Matter: *Inter Partes* Review, VoIP call monitoring and recording
Project: Three declarations to support three IPR petitions, two depositions

- L159. 2014 **Andrews Kurth LLP**
Case: Sony Mobile Communications (USA) v. Adaptix Inc.
IPR2014-01524, IPR2014-01525
Matter: *Inter Partes* Review, subcarrier selection in LTE
Project: Two declarations to support two IPR petitions, deposition
- L160. 2014 **Steptoe & Johnson LLP; Baker & McKenzie LLP**
Case: VTech Communications, Inc. and Uniden America Corporations v. Spherix Incorporated
IPR2014-01432
Matter: *Inter Partes* Review, IP telephony
Project: Declaration to support IPR petition, deposition, reply declaration, deposition
- L161. 2014 **Steptoe & Johnson LLP; Baker & McKenzie LLP**
Case: Spherix Inc. v. VTech Telecommunications Ltd., et al.
Spherix Inc. v. Uniden Corp, et al.
Northern district of Texas, Dallas division, Case No. 3:13-cv-3494 and 3:13-cv-3496
Matter: Patent infringement, IP telephony
Project: Claim construction, declaration, deposition
- L162. 2014 **McKool Smith**
Case: Good Technology Corp. v. MobileIron, Inc.
Northern district of California, Case No. 5:12-cv-05826-PSG
Matter: Patent infringement, software management in wireless devices
Project: Claim construction, three declarations, claim invalidity expert report, non-infringement expert report, deposition, jury trial testimony
- L163. 2014 **Lee & Hayes**
Case: Broadcom Corp. v. Ericsson, Inc.
IPR2013-00601, IPR2013-00602, and IPR2013-00636
Matter: *Inter Partes* Review, ARQ protocols
Project: Three declarations to support Patent Owner's responses, two declarations to support Patent Owner's Motion to Amend, deposition, two reply declarations
- L164. 2014 **Sidley Austin LLP**
Case: Adaptix, Inc. v. Huawei Technologies Co., et al.
Eastern district of Texas, Case No. 6:13-cv-00438, 439, 440 and 441
Matter: Patent infringement, subcarrier selection in LTE
Project: Source code review, non-infringement consulting
- L165. 2014 **Finnegan Henderson Farabow Garrett & Dunner LLP**
Case: Cell and Network Selection LLC v. Huawei Technologies Co., et al.
Eastern district of Texas, Case No. 6:13-cv-00404-LED-JDL

- Matter: Patent infringement, base station selection in LTE
Project: Non-infringement consulting
- L166. 2014 **Feinberg Day Alberti & Thompson LLP**
Case: DSS Technology Management, Inc. v. Apple Inc.
Eastern district of Texas, Tyler division, Case No. 6:13-cv-00919-JDL
Matter: Patent infringement, PDA and Bluetooth
Project: Claim construction and invalidity consulting
- L167. 2014 **Sheppard Mullin Richter & Hampton LLP**
Case: Digcom Inc. v. ZTE (USA), Inc.
District of Nevada, Case No. 3:13-cv-00178-RCJ-WGC
Matter: Patent infringement, cellular communication
Project: Claim construction consulting
- L168. 2014 **Lott & Fischer**
Case: Zenith Electronics, LLC, et al. v. Craig Electronics, Inc.
Southern district of Florida, Case No. 9:13-cv-80567-DMM/DLB
Matter: Patent infringement, HDTV transmission and reception
Project: Opening expert report regarding nonessentiality
- L169. 2013 **McKool Smith**
Case: Zenith Electronics, LLC, et al. v. Curtis International Ltd.
Southern district of Florida, Case No. 9:13-cv-80568-DMM/DLB
Matter: Patent infringement, HDTV transmission and reception
Project: Claim construction, declaration, deposition
- L170. 2013 **Gibson Dunn**
Case: Straight Path IP Group v. Sharp Corp. and Sharp Electronics Corp.
In the Matter of Certain Point-to-Point Network Communication
Devices and Products Containing Same, ITC Investigation No. 337-
TA-892
Matter: Patent infringement, point-to-point network communication
Project: Non-infringement consulting
- L171. 2013 **Kilpatrick Townsend & Stockton LLP; Cooley LLP**
Case: Monec Holding AG v. Motorola Mobility LLC, HTC, et al.
District of Delaware, Case No. 1:11-cv-798-LPS-SRF
Matter: Patent infringement, displaying books on tablets
Project: Non-infringement expert report for Motorola, non-infringement expert
report for HTC, deposition
- L172. 2013 **Gartman Law Group**
Case: Lone Star WiFi LLC v. Legacy Stonebriar Hotel, Ltd; et al.
Eastern district Of Texas, Tyler, Case No. 6:12-cv-957
Matter: Patent infringement, levels of access in Wi-Fi networks

- Project: Claim validity consulting
- L173. 2013 **White & Case, LLP**
Case: Nokia Corp and Nokia, Inc. v. HTC Corp and HTC America, Inc. and Google, Inc.
In the Matter of Certain Portable Electronic Communication Devices, Including Mobile Phones and Components Thereof, ITC Investigation No. 337-TA-885
Matter: Patent infringement, App download and installation
Project: Non-infringement consulting
- L174. 2013 **Heim, Payne & Chorush, LLP**
Case: Rembrandt Wireless v. Samsung Electronics Co., et al.
Eastern district of Texas, Marshall, Case No. 2:13-cv-213-JRG-RSP
Matter: Patent infringement, Bluetooth
Project: Expert report regarding validity, deposition, jury trial testimony
- L175. 2013 **Baker Hostetler; Davis Polk & Wardwell LLP**
Case: Comcast v. Sprint; and Nextel Inc.
Eastern district of Pennsylvania, Case No. 2:12-cv-00859-JD
Matter: Patent infringement, SMS/MMS in Cellular Networks
Project: Infringement expert report, validity expert report, reply expert report, declaration, two-day depositions, jury trial testimony
- L176. 2013 **McKool Smith**
Case: Samsung Electronics America v. Ericsson Inc.
In the Matter of Certain Wireless Communications Equipment and Articles Therein, ITC Investigation No. 337-TA-866
Matter: Patent infringement, LTE uplink and downlink
Project: Source code review, prior art research, claim construction, claim invalidity expert report, non-infringement expert report, ITC hearing testimony
- L177. 2012 **DLA Piper US LLP**
Case: CSR Technology Inc. v. Freescale Semiconductor, Inc.
USDC-San Francisco, Case No. 3:12-cv-02619-RS
Matter: Patent infringement, radio transceivers
Project: Claim construction, declaration
- L178. 2012 **Fish & Richardson P.C.**
Case: GPNE Corp. v. Apple, Inc.; et al.
USDC-ND California, Case No. 5:12-cv-02885-LHK
Matter: Patent infringement, resource allocation in wireless networks
Project: Prior art research consulting

- L179. 2012 **Polsinelli Shughart PC**
Case: Single Touch Interactive, Inc. v. Zoove Corporation
Northern district of California, Case No. 3:12-cv-00831-JSC
Matter: Patent infringement, abbreviated dialing, information delivery
Project: Claim construction, Markman hearing and tech tutorial testimony, two declarations
- L180. 2012 **K & L Gates**
Case: EON Corp. IP Holdings, LLC v. Novatel Wireless, Inc.; et al.
DC-Tyler, Texas, Case No. 6:11-cv-00015-LED-JDL
Matter: Patent infringement, wireless modem and 3G services
Project: Non-infringement expert report, deposition
- L181. 2012 **Simpson Thacher & Bartlett LLP**
Case: CSR Technology, Inc. v. Bandspeed, Inc.
Western district of Texas, Case No. 1:12-cv-297-LY
Matter: Patent infringement, packet identification in 2.4 GHz and 5 GHz
Project: Source code review, Markman hearing and tech tutorial testimony, infringement expert report
- L182. 2012 **Sheppard Mullin Richter & Hampton LLP**
Case: Wi-LAN v. HTC America, Inc., et al.
Eastern district of Texas, Case No. 6:10-cv-521-LED
Matter: Patent infringement, CDMA, Orthogonal Codes
Project: Source code review, non-infringement expert report, deposition, jury trial testimony
- L183. 2012 **Dechert LLP**
Case: Hitachi v. TPV and Vizio, Inc.; and Vizio v. Hitachi, LTD.
Eastern district of Texas, Case No. 2:10-cv-260
Matter: Patent infringement, HD television transmission and reception
Project: Prior art research, claim invalidity consulting
- L184. 2012 **Fish & Richardson P.C.; Covington & Burling; Alston & Bird; Brinks Hofer Gilson & Lion**
Case: InterDigital Commc'n, LLC v. Huawei Tech. Co. LTD; LG Electronics, Inc.; Nokia, Inc.; and ZTE (USA) Inc.
Certain Wireless Devices With 3G Capabilities and Components Thereof, ITC Investigation No. 337-TA-800
Matter: Patent infringement, channel coding in UMTS, HSDPA
Project: Non-infringement consulting

- L185. 2012 **Fish & Richardson P.C.; Covington & Burling; Alston & Bird; Brinks Hofer Gilson & Lione**
Case: InterDigital Commc'n, LLC v. Huawei Tech. Co. LTD; LG Electronics, Inc.; Nokia, Inc.; and ZTE (USA) Inc.
District of Delaware, Case No. 1:11-cv-00654-UNA
Matter: Patent infringement, channel coding in UMTS, HSDPA
Project: Non-infringement consulting
- L186. 2011 **O'Melveny & Myers LLP**
Case: MobileMedia Ideas, LLC v. Apple, Inc.
District of Delaware, Case No. 1:10-cv-00258-SLR-MPT
Matter: Patent infringement, voice control, call rejection in mobile phones
Project: Source code review, prior art research, declaration, claim invalidity expert report, non-infringement expert report, deposition, jury trial testimony
- L187. 2011 **Wilmer Cutler Pickering Hale and Dorr**
Case: Apple, Inc. v. Samsung Electronics Co.
Northern district of California, Case No. 5:11-cv-01846-LHK
Matter: Patent infringement, channel coding in CDMA, E-AGCH, TFCI
Project: Prior art research, claim construction consulting
- L188. 2011 **Weil, Gotshal & Manges LLP**
Case: Vizio, Inc. v. Renesas Electronics America, Inc.
ITC Investigation No. 337-TA-789
Matter: Patent infringement, HD television transmission and reception
Project: Claim invalidity consulting
- L189. 2011 **Shapiro Cohen**
Case: TenXc Wireless Inc. v. Andrew LLC
TenXc Wireless Inc. v. Mobi Antenna Technologies Ltd.
Matter: Patent infringement, antenna design, sectorized cellular network
Project: Claim validity consulting
- L190. 2010 **Fish & Richardson P.C.**
Case: Vizio, Inc., v. LG Electronics, Inc.
ITC Investigation No. 337-TA-733
Matter: Patent infringement, HD television transmission and reception
Project: Claim charts, claim construction expert report, deposition
- L191. 2010 **Fish & Richardson P.C.**
Case: Vizio, Inc., v. LG Electronics, Inc.
District of Maryland, Case No. 1:09-cv-1481-BEL
Matter: Patent infringement, HD television transmission and reception
Project: Claim charts, claim construction expert report, deposition

- L192. 2008 **Kaye Scholer LLP**
Case: eBay Inc. v. IDT.
 Western district of Arkansas, Case No. 4:08-cv-4015-HFB
Matter: Patent infringement, long distance communication using Internet
Project: Prior art research, claim construction consulting
- L193. 2008 **Simpson Thacher & Bartlett LLP**
Case: Commil USA, LLC v. Cisco Systems, Inc.
 Eastern district of Texas, Case No. 2:07-cv-00341-DF-CE
Matter: Patent infringement, two-level wireless protocol
Project: Prior art research
- L194. 2006 **Woodfill and Pressler**
Case: Charles Russell v. Interinsurance Exchange of the Auto Club
 Harris County, Texas, Case No. 2005-19706
Matter: House fire and insurance claim
Project: Determining user location using cellular phone records, expert report, deposition, jury trial testimony

Consulting History

- From: 11/2022 **Abe, Ikubo & Katayama (Client: ASUS Japan K.K.)**
To: 12/2022 Japan
Duties: Analyze 3GPP standards contribution.
- From: 8/2022 **JLP Enterprise Holdings LLC**
To: 8/2022 Dallas, TX
Duties: Analyze patents for essentiality to 5G standards.
- From: 5/2022 **Washington Utilities and Transportation Commission**
 DOCKET UT-181051
To: 12/2022 Olympia, WA
Duties: Analyze cause(s) of network failure, provide testimony on behalf of Staff, deposition, hearing testimony
- From: 8/2021 **Carter Arnett (Client: G+ Communications)**
To: 5/2022 Dallas, TX
Duties: Analyze patents for essentiality to 4G and 5G standards.
- From: 2/2021 **ExpertsDirect Pty Ltd**
To: 3/2021 Australia
Duties: Analyze antenna arrays.
- From: 11/2020 **Licks Attorneys**
To: 1/2021 Brazil
Duties: Analyze patents for essentiality to 4G standards.

From: 6/2019 **Fish & Richardson, P.C. (Client: Huawei)**
To: 5/2022 Dallas, TX
Duties: Analyze patents for essentiality to 3G, 4G, and 5G standards.

From: 1/2013 **Heim, Payne & Chorush, LLP**
To: 3/2013 Houston, TX
Duties: Analyze patents on wireless technologies.

From: 4/2007 **Collin County Sheriff's Office**
To: 5/2007 McKinney, TX
Duties: Analyzed cellular record data and determined user location in a double-homicide investigation.

From: 4/2004 **Allegiant Integrated Solutions**
To: 5/2004 Fort Worth, TX
Duties: Designed and developed an integrated set of tools for fast deployment of wireless networks. The tools optimize the placement of Access Points and determine their respective channel allocations to minimize interference and maximize capacity.

From: 3/2002 **Input/Output Incorporated**
To: 4/2002 New Orleans, LA
Duties: Designed and implemented an algorithm in MATLAB for optimizing the frequency selection process used by sonar for scanning the bottom of the ocean.

From: 6/1998 **Teleware Corporation**
To: 7/1998 Seoul, South Korea
Duties: Designed and developed a software package for analyzing the capacity in a CDMA network to maximize the number of subscribers.

Employment History

From: 5/2023 **University of North Texas**
To: Present Denton, TX
Position: *Tenured Professor Department of Computer Science and Engineering*
Conducting research on MIMO and 5G cellular networks. Teaching telecommunication courses. Advising graduate and undergraduate students.

From: 1/2015 **University of North Texas**
To: 8/2021 Denton, TX
Position: *Associate Chair of Graduate Studies Department of Computer Science and Engineering*
In charge of all administrative duties related to the Master's and Ph.D.

programs in the department.

From: 5/2008 **University of North Texas**
To: 5/2023 Denton, TX
Position: *Tenured Associate Professor Department of Computer Science and Engineering*
Conducting research on cellular networks and wireless sensor networks. Teaching wireless communication courses. Advising graduate and undergraduate students.

From: 9/2002 **University of North Texas**
To: 5/2008 Denton, TX
Position: *Assistant Professor Department of Computer Science and Engineering*
Conducting research on WCDMA/UMTS wireless networks. Teaching wireless communication and computer architecture courses. Advising graduate and undergraduate students.

From: 1/2002 **University of New Orleans**
To: 8/2002 New Orleans, LA
Position: *Assistant Professor Department of Electrical Engineering*
Designed and taught two new courses "Computer Systems Design I and II". Developed a Computer Engineering Curriculum with strong hardware-design emphasis. Formed a wireless research group. Advised graduate and undergraduate students.

From: 10/2000 **Comspace Corporation**
To: 12/2001 Coppell, TX
Position: *Senior Systems Engineer*
Designed, coded (in Matlab), and simulated Viterbi decoding, Turbo coding, trellis coded modulation (TCM), and Reed-Muller codes. Optimized soft decision parameters and interleavers for additive white Gaussian and Rayleigh faded channels. Extended the control and trunking of push-to-talk Logic Trunked Radio (LTR) to include one-to-one and one-to-many voice and data messaging.

From: 8/1997 **MinMax Corporation**
To: 5/1999 Saint Louis, MO
Position: *Research Associate*
Designed software packages that provide the tools to flexibly allocate capacity in a CDMA network and maximize the number of subscribers. Analyzed and simulated different audio compression schemes. Validated, simulated (logical and timing), and developed the hardware architecture for an ATM switch capable of channel group switching.

From: 8/1994 **Washington University**
To: 8/2000 Saint Louis, MO

Position: *Research and Teaching Assistant*

Taught, consulted, and graded Circuit Analysis at the undergraduate level and Network Design at the graduate level.

Publications

Conference Proceedings

- C1. U.K. Dey, **R. Akl**, R. Chataut, "Performance Improvement in Cellular V2X (CV2X) by Using Massive MIMO Jacobi Detector," *2022 IEEE 19th International Conference on Smart Communities: Improving Quality of Life Using ICT, IoT and AI (HONET)*, December 2022, pp. 122-127.
- C2. U.K. Dey, **R. Akl**, R. Chataut, "Performance Improvement in Cellular V2X (CV2X) by Using Low Density Parity Check (LDPC) Code," *2022 IEEE 13th Annual Ubiquitous Computing, Electronics & Mobile Communication Conference (UEMCON)*, October 2022, pp. 296-302.
- C3. M. Robaei, **R. Akl**, "Distributed Compressed Sensing Karhunen-Loève Expansion - Application to Millimeter-Wave Resource Allocation Through Group Beamforming," *2022 IEEE International Workshop Technical Committee on Communications Quality and Reliability (CQR)*, September 2022, pp. 7-12.
- C4. R. Chataut, **R. Akl**, U.K. Dey, "Massive MIMO Uplink Signal Detector for 5G and Beyond Networks," *2022 IEEE Texas Symposium on Wireless and Microwave Circuits and Systems (WMCS)*, April 2022, 7 pgs.
- C5. M. Robaei, **R. Akl**, R. Chataut, U.K. Dey, "Adaptive Millimeter-Wave Channel Estimation and Tracking," *2022 24th International Conference on Advanced Communication Technology (ICACT)*, February 2022, pp. 23-28.
- C6. U.K. Dey, **R. Akl**, R. Chataut, "Throughput Improvement in Vehicular Communication by Using Low Density Parity Check (LDPC) Code," *IEEE CCWC 2022 The 12th Annual Computing and Communication Workshop and Conference*, January 2022, pp. 836-843.
- C7. U.K. Dey, **R. Akl**, R. Chataut, M. Robaei, "Selective MIMO in Vehicular Communication for Reliable Safety Services and High Speed Non-Safety Services," *2021 IEEE 12th Annual Ubiquitous Computing, Electronics & Mobile Communication Conference (UEMCON)*, 2021, pp. 785-790, 6 pgs.
- C8. R. Chataut, **R. Akl**, U.K. Dey, "An Efficient and Fast-convergent Detector for 5G and Beyond Massive MIMO Systems," *2021 IEEE 12th Annual Ubiquitous Computing, Electronics & Mobile Communication Conference (UEMCON)*, 2021, pp. 866-872, 7 pgs.

- C9. M. Robaei, **R. Akl**, “Millimeter-Wave Blockage Modeling And Mitigation,” *2021 IEEE International Workshop Technical Committee on Communications Quality and Reliability (CQR 2021)*, 2021, 6 pgs.
- C10. M. Robaei, **R. Akl**, “Characterizing Non-Stationary Millimeter-Wave Communication Using Fuzzy Entropy,” *2021 55th Annual Conference on Information Sciences and Systems (CISS)*, 2021, 6 pgs.
- C11. M. Robaei, **R. Akl**, R. Chataut, U.K. Dey, “Adaptive Millimeter-Wave Channel Estimation and Tracking,” *2021 23rd International Conference on Advanced Communication Technology (ICACT)*, February 2021, pp. 23-28, 6 pgs.
- C12. U.K. Dey, **R. Akl**, R. Chataut, M. Robaei, “Modified PHY Layer for High Performance V2X Communication using 5G NR,” *IEEE UEMCON 11th IEEE Annual Ubiquitous Computing, Electronics & Mobile Communication Conference*, October 2020, pp. 137-142, 6 pgs.
- C13. R. Chataut, **R. Akl**, “An Efficient and Fair Scheduling for Downlink 5G Massive MIMO Systems,” *IEEE Texas Symposium on Wireless and Microwave Circuits and Systems*, June 2020, paper no. TSWMCS2020-39, 8 pgs.
- C14. R. Chataut, **R. Akl**, “Efficient and Low-Complexity Iterative Detectors for 5G Massive MIMO Systems,” *IEEE DCOSS 2020 International Conference on Distributed Computing in Sensor Systems*, May 2020, pp. 442-449, 8 pgs.
- C15. U.K. Dey, **R. Akl**, R. Chataut, “High Throughput Vehicular Communication Using Spatial Multiplexing MIMO,” *IEEE CCWC 2020 The 10th Annual Computing and Communication Workshop and Conference*, January 2020, paper no. 1570613408, 6 pgs.
- C16. R. Chataut, **R. Akl**, M. Robaei, “Accelerated and Preconditioned Refinement of Gauss-Seidel Method for Uplink Signal Detection in 5G Massive MIMO Systems,” *IEEE CCWC 2020 The 10th Annual Computing and Communication Workshop and Conference*, January 2020, paper no. 1570605343, 7 pgs.
- C17. M. Robaei, **R. Akl**, “Examining Spatial Consistency for Millimeter-Wave Massive MIMO Channel Estimation in 5G-NR,” *IEEE ICCE 2020 The 38th International Conference on Consumer Electronics*, January 2020, paper no. 1570596880, 6 pages.
- C18. R. Chataut, **R. Akl**, “Channel Gain Based User Scheduling for 5G Massive MIMO Systems,” *IEEE HONET-ICT 2019 The 16th International Conference on Smart Cities: Improving Quality of Life Using ICT & IoT and AI*, October 2019, paper no. 1570565594, 5 pgs.

- C19. M. Robaei, **R. Akl**, "Time-Variant Broadband mmWave Channel Estimation Based on Compressed Sensing," *IEEE UEMCON 2019 The 10th Annual Ubiquitous Computing, Electronics & Mobile Communication Conference*, October 2019, paper no. 1570577430, 7 pages.
- C20. R. Chataut, **R. Akl**, U. Dey, "Least Square Regressor Selection Based Detection for Uplink 5G Massive MIMO Systems," *IEEE WAMICON 2019 The 20th Annual IEEE Wireless and Microwave Technology Conference*, April 2019, paper no. 1570524727, 6 pgs.
- C21. R. Chataut, **R. Akl**, "Huber Fitting Based ADMM Detection for Uplink 5G Massive MIMO Systems," *IEEE UEMCON 2018 The 9th Annual Ubiquitous Computing, Electronics & Mobile Communication Conference*, November 2018, paper no. 1570492416, 5 pgs.
- C22. R. Chataut, **R. Akl**, "Efficient and Low Complex Uplink Detection for 5G Massive MIMO Systems," *IEEE WAMICON 2018 The 19th Annual Wireless and Microwave Technology Conference*, April 2018, paper no. 1570431593, 6 pgs.
- C23. R. Chataut, **R. Akl**, "Optimal Pilot Reuse Factor Based on User Environments in 5G Massive MIMO," *IEEE CCWC 2018 The 8th Annual Computing and Communication Workshop Conference*, January 2018, paper no. 1570413394, 6 pgs.
- C24. S. Alotaibi, **R. Akl**, "Radio Resource Management in LTE Femtocell Networks," *IEEE NCA '17 International Symposium on Network Computing and Applications*, November 2017, paper no. 117, 5 pgs.
- C25. U. Sawant, **R. Akl**, "Subcarrier Allocation in LTE Network Deployment with Mobility," *IEEE UEMCON 2017 8th Annual Ubiquitous Computing, Electronics and Mobile Communication Conference*, October 2017, paper no. 1570349184, 8 pgs.
- C26. S. Alotaibi, **R. Akl**, "Packet Scheduling Bandwidth Type-Based Mechanism for LTE," *IEEE UEMCON 2017 8th Annual Ubiquitous Computing, Electronics and Mobile Communication Conference*, October 2017, paper no. 1570394639, 6 pgs.
- C27. S. Alotaibi, **R. Akl**, "Dynamic Fractional Frequency Reuse (FFR) Scheme for Two-Tier Network in LTE," *IEEE UEMCON 2017 8th Annual Ubiquitous Computing, Electronics and Mobile Communication Conference*, October 2017, paper no. 1570394969, 6 pgs.
- C28. U. Sawant, **R. Akl**, "Evaluation of Adaptive and Non Adaptive LTE Fractional Frequency Reuse Mechanisms," *IEEE WOCC 2017 The 26th Annual Wireless and Optical Communications Conference*, April 2017, paper no. 1570341174, 6 pgs.

- C29. S. Alotaibi, **R. Akl**, "Range-Based Scheme for Adjusting Transmission Power for Femtocells in Co-Channel Deployment," *IEEE WTS 2017 The 16th Annual Wireless Telecommunications Symposium*, April 2017, paper no. 1570334744, 5 pgs.
- C30. U. Sawant, **R. Akl**, "A Novel Metric to Study the Performance of Sectorized Fractional Frequency Reuse Techniques in LTE," *IEEE WTS 2017 The 16th Annual Wireless Telecommunications Symposium*, April 2017, paper no. 1570338498, 7 pgs.
- C31. S. Alotaibi, **R. Akl**, "Dynamic Frequency Partitioning Scheme for LTE HetNet Networks Using Fractional Frequency Reuse," *IEEE WCNC '17 Wireless Communications and Networking Conference*, March 2017, paper no. 1570332420, 5 pgs., demo and poster.
- C32. U. Sawant, **R. Akl**, "Performance Evaluation of Network Productivity for LTE Heterogenous Networks with Reward-Penalty Weights Assessment," *IEEE CCWC 2017 The 7th Annual Computing and Communication Workshop Conference*, January 2017, paper no. 1570328396, 6 pgs.
- C33. S. Alotaibi, **R. Akl**, "Self-Adjustment Downlink Transmission Power for Femtocells in Co-Channel Deployment in Heterogeneous Networks," *IEEE CCWC 2017 The 7th Annual Computing and Communication Workshop Conference*, January 2017, paper no. 1570326815, 6 pgs.
- C34. U. Sawant, **R. Akl**, "Performance Evaluation of Sectorized Fractional Frequency Reuse Techniques Using Novel Metric," *IEEE ISCC 2016 The Twenty-First IEEE Symposium on Computers and Communications*, June 2016, paper no. 1570275270, 7 pgs.
- C35. R. Tidwell, S. Akumalla, S. Karlaputi, **R. Akl**, K. Kavi, and D. Struble, "Evaluating the Feasibility of EMG and Bend Sensors for Classifying Hand Gestures," *1st International Conference on Multimedia and Human Computer Interaction*, July 2013, paper no. 63, 8 pgs.
- C36. **R. Akl**, K. Pasupathy, and M. Haidar, "Anchor Nodes Placement for Effective Passive Localization," *2011 IEEE International Conference on Selected Topics in Mobile and Wireless Networks (iCOST)*, October 2011, paper no. 1569490799, pp. 127 - 132.
- C37. **R. Akl**, P. Kadiyala, and M. Haidar, "Non-Uniform Grid-Based Routing in Sensor Networks," *9th IEEE Malaysia International Conference on Communications*, December 2009, paper no. 1569243649, pp. 536 - 540.
- C38. M. Haidar, M. Al-Rizzo, Y. Chan, **R. Akl**, M. Bouharras, "Throughput Validation of an Advanced Channel Assignment Algorithm in IEEE 802.11 WLAN," *ICCSN*

2009 – *International Conference on Communication Software and Networks*, February 2009, paper no. P385, pp. 801 - 806.

- C39. **R. Akl** and D. Keathly, “Robocamp: Encouraging Young Women to Embrace STEM,” 4th Annual TETC Best Practices Conference, February 2009, 13 pgs.
- C40. M. Haidar, R. Ghimire, M. Al-Rizzo, **R. Akl**, Y. Chan, “Channel Assignment in an IEEE 802.11 WLAN Based on Signal-to-interference Ratio,” *IEEE CCECE – Canadian Conference on Electrical and Computer Engineering: Communications and Networking*, May 2008, paper no. 1569092894, pp. 1169 - 1174.
- C41. H. Al-Rizzo, M. Haidar, **R. Akl**, and Y. Chan, “Enhanced Channel Assignment and Load Distribution in IEEE 802.11 WLANs,” *IEEE International Conference on Signal Processing and Communication*, November 2007, paper no. 1569042132, pp. 768 - 771.
- C42. **R. Akl** and Y. Saravanos, “Hybrid Energy-Aware Synchronization Algorithm in Wireless Sensor Networks,” *18th Annual IEEE International Symposium on Personal, Indoor and Mobile Radio Communications*, September 2007, paper no 692, 5 pgs.
- C43. M. Haidar, **R. Akl**, and H. Al-Rizzo, “Channel Assignment and Load Distribution in a Power-Managed WLAN,” *18th Annual IEEE International Symposium on Personal, Indoor and Mobile Radio Communications*, September 2007, paper no. 463, 5 pgs.
- C44. D. Keathly and **R. Akl**, “Attracting and Retaining Women in Computer Science and Engineering: Evaluating the Results,” *Proceedings of American Society for Engineering Education: ASEE Annual Conference*, June 2007, paper no. AC 2007-1229, 10 pgs.
- C45. M. Haidar, **R. Akl**, H. Al-Rizzo, Y. Chan, R. Adada, “Optimal Load Distribution in Large Scale WLAN Networks Utilizing a Power Management Algorithm,” *Proceedings of IEEE Sarnoff Symposium*, May 2007, 5 pgs.
- C46. R. Dantu, P. Kolan, **R. Akl**, and K. Loper, “Classification of Attributes and Behavior in Risk Management Using Bayesian Networks,” *Proceedings of IEEE Intelligence and Security Informatics Conference*, May 2007, pp. 71-74.
- C47. **R. Akl** and A. Arepally, “Dynamic Channel Assignment in IEEE 802.11 Networks,” *Proceedings of IEEE Portable 2007: International Conference on Portable Information Devices*, March 2007, pp 309-313.
- C48. **R. Akl** and U. Sawant, “Grid-based Coordinated Routing in Wireless Sensor Networks,” *Proceedings of IEEE CCNC 2007: Consumer Communications and Networking Conference*, January 2007, pp. 860-864.

- C49. **R. Akl** and A. Arepally, "Simulation of Throughput in UMTS Networks with Different Spreading Factors," *Proceedings of IEEE VTC Fall 2006: Vehicular Technology Conference*, September 2006, pp. C1-5.
- C50. A. Alhabsi, H. Al-Rizzo, and **R. Akl**, "Parity Assisted Decision Making for QAM Modulation," *International Conference on Mobile Computing and Wireless Communications*, September 2006, paper no. 1568988776, 5 pgs.
- C51. **R. Akl** and R. Garlick, "Retention and Recruitment of Women in Computer Engineering," *ICEE 2006: International Conference on Engineering Education*, July 2006, paper no. 3318, 5 pgs.
- C52. R. Garlick and **R. Akl**, "Intra-Class Competitive Assignments in CS2: A One-Year Study," *ICEE 2006: International Conference on Engineering Education*, July 2006, paper no. 3325, 5 pgs.
- C53. **R. Akl**, D. Tummala, and X. Li, "Indoor Propagation Modeling at 2.4 GHz for IEEE 802.11 Networks," *WNET 2006: Wireless Networks and Emerging Technologies*, July 2006, paper no. 510-014, 6 pgs.
- C54. P. Chen, K. Kavi, and **R. Akl**, "Performance Enhancement by Eliminating Redundant Function Execution," *Proceedings of IEEE: 39th Annual Simulation Symposium*, April 2006, pp. 143-150.
- C55. **R. Akl** and S. Nguyen, "Capacity Allocation in Multi-cell UMTS Networks for Different Spreading Factors with Perfect and Imperfect Power Control," *Proceedings of IEEE CCNC 2006: Consumer Communications and Networking Conference*, January 2006, vol. 2, pp. 928-932.
- C56. W. Li, K. Kavi, and **R. Akl**, "An Efficient Non-Preemptive Real-Time Scheduling," *18th International Conference on Parallel and Distributed Computing Systems*, Las Vegas, NV, September 2005, pp. 154-160.
- C57. S. Nguyen and **R. Akl**, "Approximating User Distributions in WCDMA Networks Using 2-D Gaussian," *CCCC20T 05: International Conference on Computing, Communications, and Control Technologies*, July 2005, 5 pgs.
- C58. **R. Akl** and S. Park, "Optimal Access Point Selection and Traffic Allocation in IEEE 802.11 Networks," *Proceedings of 9th World Multiconference on Systemics, Cybernetics and Informatics (WMSCI 2005): Communication and Network Systems, Technologies and Applications*, July 2005, vol. 8, pp. 75-79.
- C59. **R. Akl**, M. Naraghi-Pour, M. Hegde, "Throughput Optimization in Multi-Cell CDMA Networks," *IEEE WCNC 2005 - Wireless Communications, and Networking Conference*, March 2005, vol. 3, pp. 1292-1297.

- C60. **R. Akl**, “Subscriber Maximization in CDMA Cellular Networks,” *Proceedings of CCCT 04: International Conference on Computing, Communications, and Control Technologies*, August 2004, vol. 3, pp. 234-239.
- C61. **R. Akl** and A. Parvez, “Global versus Local Call Admission Control in CDMA Cellular Networks,” *Proceedings of CITSA 04: Communications, Information and Control Systems, Technologies and Applications*, July 2004, vol. 2, pp. 283-288.
- C62. **R. Akl** and A. Parvez, “Impact of Interference Model on Capacity in CDMA Cellular Networks,” *Proceedings of SCI 04: Communication and Network Systems, Technologies and Applications*, July 2004, vol. 3, pp. 404-408. Selected as **best paper** of those presented in the session: Tele-Communication Systems, Technologies and Application II.
- C63. **R.G. Akl**, M.V. Hegde, M. Naraghi-Pour, P.S. Min, “Call Admission Control Scheme for Arbitrary Traffic Distribution in CDMA Cellular Systems,” *IEEE Wireless Communications and Networking Conference*, September 2000, vol. 1, pp. 465-470.
- C64. **R.G. Akl**, M.V. Hegde, M. Naraghi-Pour, P.S. Min, “Cell Placement in a CDMA Network,” *IEEE Wireless Communications and Networking Conference*, September 1999, vol. 2, pp. 903-907.
- C65. **R.G. Akl**, M.V. Hegde, P.S. Min, “Effects of Call Arrival Rate and Mobility on Network Throughput in Multi-Cell CDMA,” *IEEE International Conference on Communications*, June 1999, vol. 3, pp. 1763-1767.
- C66. **R.G. Akl**, M.V. Hegde, M. Naraghi-Pour, P.S. Min, “Flexible Allocation of Capacity in Multi-Cell CDMA Networks,” *IEEE Vehicular Technology Conference*, May 1999, vol. 2, pp. 1643-1647.

Journal Publications

- J1. R. Chataut, A. Phoummalayvane, **R. Akl**, “Unleashing the Power of IoT: A Comprehensive Review of IoT Applications and Future Prospects in Healthcare, Agriculture, Smart Homes, Smart Cities, and Industry 4.0,” *Sensors* 2023, August 2023.
- J2. M. Robaei, **R. Akl**, “Quadratic Displacement Operators—Theory and Application to Millimeter-Wave Channel Tracking,” *IEEE Transactions on Wireless Communications*, January 2023, Vol. 22, No. 1, 15 pgs.
- J3. M. Robaei, **R. Akl**, “Continuous Compressed Sensing Hilbert-Schmidt Integral Operator,” *IEEE Access*, August 2022, pp. 80264-80276.

- J4. R. Chataut, **R. Akl**, U.K. Dey, M. Robaei, "SSOR Preconditioned Gauss-Seidel Detection and Its Hardware Architecture for 5G and beyond Massive MIMO Networks," *Electronics 2021 ISSN 2079-9292*, 10(5), 578, *Special Issue MIMO for Next Generation Wireless Systems*, March 2021, 17 pgs.
- J5. R. Chataut, **R. Akl**, "Massive MIMO Systems for 5G and Beyond Networks – Overview, Recent Trends, Challenges, and Future Research Direction," *Sensors 2020*, 20(10), 2753, May 2020.
- J6. R. Chataut, **R. Akl**, "Massive MIMO Systems for 5G," *Encyclopedia 2020*, doi:10.32545, 2020, (ISSN 2309-3366).
- J7. S. Alotaibi, **R. Akl**, "Range-Based Scheme for Adjusting Transmission Power of Femtocell in Co-Channel Deployment," *International Journal of Interdisciplinary Telecommunications and Networking*, IJITN Vol. 10, No. 4, pgs. 14-24, 2018.
- J8. U. Sawant, **R. Akl**, "Adaptive and Non Adaptive LTE Fractional Frequency Reuse Mechanisms Mobility Performance," *Advances in Science, Technology and Engineering Systems Journal*, ASTES Vol. 3, No. 3, 02-11, 11 pgs., 2018.
- J9. M. Haidar, H.M. Al-Rizzo, **R. Akl**, and Z. Elbazzal, "The Effect of an Enhanced Channel Assignment Algorithm in an IEEE 802.11 WLAN," *World Scientific and Engineering Academy and Society Transactions on Communications*, WSEAS, Vol. 8, Issue 12, December 2009.
- J10. **R. Akl**, P. Kadiyala, and M. Haidar, "Non-Uniform Grid-Based Coordinated Routing in Wireless Sensor Networks," *Journal of Sensors*, article ID 491349, volume 2009, 11 pages.
- J11. M. Haidar, M. Al-Rizzo, Y. Chan, **R. Akl**, "User-Based Channel Assignment Algorithm in a Load-Balanced IEEE 802.11 WLAN," *International Journal of Interdisciplinary Telecommunications & Networking (IJITN)*, April-June 2009, 1(2), pp. 66-81.
- J12. **R. Akl**, D. Keathly, and R. Garlick, "Strategies for Retention and Recruitment of Women and Minorities in Computer Science and Engineering," *iNEER Special Volume: Innovations 2007- World Innovations in Engineering Education and Research*, 9 pgs., 2007.
- J13. R. Garlick and **R. Akl**, "Motivating and Retaining CS2 Students with a Competitive Game Programming Project," *iNEER Special Volume: Innovations 2007- World Innovations in Engineering Education and Research*, 9 pgs., 2007.
- J14. **R. Akl** and S. Nguyen, "UMTS Capacity and Throughput Maximization for Different Spreading Factors," *Journal of Networks*, July 2006, vol. 1, issue 3, pp. 40-49. ISSN: 1796-2056

- J15. W. Li, K. Kavi, and **R. Akl**, "A Non-preemptive Scheduling Algorithm for Soft Real-time Systems," *Journal of Computer and Electrical Engineering*, 2006, vol. 32, 18 pgs. ISSN: 0045-7906
- J16. **R. Akl**, A. Parvez, and S. Nguyen, "Effects of Interference on Capacity in Multi-Cell CDMA Networks," *Journal of Systemics, Cybernetics and Informatics*, 2006, vol. 3, no. 1, p825612, 7 pgs. ISSN: 1690-4524
- J17. **R.G. Akl**, M. Hegde and M. Naraghi-Pour, "Mobility-based CAC Algorithm for Arbitrary Traffic Distribution in CDMA Cellular Systems," *IEEE Transactions on Vehicular Technology*, March 2005, vol. 54, no. 2, pp. 639-651.
- J18. **R.G. Akl**, M.V. Hegde, M. Naraghi-Pour, P.S. Min, "Multi-Cell CDMA Network Design," *IEEE Transactions on Vehicular Technology*, May 2001, vol. 50, no. 3, pp. 711-722.

Technical Papers

- T1. J. Williams, **R. Akl**, et al, "Flight Control Subsystem," *The Eagle Feather*, Special Section: Undergraduate Research Initiative in Engineering, University of North Texas, Vol. 7, 2010.
- T2. **R.G. Akl**, M.V. Hegde, A. Chandra, P.S. Min, "CDMA Capacity Allocation and Planning," Technical Document, Washington University Department of Electrical Engineering WUEE-98, April 1998.

Book Chapters

- B1. R. Akl, Y. Saravanos, and M. Haidar, "Chapter 18: Hybrid Approach for Energy-Aware Synchronization in Sensor Networks," *Sustainable Wireless Sensor Networks*, December 2010, pgs. 413-429, ISBN: 978-953-307-297-5.
- B2. K. Kavi, **R. Akl** and A. Hurson, "Real-Time Systems: An Introduction and the State-of-the-Art," *Encyclopedia of Computer Science and Engineering*, John Wiley & Sons, Volume 4, January 2009, pgs. 2369-2377.
- B3. **R. Akl** and K. Kavi, "Chapter 12: Modeling and Analysis using Computational Tools," *Introduction to Queuing Theory: Modeling and Analysis*, Birkhauser Boston, December 2008, pgs. 295-320.

Technical Presentations

- P1. "Bio-Com Project," Raytheon, Richardson TX, May 2012, (invited).
- P2. "Bio-Com Project," Net-Centric Software and Systems I/UCRC Meeting, Denton

TX, December 2011, (invited).

- P3. "Student Outreach Report: Robocamp," College of Engineering Advisory Board Meeting, Denton TX, May 2011, (invited).
- P4. "Robocamp: Encouraging Young Women to Embrace STEM," 4th Annual TETC Best Practices Conference, Austin TX, February 2009, (invited).
- P5. "Self-Configuring Wireless MEMS Network (demo)," Southern Methodist University, Dallas TX, January 2008, (invited).
- P6. "Energy-aware Routing and Hybrid Synchronization in Sensor Networks," *Southern Methodist University*, Dallas TX, September 2007, (invited).
- P7. "Retention and Recruitment of Women in Computer Engineering," *ICEE 2006: International Conference on Engineering Education*, Puerto Rico, July 2006, (refereed).
- P8. "Capacity Allocation in Multi-cell UMTS Networks for Different Spreading Factors with Perfect and Imperfect Power Control," *IEEE CCNC 2006: Consumer Communications and Networking Conference*, Las Vegas, NV, January 2006, (refereed).
- P9. "Research, Teaching, and Outreach," CSE Advisory Council Meeting, *UNT Research Park*, Denton, TX, December 2005, (invited).
- P10. "Wi-Fi and WCDMA Network Design," *University of Arkansas*, Little Rock, AR, April 2005, (invited).
- P11. "Wi-Fi and WCDMA Network Design," *Southern Methodist University*, Dallas, TX, March 2005, (invited).
- P12. "Current Research in Wireless at UNT," *Nortel Networks*, Richardson, TX, October 2004, (invited).
- P13. "Subscriber Maximization in CDMA Cellular Networks," *International Conference on Computing, Communications, and Control Technologies*, Austin, TX, August 2004, (refereed).
- P14. "Global versus Local Call Admission Control in CDMA Cellular Networks," *International Conference on Cybernetics and Information Technologies, Systems and Applications*, Orlando, FL, July 2004, (refereed).
- P15. "Impact of Interference Model on Capacity in CDMA Cellular Networks," *8th World Multi-Conference on Systemics, Cybernetics, and Informatics*, Orlando, FL, July 2004, (refereed).

- P16. "CDMA Network Design," IEEE Communications Society – New Orleans Chapter, New Orleans, LA, May 2002, (invited).
- P17. "Cell Design to Maximize Capacity in CDMA Networks," Louisiana State University, Baton Rouge, LA, April 2002, (invited).
- P18. "Call Admission Control Scheme for Arbitrary Traffic Distribution in CDMA Cellular Systems," *IEEE Wireless Communications and Networking Conference*, Chicago, IL, September 2000, (refereed).
- P19. "Cell Placement in a CDMA Network," *IEEE Wireless Communications and Networking Conference*, September 1999, (refereed).
- P20. "Effects of Call Arrival Rate and Mobility on Network Throughput in Multi-Cell CDMA," *IEEE International Conference on Communications*, June 1999, (refereed).
- P21. "Flexible Allocation of Capacity in Multi-Cell CDMA Networks," *IEEE Vehicular Technology Conference*, May 1999, (refereed).
- P22. "CCAP: A Strategic Tool for Managing Capacity of CDMA Networks," Teleware Co. Ltd., Seoul, South Korea, 1998, (invited).

Courses Developed

- CSCE 5933: LTE Physical Layer Using MATLAB.
Research issues in the design of LTE physical layer and simulate using MATLAB. Topics include modulation and coding, OFDM, channel modeling, MIMO, and link adaption.
- CSCE 6590: Advanced Topics in Wireless Communications & Networks: 4G/LTE.
Research issues in the design of next generation wireless networks: cellular systems, medium access techniques, signaling, mobility management, control and management for mobile networks, wireless data networks, Internet mobility, quality-of-service for multimedia applications, caching for wireless web access, and ad hoc networks.
- CSCE 5933: Fundamentals of VoIP.
Fundamentals of VoIP, with emphasis on network infrastructure implementation and security. Topics include IP protocol suite, SS7, speech-coding techniques, quality of service, session initiation protocol, and security issues.
- CSCE 5540: Introduction to Sensor Networks.
Topics include: design implications of energy (hardware and software), and otherwise resource-constrained nodes; network self-configuration; services such as

routing under network dynamics, localization, time-synchronization and calibration; distributed data management, in-network aggregation and collaborative signal processing, programming tools and language support.

- CSCE 5510. Wireless Communication.
Point-to-point signal transmission through a wireless channel, channel capacity, channel encoding, and multi-user transmissions. First, second, and third generation cellular systems, and mobility management.
- CSCE 3510. Introduction to Wireless Communication.
Fundamentals of wireless communications and networking, with emphasis on first, second, and third generation cellular systems. Topics include point-to-point signal transmission through a wireless channel, cellular capacity, multi-user transmissions, and mobility management.
- CSCE 3020. Communications Systems.
Introduction to the concepts of transmission of information via communication channels. Amplitude and angle modulation for the transmission of continuous-time signals. Analog-to-digital conversion and pulse code modulation. Transmission of digital data. Introduction to random signals and noise and their effects on communication. Optimum detection systems in the presence of noise.
- ENEE 3583. Computer Systems Design I (UNO).
The design process of digital computer systems is studied from the instruction set level, system architecture level, and digital logic level. Topics include machine organization, register transfer notation, processor design, memory design, and input/output considerations. Includes semester project.
- ENEE 3584. Computer Systems Design II (UNO).
The design and evaluation of contemporary computer systems are analyzed to compare the performance of different architectures. Topics include performance metrics, computer arithmetic, pipelining, memory hierarchies, and multiprocessor systems.
- ENEE 3514. Computer Architecture Laboratory (UNO).
Selected experiments examining programmable logic, VHDL and logic synthesis, and including a final design project, to accompany and complement the lecture course ENEE 3584. Three hours of laboratory.

Courses Taught

Spring 2023

- CSCE 3020.1: Communication Systems (4.5 / 5.0)

Fall 2022

- CSCE 3010.1: Signals and Systems (4.4 / 5.0)
- CSCE 6950.743: Dissertation (no evaluation done)

Spring 2022

- CSCE 3020.1: Communication Systems (4.2 / 5.0)
- CSCE 6950.743: Dissertation (no evaluation done)

Fall 2021

- CSCE 3010.1: Signals and Systems (4.2 / 5.0)
- CSCE 5933.1: LTE Physical Layer Using MATLAB (5.0 / 5.0)
- CSCE 6950.743: Dissertation (no evaluation done)

Spring 2021

- CSCE 2610.2: Computer Organization (4.0 / 5.0)
- CSCE 3020.1: Communication Systems (4.2 / 5.0)
- CSCE 6950.743: Dissertation (no evaluation done)

Fall 2020

- CSCE 3010.1: Signals and Systems (4.1 / 5.0)
- CSCE 6940.743: 5G MIMO Systems (no evaluation done)
- CSCE 6950.743: Dissertation (no evaluation done)

Spring 2020

- CSCE 6940.743: 5G MIMO Systems (no evaluation done)
- CSCE 6950.743: Dissertation (no evaluation done)

Fall 2019

- CSCE 5933.3: LTE Physical Layer Using MATLAB (4.3 / 5.0)
- CSCE 6940.743: 5G MIMO Systems (no evaluation done)
- CSCE 6950.743: Dissertation (no evaluation done)

Spring 2019

- CSCE 6940.743: 5G MIMO Systems (no evaluation done)
- CSCE 6940.743: Software Defined Radios (no evaluation done)
- CSCE 6950.743: Dissertation (no evaluation done)

Fall 2018

- CSCE 5933.3: LTE Physical Layer Using MATLAB (4.8 / 5.0)
- CSCE 6940.743: 5G MIMO Systems (no evaluation done)
- CSCE 6950.743: Dissertation (no evaluation done)

Spring 2018

- CSCE 6940.743: 5G MIMO Systems (no evaluation done)
- CSCE 6940.743: Jitter-buffer Management and Interference in VoIP (no evaluation done)
- CSCE 6950.743: Dissertation (no evaluation done)

Fall 2017

- CSCE 5933.3: LTE Physical Layer Using MATLAB (4.9 / 5.0)
- CSCE 6940.743: 5G MIMO Systems (no evaluation done)
- CSCE 6940.743: VoLTE and VoWiFi (no evaluation done)
- CSCE 6950.743: Dissertation (no evaluation done)

Spring 2017

- CSCE 6950.743: Dissertation (no evaluation done)

Fall 2016

- CSCE 5933.3: LTE Physical Layer Using MATLAB (4.7 / 5.0)

- CSCE 6950.743: Dissertation (no evaluation done)
- Spring 2016
- CSCE 5950.743: Thesis (no evaluation done)
 - CSCE 6950.743: Dissertation (no evaluation done)
- Fall 2015
- CSCE 3010.1: Signals and Systems (5.7 / 7.0)
 - CSCE 5950.743: Thesis (no evaluation done)
 - CSCE 6950.743: Dissertation (no evaluation done)
- Spring 2015
- CSCE 5934.743: Directed Study (no evaluation done)
 - CSCE 5950.743: Thesis (no evaluation done)
 - CSCE 6950.743: Dissertation (no evaluation done)
- Fall 2014
- CSCE 3010.1: Signals and Systems (3.32 / 4.00)
 - CSCE 5950.743: Thesis (no evaluation done)
 - CSCE 6950.743: Dissertation (no evaluation done)
 - CSCE 6590.1: Advanced Topics in Wireless Communications & Networks: 4G/LTE (3.79 / 4.00)
- Spring 2014
- CSCE 3510.1: Intro to Wireless Communication (808 – Highly Effective)
 - CSCE 5510.1: Wireless Communications (808 – Highly Effective)
 - CSCE 5950.743: Thesis (no evaluation done)
 - CSCE 6950.743: Dissertation (no evaluation done)
- Fall 2013
- CSCE 5950.743: Thesis (no evaluation done)
 - CSCE 6950.743: Dissertation (no evaluation done)
 - CSCE 6590.1: Advanced Topics in Wireless Communications & Networks: 4G/LTE (804 – Highly Effective)
- Spring 2013
- CSCE 4890.743: Directed Study (no evaluation done)
 - CSCE 5950.743: Thesis (no evaluation done)
 - CSCE 6940.743: Individual Research (no evaluation done)
 - CSCE 6950.743: Dissertation (no evaluation done)
- Fall 2012
- CSCE 3010.1: Signals and Systems (793 – Highly Effective)
 - CSCE 5540.1: Intro to Sensor Networks (814 – Highly Effective)
 - CSCE 5950.743: Thesis (no evaluation done)
 - CSCE 6950.743: Dissertation (no evaluation done)
- Spring 2012
- CSCE 3020.1: Communication Systems (809 – Highly Effective)
 - CSCE 3510.1: Intro to Wireless Communication (811 – Highly Effective)
 - CSCE 5510.1: Wireless Communications (817 – Highly Effective)
 - EENG 3810.1: Communication Systems (801 – Highly Effective)
- Fall 2011

- CSCE 3010.1: Signals and Systems (793 – Highly Effective)
 - CSCE 5540.1: Intro to Sensor Networks (824 – Highly Effective)
- Spring 2011
- CSCE 3020.1: Communication Systems (820 – Highly Effective)
 - CSCE 3510.1: Intro to Wireless Communication (812 – Highly Effective)
 - CSCE 5510.1: Wireless Communications (812 – Highly Effective)
 - EENG 3810.1: Communication Systems (826 – Highly Effective)
- Fall 2010
- CSCE 3010.1: Signals and Systems (857 – Highly Effective)
 - CSCE 5540.1: Intro to Sensor Networks (831 – Highly Effective)
- Spring 2010
- CSCE 3020.1: Communication Systems (792 – Highly Effective)
 - CSCE 3510.1: Intro to Wireless Communication (793 – Highly Effective)
 - CSCE 5510.1: Wireless Communications (834 – Highly Effective)
 - EENG 3810.1: Communication Systems (854 – Highly Effective)
- Fall 2009
- CSCE 3010.1: Signals and Systems (4.40 / 5.00)
 - CSCE 5540.1: Intro to Sensor Networks (4.70 / 5.00)
 - EENG 2620.1: Signals and Systems (4.40 / 5.00)
- Spring 2009
- CSCE 3020.1: Communication Systems (4.87 / 5.00)
 - CSCE 3510.1: Intro to Wireless Communication (4.65 / 5.00)
 - CSCE 5510.1: Wireless Communications (4.79 / 5.00)
- Fall 2008
- CSCE 3010.1: Signals and Systems (4.91 / 5.00)
 - CSCE 5540.2: Intro to Sensor Networks (4.10 / 5.00)
 - EENG 2620.3: Signals and Systems (4.91 / 5.00)
- Spring 2008
- CSCE 3020.1: Communication Systems (4.68 / 5.00)
 - CSCE 3510.1: Intro to Wireless Communication (3.96 / 5.00)
 - CSCE 5510.1: Wireless Communications (4.75 / 5.00)
- Fall 2007
- CSCE 3010.1: Signals and Systems (4.57 / 5.00)
 - CSCE 5540.2: Intro to Sensor Networks (4.01 / 5.00)
- Summer 2007
- CSCE 3020.1: Fund. of Communication Theory (no evaluation done)
 - EENG 3810.1: Communication Systems (no evaluation done)
- Spring 2007
- CSCE 5510.2: Wireless Communications (4.75 / 5.00)
 - CSCE 5933.6: Fundamentals of VoIP (4.70 / 5.00)
- Fall 2006
- CSCE 3010.1: Signals and Systems (4.58 / 5.00)
 - CSCE 5540.1: Intro to Sensor Networks (4.70 / 5.00)
 - EENG 2620.1: Signals and Systems (4.58 / 5.00)

Summer 2006

- CSCE 3020.1: Fund. of Communication Theory (no evaluation done)
- CSCE 3510.21: Intro to Wireless Communications (no evaluation done)
- CSCE 5510.21: Intro to Wireless Communications (no evaluation done)
- EENG 3810.1: Communication Systems (no evaluation done)

Spring 2006

- CSCE 2610.2: Computer Organization (3.69 / 5.00)
- CSCE 3010.1: Signals and Systems (4.41 / 5.00)
- EENG 2620.1: Signals and Systems (4.41 / 5.00)

Fall 2005

- CSCE 3510.1: Intro to Wireless Communications (4.52 / 5.00)
- CSCE 5510.1: Wireless Communications (4.46 / 5.00)
- CSCE 5933.6: Intro to Sensor Networks (4.60 / 5.00)

Summer 2005

- CSCE 3010.21: Signals and Systems (no evaluation done)
- CSCE 3510.21: Intro to Wireless Communications (no evaluation done)

Spring 2005

- CSCE 3510.02: Intro to Wireless Communications (4.46 / 5.00)
- CSCI 3100.02: Computer Organization (4.14 / 5.00)

Fall 2004

- CSCE 3510.01: Intro to Wireless Communications (4.15 / 5.00)
- CSCI 4510.01: Machine Structures (4.55 / 5.00)
- CSCI 5330.02: Intro to Wireless Communications (4.05 / 5.00)

Summer 2004

- CSCI 4330.22: Intro to Wireless Communications (no evaluation done)
- CSCI 4330.23: Intro to Wireless Communications (no evaluation done)
- CSCI 5330.22: Intro to Wireless Communications (no evaluation done)

Spring 2004

- CSCI 3100: Computer Organization (4.64 / 5.00)
- CSCI 4330: Intro to Wireless Communications (4.22 / 5.00)

Fall 2003

- CSCI 4510: Machine Structures (4.49 / 5.00)
- CSCI 5330: Intro to Wireless Communications (4.83 / 5.00)

Summer 2003

- CSCI 3100: Computer Organization (no evaluation done)

Spring 2003

- CSCI 3100: Computer Organization (3.84 / 5.00)

Fall 2002

- CSCI 4510: Machine Structures (4.38 / 5.00)

Funded Proposals

- R1. "I/UCRC Industrial Membership - Ashum Corp," 2020. Krishna Kavi (PI), Robert Akl (co-PI), **\$52,000.**

- R2. "I/UCRC Industrial Membership - Ashum Corp," 2019. Krishna Kavi (PI), Robert Akl (co-PI), **\$60,900.**
- R3. "I/UCRC Industrial Membership - Ashum Corp," 2018. Krishna Kavi (PI), Robert Akl (co-PI), **\$57,700.**
- R4. "Robotics and App Design Summer Camp" under Texas Higher Education Coordinating Board: Engineering Summer Program. Requested amount is \$11,727. Submitted 5/5/17. Robert Akl (PI), **\$11,727.**
- R5. "I/UCRC Industrial Membership - Ashum Corp," 2017. Krishna Kavi (PI), Robert Akl (co-PI), **\$50,000.**
- R6. "UNT GenCyber Summer Program: Inspiring the Next Generation of Cyber Stars in North Texas," National Security Agency (NSA). Requested amount is \$85,000. Submitted 11/4/2016. Robert Akl (co-PI), **\$85,000.**
- R7. "App Design Summer Camp" under Texas Higher Education Coordinating Board: Engineering Summer Program. Requested amount is \$12,900. Submitted 5/6/16. Robert Akl (PI), **\$12,900.**
- R8. "I/UCRC Industrial Membership - Ashum Corp," 2016. Krishna Kavi (PI), Robert Akl (co-PI), **\$65,000.**
- R9. "Robotics, Game and App Programming Summer Camps" under Texas Workforce Commission: Summer Merit Program. Requested amount is \$63,000. Submitted 11/16/15. Robert Akl (PI), **\$63,000.**
- R10. "App Design Summer Camp" under Texas Higher Education Coordinating Board: Engineering Summer Program. Requested amount is \$13,998. Submitted 5/1/15. Robert Akl (PI), **\$13,988.**
- R11. "I/UCRC Industrial Membership - Ashum Corp," 2015. Krishna Kavi (PI), Robert Akl (co-PI), **\$40,000.**
- R12. "App Design Summer Camp" under Texas Higher Education Coordinating Board: Engineering Summer Program. Requested amount is \$12,500. Submitted 5/2/14. Robert Akl (PI), **\$12,500.**
- R13. "I/UCRC Industrial Membership - Ashum Corp," 2014. Krishna Kavi (PI), Robert Akl (co-PI), **\$46,000.**
- R14. "I/UCRC Industrial Membership - Ashum Corp," 2013. Krishna Kavi (PI), Robert Akl (co-PI), **\$38,500.**
- R15. "Robotics, Game and App Programming Summer Camps" under Texas Workforce

- Commission: Summer Merit Program. Requested amount is \$63,000. Submitted 12/14/12. Robert Akl (PI), **\$63,000.**
- R16. “Bio-Com Project,” funded by Raytheon under Net-Centric Software and Systems I/UCRC 2nd year. Requested amount is \$30,000. Submitted 5/12/12. Krishna Kavi (PI), Robert Akl (co-PI), **\$30,000.**
- R17. “Bio-Com Project,” funded by Raytheon under Net-Centric Software and Systems I/UCRC. Requested amount is \$30,000. Submitted 5/12/11. Krishna Kavi (PI), Robert Akl (co-PI), **\$30,000.**
- R18. “Game Programming for Xbox 360 Summer Camp” under Texas Higher Education Coordinating Board: Engineering Summer Program. Requested amount is \$20,000. Submitted 3/21/11. Robert Akl (PI), **\$20,000.**
- R19. “RoboCamps and Game Programming Summer Camps” under Texas Workforce Commission: Summer Merit Program. Requested amount is \$63,000. Submitted 2/17/11. Robert Akl (PI), **\$63,000.**
- R20. “Game Programming for Xbox 360 Summer Camp” under Texas Higher Education Coordinating Board: Engineering Summer Program. Requested amount is \$13,000. Submitted 2/22/10. Robert Akl (PI), **\$18,000.**
- R21. “Robotics and Game Programming Summer Camps” under Texas Workforce Commission: Summer Merit Program. Requested amount is \$63,000. Submitted 10/16/09. Robert Akl (PI), **\$63,000.**
- R22. “Micro Air Vehicle Design: A Collaborative Undergraduate Project for Electrical Engineering, Computer Engineering, and Computer Science Students,” under UNT Undergraduate Research Initiative. Submitted 9/25/2009. Robert Akl (co-PI), **\$8,000.**
- R23. “Summer Merit Program” under Texas Workforce Commission. Requested amount is \$42,000. Submitted 3/20/09. Robert Akl (PI), **\$42,000.**
- R24. “Robocamp at Stewpot” under Dallas Women's Foundation. Requested amount is \$20,000. Submitted 2/23/09. Robert Akl (PI), **\$18,600.**
- R25. “Robocamp Jump Start” under Motorola Foundation Innovation Generation Grant. Requested amount is \$29,852. Submitted 2/12/09. Robert Akl (PI), **\$30,700.**
- R26. “Engineering Summer Program” under Texas Higher Education Coordinating Board. Requested amount is \$7,944. Submitted 2/13/09. Robert Akl (PI), **\$11,111.**
- R27. “Texas Youth in Technology” under Texas Workforce Commission. Requested

- amount is \$152,393. Submitted 11/10/08. Robert Akl (PI), **\$152,393.**
- R28. "I/UCRC Center Proposal: Net-Centric Software and Systems," under NSF-07-537: Industry/University Cooperative Research Centers. Requested amount is \$349,482. Submitted 9/26/08. Krishna Kavi (PI), Robert Akl (co-PI), **\$60,000 per year for 5 years.**
- R29. "Robocamp and Beyond" under Motorola Foundation Innovation Generation Grant. Requested amount is \$30,000. Submitted 6/20/08. Robert Akl (PI), **\$30,000.**
- R30. Texas Youth in Technology" under Texas Workforce Commission. Requested amount is \$30,000. Submitted 2/27/08. Robert Akl (PI), **\$31,500.**
- R31. "Robocamp Program for Young Women" under RGK foundation. Requested amount is \$30,000. Submitted 11/5/07. Robert Akl (PI), **\$15,000.**
- R32. "Texas Youth in Technology" under Texas Workforce Commission. Requested amount is \$102,514. Submitted 10/22/07. Robert Akl (PI), **\$102,514.**
- R33. "Women Art Technology" under Hispanic and Global Studies Initiatives Fund. Requested amount is \$14,125. Submitted 9/30/07. Jennifer Way (PI), Robert Akl (co-PI), **\$12,785.**
- R34. "Robocamp Mobile Unit" under Motorola Foundation Innovation Generation Grant. Requested amount is \$35,000. Submitted 6/20/07. Robert Akl (PI), **\$30,000.**
- R35. "ICER: UNT Engineering Challenge Camps" under NSF 0547299. Requested amount is \$35,000. Submitted 4/27/07. Oscar Garcia (PI), Robert Akl (senior personnel), **\$32,792.**
- R36. "I/UCRC-Planning Proposal: UNT Research Site Proposal to join Embedded Systems I/UCRC," under NSF-01-116: Industry/University Cooperative Research Centers. Requested amount is \$10,000. Submitted 3/31/07. Krishna Kavi (PI), Robert Akl (co-PI), **\$10,000.**
- R37. "High-assurance NCCS: Ultra Dependability Integration Engineering," Department of Defense. Requested amount is \$20,000. Submitted 3/12/07. Krishna Kavi (PI), Robert Akl (co-PI), **\$20,000.**
- R38. "Recruiting and Retention Strategies for Computer Science at UNT" under Texas Technology Workforce Development Grant Program – 2005. Requested amount is \$163,322. Submitted 3/17/05. Robert Akl (PI), **\$125,322.**
- R39. UNT Faculty Research Grant for Fall 2003, Robert Akl (PI), \$5,000, **\$4,000.**

R40. UNT Junior Faculty Summer Research Fellowship for Summer 2003, Robert Akl (PI), \$5,000, **\$5,000**.

Professional Associations and Achievements

Membership in Professional Organizations

- Senior Member IEEE
- Member, Federation Council of North Texas Universities
- Member, Eta Kappa Nu Electrical Engineering Honor Society
- Member, Golden Key National Honor Society
- Member, Tau Beta Pi Engineering Honor Society

Offices and Committee Assignments in Professional Organizations

- Technical Program Committee Member, IEEE Wireless Communications and Networking Conference, IEEE WCNC
- Technical Program Committee Member, International Wireless Symposium, IWS
- Technical Program Committee Member, IEEE International Conference on Computational Science, IEEE ICCS
- Technical Program Committee Member, IASTED International Conference on Wireless Communications, WC
- Technical Program Committee Member, WTS Wireless Telecommunications Symposium
- Technical Program Committee Member, Mosharaka International Conference on Computer Science and Engineering, Amman
- Invitation to serve as an NSF reviewer/panelist for Engineering Research Centers (ERC) proposals
- Technical Program Committee Member, 18th IEEE International Symposium on Personal, Indoor and Mobile Radio Communication, Greece
- International Program Committee, IASTED International Conference on Wireless and Optical Communication, Canada
- Program Committee Member, Fifth Annual Wireless Telecommunications Symposium, CA
- Technical Publications Chair, IEEE Vehicular Technology Conference, Dallas TX
- Session Chair, International Conference on Computing, Commun. and Control Tech., Austin TX
- Session Chair, International Conference on Cybernetics and Information Technologies, Orlando FL
- Session Chair, 8th World Multi Conference on Systemics, Cybernetic, and Informatics, Orlando FL

Additional Responsibilities and Activities

- Reviewer, *Wireless Communications and Mobile Computing*, 2012 – present
- Reviewer, *Journal of Sensor and Actuator Networks*, 2012 – present
- Reviewer, *IEEE Transactions on Vehicular Technology*, 2011 – present
- Reviewer, *Elsevier Journal of Computers & Electrical Engineering*, 2008 – present
- Reviewer, *IEEE Globecom*, 2007 – present
- Reviewer, *IEEE International Conference on Advanced Networks and Telecommunication Systems (ANTS)*, 2008 – present
- Reviewer, *The International Wireless Communications and Mobile Computing Conference*, 2007 – present
- Reviewer, *Journal on Wireless Communications and Networking*, 2007 – present
- Reviewer, *IEEE Transactions on Communications*, 2007 - present
- Reviewer, *International Journal of Communication Systems*, 2007 – present
- Reviewer, *IEEE Communications Magazine*, 2005 – present
- Reviewer, *Journal of Wireless Networks*, 2004 – present
- Reviewer, *IEEE Transactions on Mobile Computing*, 2004 – present
- Reviewer, *IEEE Transactions on Wireless Communications*, 2004 – present
- Reviewer, *ACM Crossroads*, 2004 – present

Honors and Awards

- Who's Who in America, 2012 Edition
- Winner of Tech Titan of the Future – University Level Award for UNT Robocamps for Girls, Metroplex Technology Business Council, 2010 with **\$15,000 cash prize**.
- IEEE Professionalism Award, Ft Worth Chapter, 2008
- UNT College of Engineering Outstanding Teacher Award, 2008
- Certificate of Appreciation: IEEE Vehicular Technology Conference, Dallas, TX, 2005
- Certificate of Appreciation: Denton County Boosting Engineering, Science and Technology (BEST) Robotics Competition, 2004
- Summa Cum Laude Graduate, Ranked First in Undergraduate Class
- The Computer Science Departmental Award for Academic Excellence, Washington University, 1993
- The Dual Degree Engineering Award for Outstanding Senior, Washington University, 1993
- The 1992 Technical Writing Competition Award, The Society for Technical Communication