

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

SHENZHEN QIANFENYI INTELLIGENT TECHNOLOGY CO., LTD.,
Petitioner

v.

WACOM CO., LTD.,
Patent Owner

DECLARATION OF DR. RICARDO VALERDI
IN SUPPORT OF PETITION FOR *INTER PARTES* REVIEW OF
U.S. PATENT NO. 9,977,519

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I. Introduction

I, Ricardo Valerdi, Ph.D., declare as follows:

1. I have been retained on behalf of Shenzhen Qianfenyi Intelligent Technology Co., Ltd. (hereinafter “Petitioner”) for the above-captioned *Inter Partes* Review proceeding to provide my expert opinions and expert knowledge. I understand that this proceeding involves U.S. Patent No. 9,977,519 (“the ’519 patent”) titled “Active pen with bidirectional communication” to Lukanc *et al.*, and that the ’519 patent is currently assigned to Wacom Co., Ltd. (“Patent Owner”). I understand that the present proceedings involve a challenge to the validity of claims 1-4, 6, 7, 9, 10, 12-14, 16, 17, and 19-24 of the ’519 patent (the “Challenged Claims”).
2. In preparing this declaration, I have reviewed and am familiar with all the references cited herein. I have reviewed and am familiar with the ’519 patent and its file history. I confirm that to the best of my knowledge the accompanying exhibits are true and accurate copies of what they purport to be, and that an expert in the field would reasonably rely on them to formulate opinions such as those set forth in this declaration.
3. The ’519 patent describes an active pen with bidirectional communication. The technology involves a processing system that broadcasts beacon signals to multiple active pens, enabling them to transmit status and attribute data

back to the system during designated timeslots, allowing for features like pen identification, pressure sensitivity, tilt recognition, and color assignment.

4. I am familiar with the technology described in the '519 patent and state of the art as of the '519 patent's earliest possible effective priority date of February 25, 2015, and its filing date of February 19, 2016.
5. I have been asked to provide my independent technical review, analysis, insights, and opinions regarding the '519 patent and the references that form the basis for the grounds set forth in the Petition for *Inter Partes* Review of the '519 patent.

II. Qualifications

6. A copy of my Curriculum Vitae ("CV") is submitted as Exhibit 1004 in this proceeding. It includes details of my education, employment, and professional credentials. Further experience with styluses, touchscreen devices, and related technologies is discussed below.
7. I am currently a Full Professor, with tenure, at the University of Arizona in the Department of Systems & Industrial Engineering. Previously, I was on the faculty at the Massachusetts Institute of Technology in Cambridge, MA, and was a Visiting Professor at the United States Military Academy in West Point, NY.

8. I received a Bachelor of Science degree in Electrical Engineering from the University of San Diego, a Masters in Systems Architecture and Engineering from the University of Southern California, and a Ph.D. in Industrial and Systems Engineering from the University of Southern California.
9. My industry experience includes a variety of engineering roles at Motorola (in the wireless communications division) and SpaceX (in the space rocket production department). My experience at Motorola included the development of data systems connected via wireless communication networks. This involved technologies described in the '519 patent including sensors, time division communication protocols, cellular phone devices, device pairing, and data packets in a computer network. My work at Motorola involved the design and installation of these technologies for mission critical public safety communications systems for customers such as the Los Angeles Police Department, the Los Angeles County Sheriff, and the San Diego County Police Department.
10. I am a Senior Member of the Institute of Electrical and Electronics Engineers (IEEE), the largest engineering professional society in the world. I have received numerous awards for my research including the Frank Freiman Award for Lifetime Achievement in Cost Estimation and Parametric Modeling (the highest award given by the International Cost Estimating &

Analysis Association), Distinguished Visiting Fellowship at the Royal Academy of Engineering (United Kingdom), and Distinguished Outreach Professor Award at the University of Arizona. I have also been elected as a Foreign Member of the Mexican Academy of Engineering. I have received best paper awards in the Defense Acquisition Research Journal, Conference on Predictive Models in Software Engineering, and Symposium of the International Council on Systems Engineering.

11. I have over 100 publications in journals, magazines, and conferences relating to a broad range of technologies including the design of military weapon systems, maintenance models for nuclear weapons arsenal, and testing of autonomous systems.
12. A few of my research projects most relevant to the technology at issue here include the following: (1) the development of a taxonomy and ontology for expeditionary cyber systems applied to cognitive radio, which was funded by the Office of Naval Research in collaboration with Army Research Laboratory, (2) Dynamic Data Driven Applications Systems, funded by the U.S. Air Force Office of Scientific Research in collaboration with Oak Ridge National Laboratory.
13. I have testified in a number of cases, both at trial and by deposition; a complete list is available in my CV. My time is billed at a rate of \$700 per hour in this

proceeding. The compensation received from this case is not contingent upon my opinions or performance, the outcome, or any issues involved in or related to the proceeding.

III. My Understanding of Legal Principles

14. I understand that the Petitioner must demonstrate by a preponderance of the evidence that the Challenged Claims are unpatentable. I understand that the preponderance of the evidence standard is one characterized as being more likely than not. As each claim is considered a separate invention, I understand that the Petitioner's burden is applicable individually to each claim.
15. I further understand that determining whether a patent claim is unpatentable requires two steps: first, construction of the meaning and scope of the claim (or individual terms of the claim), and second, comparing the properly construed claim to the prior art. A party may assert unpatentability on the basis of anticipation or obviousness.
16. I understand that my analysis requires an understanding of the scope of the '519 patent claims and that the disclosures of the '519 patent and the prior art are judged from the perspective of a person of ordinary skill in the art ("POSITA") at the time of the purported invention. For the purposes of this declaration, I have been instructed to consider the earliest possible priority

date for the '519 patent to be February 25, 2015, and my analysis is based on the perspective of a POSITA as of that date.

17. I understand that during an *inter partes* review, claims of an unexpired patent are to be construed according to their ordinary and customary meaning as would be understood by a POSITA within the context of the patent record. Unless otherwise noted, I have given the claim terms their plain and ordinary meaning as understood by a POSITA at the time of purported invention.
18. I understand that a claim is unpatentable if it is anticipated or obvious. I understand that anticipation of a claim requires that every element of a claim is expressly or inherently disclosed in a single prior art reference. I understand that an anticipating reference need not use the exact terms of the claims, but must describe the patented subject matter with sufficient clarity and detail to establish that the claimed subject matter existed in the prior art and that such existence would be recognized by persons of ordinary skill in the field of the purported invention. I also understand that an anticipating reference must enable one of ordinary skill in the art to reduce the purported invention to practice without undue experimentation.
19. I understand that a patent claim is unpatentable if the claimed invention would have been obvious to a POSITA at the time of the purported invention. This means that, even if all requirements of the claim cannot be found in a single

prior art reference that would anticipate the claim, the claim can still be unpatentable.

20. I understand that an obviousness analysis involves comparing a claim to the prior art to determine whether the claimed invention would have been obvious to a POSITA at the time of the purported invention in view of the prior art and in light of the general knowledge in the art as a whole. I also understand that obviousness is ultimately a legal conclusion based on underlying facts of four general types, all of which must be considered: (1) the scope and content of the prior art; (2) the level of ordinary skill in the art; (3) the differences between the claimed invention and the prior art; and (4) any objective indicia of non-obviousness.
21. I also understand that obviousness may be established by combining or modifying the teachings of the prior art. Specific teachings, suggestions, or motivations to combine any first prior art reference with a second prior art reference can be explicit or implicit, but if relied upon must have existed before the date of purported invention. I understand that prior art references themselves may be one source of a specific teaching or suggestion to combine features of the prior art, but that such suggestions or motivations to combine art may come from the knowledge of a POSITA. Specifically, a rationale to

combine the teachings of references may include logic or common sense available to a POSITA.

22. I understand that a reference may be relied upon for all that it teaches, including uses beyond its primary purpose. I understand that, though a reference may be said to teach away when a person of ordinary skill, upon reading the reference, would be discouraged from following the path set out in the reference, the mere disclosure of alternative designs does not teach away.
23. I further understand that whether there is a reasonable expectation of success from combining references in a particular way is also relevant to the analysis. I understand there may be a number of rationales that may support a conclusion of obviousness, including:
- Combining prior art elements according to known methods to yield predictable results;
 - Substitution of one known element for another to obtain predictable results;
 - Use of a known technique to improve similar devices (methods, or products) in the same way;
 - Applying a known technique to a known device (method, or product) ready for improvement to yield predictable results;

- “Obvious to try” – choosing from a finite number of identified, predictable solutions, with a reasonable expectation of success;
- Known work in one field of endeavor may prompt variations of it for use in either the same field or a different one based on design incentives or other market forces if the variations are predictable to a POSITA; and
- Some teaching, suggestion, or motivation in the prior art that would have led one of ordinary skill to modify the prior art reference or to combine prior art teachings to arrive at the claimed invention.

24. I understand that it is not proper to use hindsight to combine references or elements of references to reconstruct the invention using the claims as a guide. My analysis of the prior art is made from the perspective of a POSITA at the time of the purported invention and does not rely on hindsight.
25. I understand that so-called objective indicia may be relevant to the determination of whether a claim is obvious, should such evidence be alleged. Such objective indicia can include evidence of commercial success caused by an invention, evidence of a long-felt need that was solved by an invention, evidence that others copied an invention, skepticism or disbelief by those skilled in the art, failure of others, praise of the invention, evidence that an invention achieved a surprising result, or near-simultaneous invention by

multiple parties. I understand that most of such evidence must have a nexus, or causal relationship to the elements of a claim, in order to be relevant to the obviousness or non-obviousness of the claim. I am unaware of any such objective considerations of non-obviousness having a nexus to the claims at issue in this proceeding.

26. I understand that for a reference to be used to show that a claim is obvious, the reference must be analogous art to the claimed invention. I understand that a reference is analogous to the claimed invention if the reference is from the same field of endeavor as the claimed invention, even if it addresses a different problem, or if the reference is reasonably pertinent to the problem faced by the inventor, even if it is not in the same field of endeavor as the claimed invention. I understand that a reference is reasonably pertinent based on the problem faced by the inventor as reflected in the specification, either explicitly or implicitly.

IV. Overview of the '519 Patent

27. The '519 patent is titled "Active pen with bidirectional communication," and is directed to a processing system for an input device, which facilitates communication with a plurality of active pens through bidirectional communication. In the context of the '519 patent, 'upstream' communication refers to signals originating from the processing system to the pen, while

‘downstream’ refers to responses sent from the pen to the processing system. *See, e.g.*, Ex. 1001, at 8:3-6 (“Many attributes that may be transmitted downstream from the active pen (140) to the processing system (110) may also be transmitted upstream from the processing system to the active pen (140).”).

28. The ’519 patent describes a processing system that broadcasts beacon signals to multiple active pens, enabling them to transmit status and attribute data back to the system during designated timeslots, allowing for features like pen identification, pressure sensitivity, tilt recognition, and color assignment. This enables multi-pen environments.
29. The ’519 patent describes embodiments of a system that includes a sensor module 160 configured to initiate a beacon period containing multiple timeslots by broadcasting a beacon signal to a plurality of active pens 140, 145. *Id.* at 8:25–52. The sensor module 160 also receives downstream packets from active pens during different timeslots. *Id.*
30. Additionally, the system has a determination module 150 which is configured to determine attributes of the active pens 140, 145 (e.g., pen ID, button status, pressure, tilt) based on received packets. *Id.* at 7:12–23, 8:53–9:6, 10:52–11:10. The determination module 150 also handles pairing and unpairing of

pens based on communication status. *Id.* at 10:21–36; *see also id.* at Figs. 1, 5:

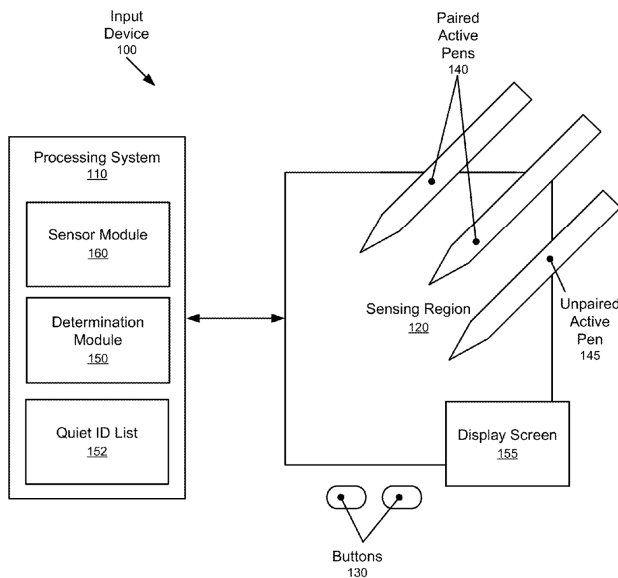


FIG. 1

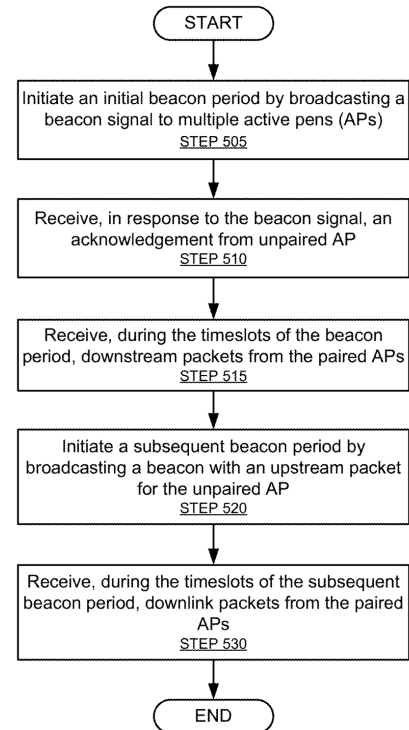


FIG. 5

31. The active pen disclosed in the '519 patent includes an ID register 230, one or more buttons 226, and a transceiver 228. *Id.* at 10:37–51, Fig. 2. The sensor module broadcasts a beacon signal that includes a pen ID, a timeslot, and a frequency for communication. *Id.* at 9:46–10:3; *see also* Fig. 7. The active pen transmits data (e.g., pressure, tilt, button status) back to the processing system. *Id.* at 7:12–23. The system can reconfigure communication parameters (like timeslots and frequencies) dynamically. *Id.* at 9:23–45.

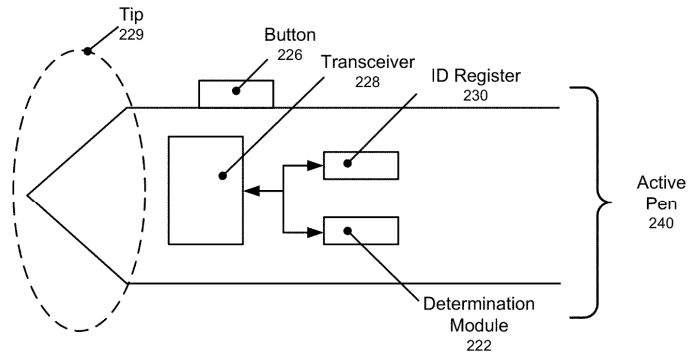


FIG. 2

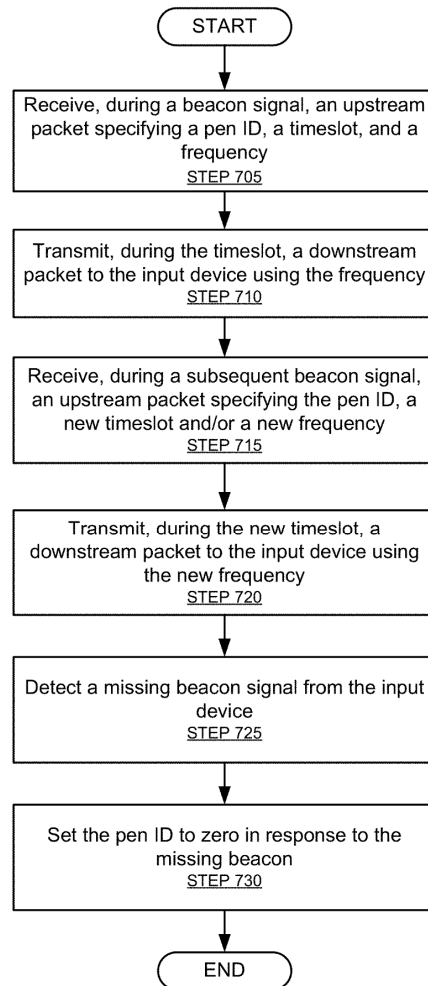


FIG. 7

32. Unpaired pens respond to the beacon signal with an acknowledgment (ACK).

Id. at 7:32–38, 10:4–18. Upon receiving this ACK, the system may initiate

pairing with the pen and assign it communication parameters such as a pen ID, timeslot, and frequency. *Id.* If downstream packets are missed, the system marks the pen as “quiet” and may recycle its pen ID. *Id.* at 10:19–36. The system can detect and resolve communication conflicts between pens. *Id.* at 12:14–12:44.

V. Challenged Claims

33. I have listed the challenged claims below, with numbers and letters identifying each element of the claims that are used for clarity throughout this declaration and appendices thereto.

Claim 1

1[pre] – “A processing system for an input device, the processing system comprising:”

1[a] – “a sensor module coupled to sensor circuitry and configured to:”

1[b] – “initiate a current beacon period comprising a plurality of timeslots by broadcasting, to a plurality of active pens comprising a first active pen, a current beacon signal comprising an upstream packet for the first active pen and specifying a pen identification (ID) associated with the first active pen;”

1[c] – “receive, during a first timeslot, a first downstream packet from a first active pen transceiver of the first active pen; and”

1[d] – “receive, during a second timeslot, a second downstream packet from a second active pen transceiver; and”

1[e] – “a determination module configured to:”

1[f] – “generate the upstream packet for the first active pen specifying the pen ID; and”

1[g] – “determine an attribute of the first active pen comprising the first active pen transceiver from at least the first downstream packet.”

Claim 2

2[pre] – “The processing system of claim 1,”

2[a] – “wherein the first active pen further comprises the second active pen transceiver,”

2[b] – “and wherein the attribute of the first active pen is further determined from the second downstream packet.”

Claim 3

3[pre] – “The processing system of claim 1,”

3[a] – “wherein the attribute is at least one selected from a group consisting of pen tilt, color, and erasure mode.”

Claim 4

4[pre] – “The processing system of claim 1, wherein the determination module is further configured to:”

4[a] – “determine an attribute of a second active pen comprising the second active pen transceiver from the second downstream packet.”

Claim 6

6[pre] – “The processing system of claim 4, wherein the determination module is further configured to:”

6[a] – “detect a collision between the first active pen and the second active pen; and”

6[b] – “generate a collision packet for the first active pen and the second active pen,”

6[c] – “wherein the sensor module is further configured to send the collision packet, and”

6[d] – “wherein each of the first active pen and the second active pen wait a random time interval before reattempting to pair in response to the collision packet.”

Claim 7

7[pre] – “The processing system of claim 1,”

7[a] – “wherein the attribute of the first active pen is at least one selected from a group consisting of a force measurement at a tip of the first active pen”

7[b] – “and a button status of a button on the first active pen.”

Claim 9

9[pre] – “The processing system of claim 1,”

9[a] – “wherein the first downstream packet is transmitted using a first frequency”

9[b] – “and the second downstream packet is transmitted using a second frequency.”

Claim 10

10[pre] – “The processing system of claim 9, wherein:”

10[a] – “the sensor module is further configured to:”

10[b] – “initiate a prior beacon period by broadcasting a prior beacon; and”

10[c] – “receive, during a timeslot of the prior beacon period, an acknowledgement from the first active pen in response to the prior beacon,”

10[d] – “wherein the first active pen is unpaired during a portion of the prior beacon period,”

10[e] – “wherein the upstream packet is generated in response to the acknowledgement, and”

10[f] – “wherein the upstream packet further specifies the first timeslot and the first frequency.”

Claim 12

12[pre] – “A method for operating a processing system of an input device, comprising:”

12[a] – “generating an upstream packet for a first active pen specifying a pen identification (ID) associated with the first active pen;”

12[b] – “initiating a current beacon period comprising a plurality of timeslots by broadcasting, to a plurality of active pens comprising the first active pen, a current beacon signal comprising the upstream packet;”

12[c] – “receiving, during a first timeslot, a first downstream packet from a first active pen transceiver over a first frequency;”

12[d] – “receiving, during a second timeslot, a second downstream packet from a second active pen transceiver over a second frequency; and”

12[e] – “determining an attribute of the first active pen comprising the first active pen transceiver from at least the first downstream packet.”

Claim 13

13[pre] – “The method of claim 12,”

13[a] – “wherein the first active pen further comprises the second active pen transceiver, and”

13[b] – “wherein the attribute of the first active pen is further determined from the second downstream packet.”

Claim 14

14[pre] – “The method of claim 12, further comprising:”

14[a] – “determining an attribute of a second active pen comprising the second active pen transceiver from the second downstream packet.”

Claim 16

16[pre] – “The method claim 14, further comprising:”

16[a] – “detecting a collision between the first active pen and the second active pen; and”

16[b] – “sending a collision packet for the first active pen and the second active pen,”

16[c] – “wherein each of the first active pen and the second active pen wait a random time interval before reattempting to pair in response to the collision packet.”

Claim 17

17[pre] – “The method of claim 12,”

17[a] – “wherein the attribute of the first active pen is at least one selected from a group consisting of a force measurement at a tip of the first active pen and a button status of a button on the first active pen.”

Claim 19

19[pre] – “The method of claim 12, further comprising:”

19[a] – “initiating, before initiating the current beacon period, a prior beacon period by broadcasting a prior beacon signal;”

19[b] – “receiving, during a timeslot of the prior beacon period, an acknowledgement from the first active pen in response to the prior beacon,”

19[c] – “wherein the first active pen is unpaired during at least a portion of the prior beacon period,”

19[d] – “wherein the upstream packet is generated in response to the acknowledgment, and”

19[e] – “wherein the upstream packet further specifies the first timeslot and the first frequency.”

Claim 20

20[pre] – “An active pen, comprising:”

20[a] – “an identification (ID) register storing a pen identification (ID);”

20[b] – “a button; and”

20[c] – “a transceiver configured to:”

20[d] – “receive, from a first input device, a current beacon signal comprising an upstream packet specifying the pen ID, a timeslot, and a frequency,”

20[e] – “wherein the current beacon signal initiates a current beacon period comprising a plurality of timeslots; and”

20[f] – transmit, to the first input device and during the timeslot specified in the upstream packet, a downstream packet comprising a status of the button using the frequency specified in the upstream packet.

Claim 21

21[pre] – “The active pen of claim 20, wherein the transceiver is further configured to:”

21[a] – “receive, before receiving the current beacon signal, a prior beacon from the first input device,”

21[b] – “wherein the prior beacon signal initiates a prior beacon period, and”

21[c] – “wherein the active pen is unpaired for at least a portion of the prior beacon period; and”

21[d] – “send, in response to the prior beacon, an acknowledgment to trigger pairing with the first input device.”

Claim 22

22[pre] – “The active pen of claim 21, wherein the transceiver is further configured to:”

22[a] – “receive, from the first input device, a collision packet;”

22[b] – “wait a random time interval in response to the collision packet; and”

22[c] – “re-attempt pairing with the first input device after the random time interval.”

Claim 23

23[pre] – “The active pen, of claim 21, further comprising:”

23[a] – “a determination module configured to:”

23[b] – “detect a missing beacon from the first input device; and”

23[c] – “set the ID register to zero in response to the missing beacon to unpair the active pen.”

Claim 24

24[pre] – “The active pen of claim 20, wherein the transceiver is further configured to:”

24[a] – “receive, from the first input device, a user ID of a user;”

24[b] – “send the user ID to a second input device during a pairing of the second input device.”

VI. Level of Ordinary Skill in the Art

34. I understand that several factors are relevant to determining the level of ordinary skill in the art at the time of the claimed invention. I understand that those factors include: (1) the educational level of the inventor(s); (2) type of problems encountered in the art; (3) prior art solutions to those problems; (4) rapidity with which innovations are made; (5) sophistication of the technology; and (6) educational level of active workers in the field.
35. The art of the '519 patent relates to styluses and their communication with processing systems.
36. The types of problems encountered in the art include providing styluses with various functionalities that are easily and conveniently enabled by a user,

providing reliable communication between a stylus and a device, and providing styluses that are easy to use.

37. Innovations are made incrementally because stylus-type input devices were not new in February 2015, and various ways of designing and using a stylus with touch devices were well-known in the art in February 2015. The sophistication of styluses can vary, from simple passive styluses to more sophisticated active styluses, which may have various functionalities and sophisticated electronic and/or computerized components.
38. The inventors of the '519 patent are Jeff Lukanc, Kirk Hargreaves, David Sobel, and Joseph Kurth Reynolds. Based on publicly available records, it appears that Mr. Lukanc¹, Mr. Hargreaves², Dr. Sobel³, and Mr. Reynolds⁴ have advanced degrees (e.g., master's degrees or higher) in electrical or computer science disciplines. In particular, Mr. Lukanc received his BSEE from the University of Illinois Urbana-Champaign, Mr. Hargreaves received his MSEE from the University of Washington, and Dr. Sobel received his MS and PhD from the University of California, Berkeley.

¹ <https://www.linkedin.com/in/jeff-lukanc-543a613/details/education/>.

² <https://www.linkedin.com/in/kirk-hargreaves/>.

³ <https://www.linkedin.com/in/dasobel/details/education/>.

⁴ <https://www.linkedin.com/in/kurth-reynolds-65063/>.

39. A POSITA in February 2015 would have knowledge of numerous communication protocols and procedures between electronic devices. ABET-accredited programs⁵ in Electrical and Computer Engineering typically include courses in computer networking as part of their curriculum. These programs aim to provide a comprehensive education in areas like hardware, software, and systems integration, and computer networking is a key component of modern systems. For example, ABET-accredited Electrical and Computer Engineering programs in the U.S. such as the University of Illinois Urbana-Champaign,⁶ University of California, Berkeley,⁷ and the University of Washington⁸ offer courses in network protocols and data communication.
40. After considering the factors mentioned above, and based on the disclosure of the '519 patent, a POSITA at the relevant time would have had at least a four-

⁵ Engineering programs are accredited by the Accreditation Board for Engineering and Technology (ABET).

⁶ ECE 459 - Communications Systems
<https://ece.illinois.edu/academics/courses/ECE459-120248>

ECE 438 – Communication Networks
<https://ece.illinois.edu/academics/courses/ECE438-120248>

⁷ EE 122 - Introduction to Communication Networks
<https://www2.eecs.berkeley.edu/Courses/EE122/>

⁸ EE 419 – Introduction to Computer-Communication Networks
<https://myplan.uw.edu/course/#!/courses/E%20E419>

EE 565 – Computer-Communication Networks
<https://myplan.uw.edu/course/#!/courses/E%20E565>

year bachelor's degree in computer engineering, electrical engineering, or similar, and at least two years of experience working with computing systems and their interaction/communication with other devices, or an advanced degree in computer engineering, electrical engineering, or the like. This skill level reflects familiarity with wireless protocols, embedded systems, and input device integration with capacitive or inductive surfaces.

VII. Summary of the Prosecution History

41. The patent application that issued as the '519 patent was filed on February 19, 2016. The '519 patent claims priority to U.S. Provisional Application No. 62/120,856, filed on February 25, 2015. Ex. 1001 ('519 patent); Ex. 1002 (prosecution file history of '519 patent).
42. The application that issued as the '519 patent, U.S. Patent Application No. 15/047,773 (the "'773 Application"), contained 26 claims.
43. The '773 Application was filed by a company called Synaptics Incorporated ("Synaptics").
44. On September 14, 2017, the Examiner issued a Non-Final Office Action ("NFOA"). The NFOA rejected or objected to all 26 claims in the '773 Application.

45. The NFOA explained that '773 Application claims 1, 3-5, 8, 13, 15-16 and 22 were “rejected under 35 U.S.C. 102(a)(1) as being anticipated by Maeda et al (US 20120013555 A1).” *See* Ex. 1002 at p. 60 ¶ 5.
46. The NFOA explained that '773 Application claims 2, 6-7, 9-12, 14, 17-21 and 23-26 were “objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.” *Id.* at ¶ 6.
47. On December 14, 2017, Synaptics filed Arguments, Remarks, and Amendments in response to the NFOA. Synaptics cancelled '773 Application claims 6 and 17. Claims 1 and 13 were amended to include the subject matter of the cancelled dependent claims 6 and 17, respectively. Claims 7, 9, and 19 were amended for clarification.
48. On January 26, 2018, the Examiner issued a Notice of Allowance allowing '773 Application claims 1-5,7-16 and 18-26 as amended.
49. The '519 patent issued on May 22, 2018.

VIII. Teachings of the Prior Art and Applied References

50. My prior art analysis relies primarily on five references as shown in the table below, in addition to my knowledge and the background discussed herein. Each of the prior art reference identified herein is from the field of stylus-type

input devices and/or is reasonably pertinent to the particular problem with which the inventors were concerned.

Reference	Inventor(s)	Filing Date	Issue/Publication Date
U.S. Patent No. 9,606,680 ("Sundara-Rajan")	Kishore Sundara-Rajan	June 12, 2014	March 28, 2017
U.S. Patent Application Publication 2013/0207926 ("Kremin'926")	Viktor Kremin, Andriy Ryshtun, David Wright, Jeff Boschee	Feb. 15, 2012	Aug. 15, 2013
U.S. Patent Application Publication 2012/0105361 ("Kremin'361")	Viktor Kremin, Roman Ogirko, Oleksandr Pirogov, Andriy Ryshtun, Darrin Vallis	Oct. 28, 2010	May 3, 2012
U.S. Patent Application Publication 2013/0157690 ("Lefevre")	Valentin Lefevre, Christophe Duteil	Sep. 3, 2010	June 20, 2013
U.S. Patent No. 9,703,433 ("Chandran")	Praveesh Chandran, Baranidharan Karuppusamy, Giuseppe Noviello, Chee Weng Cheong, Leonard Dinu, Dianbo Guo, Kien Beng Tan, Chaochao Zhang	Aug. 18, 2014	July 11, 2017

51. None of the above prior art references were before the examiner during the prosecution of the '519 patent. Ex. 1001, 1002.

A. U.S. Patent No. 9,606,680 to Sundara-Rajan (“Sundara-Rajan”) (Ex. 1005)

52. Sundara-Rajan is titled “Capacitive communication between stylus devices and computing devices” and was filed June 12, 2014. Sundara-Rajan issued on March 28, 2017. I understand that Sundara-Rajan is prior art to the '519 patent.

53. One of the embodiments disclosed in Sundara-Rajan serves to solve the drawback in prior art where operating a stylus with a computing device only allowed one-way communication—i.e., the stylus “communicates with the computing device but the computing device typically does not have the ability to communicate with the stylus.” Ex. 1005, at 2:17-2:22. Two-way communication “allow[s] the implementation of many more features and customization of stylus-device operations.” *Id.* at 2:22-2:24. Sundara-Rajan seeks to improve on this issue by disclosing an embodiment whereby an active capacitive stylus allows for bi-directional communication with a computing device “for example, via a touch controller, using an electromagnetic communication channel, such as a capacitive link or capacitive communication channel. This enables bi-directional data transfer between the stylus and the computing device without requiring a separate radio

communication link to enable device-to-stylus communications.” *Id.* at 2:26-2:34; *see also id.* Figs. 1, 2:

FIG. 1

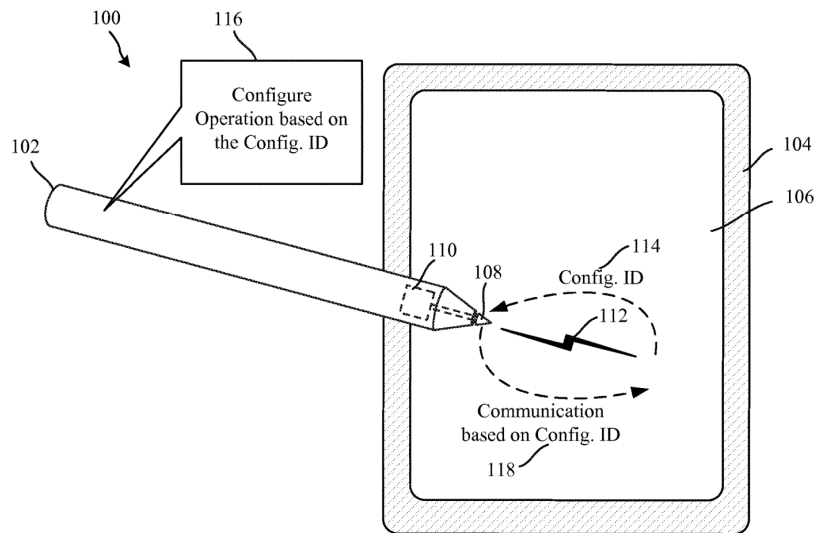
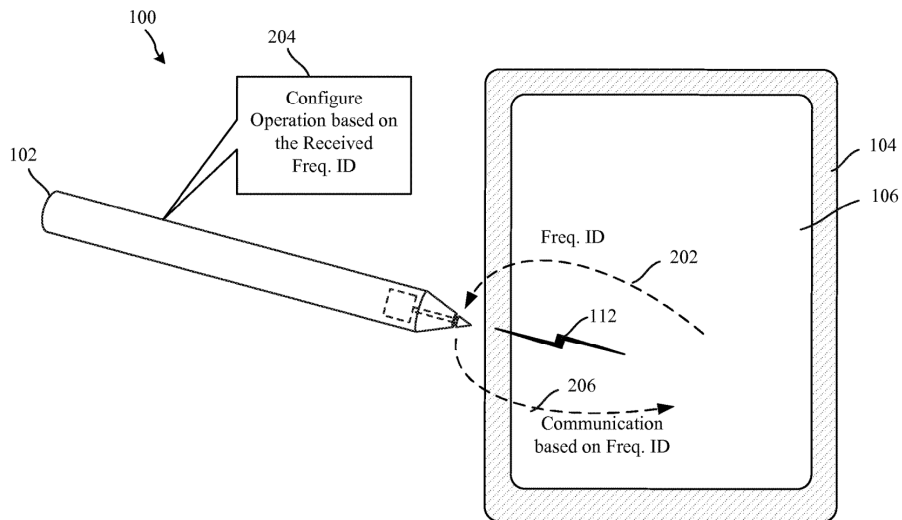
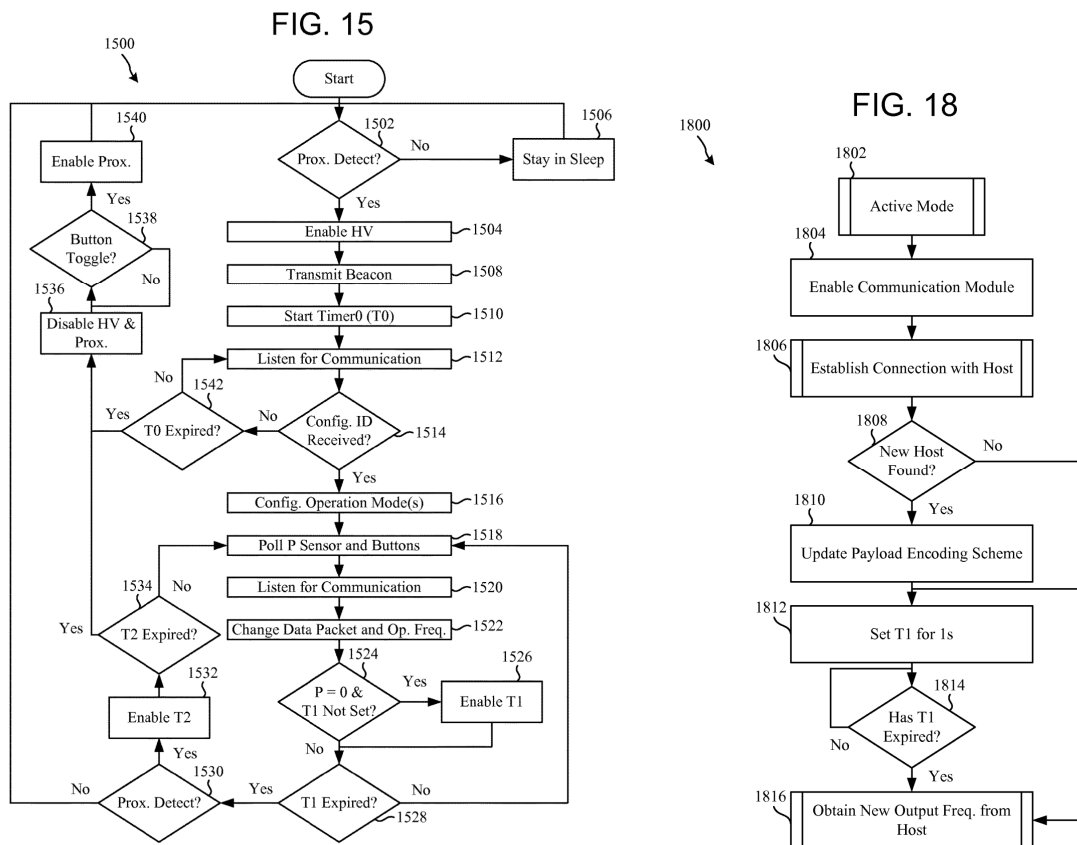


FIG. 2



54. Sundara-Rajan also seeks to solve an issue where there is noise at a certain operating frequency where styli are only configured to operate at a fixed frequency or group of fixed frequencies. *Id.* at 2:42-2:50. Sundara-Rajan discloses an active stylus that can change its frequency “to accommodate for a changing noise environment.” *Id.* at 2:50-2:53. The new frequency “may be determined by the touch controller of the computing device and communicated to the stylus device in message including data using the capacitive communication channel.” *Id.* at 2:53-2:57; *see also id.* Figs. 15, 18:



55. Sundara-Rajan also seeks to solve an issue where “[m]ost styli are tied to a certain type of touch controller,” which may “cause a user to purchase a new stylus for each different computing device the user purchases,” and/or cause “manufacturers to produce new styli every time the touch controller changes.” *Id.* at 2:59-2:65. Therefore, the active stylus disclosed in Sundara-Rajan “is capable of configuring its operation so that it can communicate and function with a multitude of touch controllers.” *Id.* at 3:2-3:5. “[T]he computing device may also be adapted to transmit a message including data, such as a configuration ID or other identifier corresponding to a requested mode of operation to the stylus device.” *Id.* at 3:5-3:9; *see also id.* Fig. 1.
56. Therefore, the technology disclosed in Sundara-Rajan relates to “an active capacitive stylus that enables the computing device to communicate to the active stylus using the existing capacitive link; is adapted to change its operating frequency to accommodate for changing noise environment; [and] is capable of changing its output so that it can communicate and function with a multitude of touch controllers.” *Id.* at 3:33-3:39.

B. U.S. Patent Application Publication 2013/0207926 (“Kremin’926”) (Ex. 1006)

57. Kremin’926, titled “Stylus to host synchronization,” was filed March 27, 2012, and claims priority to U.S. Provisional Application No. 61/599,332,

filed on February 15, 2012. Kremin'926 published on August 15, 2013. I understand that Kremin'926 is prior art to the '519 patent.

58. The technology disclosed in Kremin'926 relates to a system for synchronizing a stylus with a capacitive sense array. Ex. 1006, at ¶ 0018. The system transmits a synchronization signal from the capacitive sense array to the stylus using capacitive coupling, allowing the stylus to adjust its timing based on the received signal. *Id.* ¶ 0062. The synchronization signal and a host transmit (TX) signal can be transmitted at different frequencies or simultaneously, enabling accurate stylus tracking and reduced interference. *Id.* ¶ 0035; *see also id.* Fig. 11:

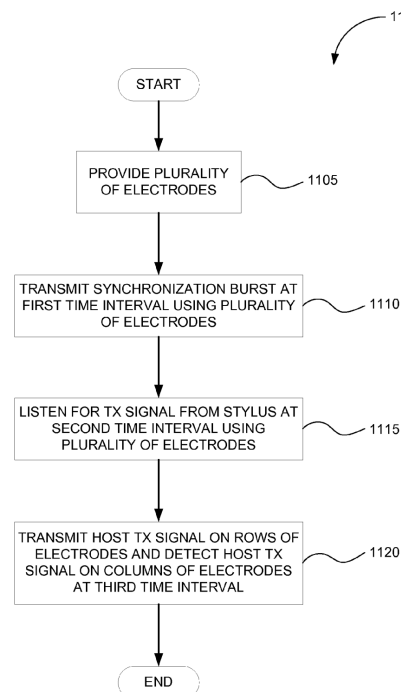


FIG. 11

59. This approach improves communication accuracy and enables simultaneous use of multiple stylus and touch inputs on the same capacitive sense array. *Id.*
60. Kremin'926 also discloses operations and configurations whereby the processing device and the capacitive sense array disclosed are able to detect and track both a touch object (like a finger) and a stylus. *Id.* ¶ 0020; *see also* Fig. 1:

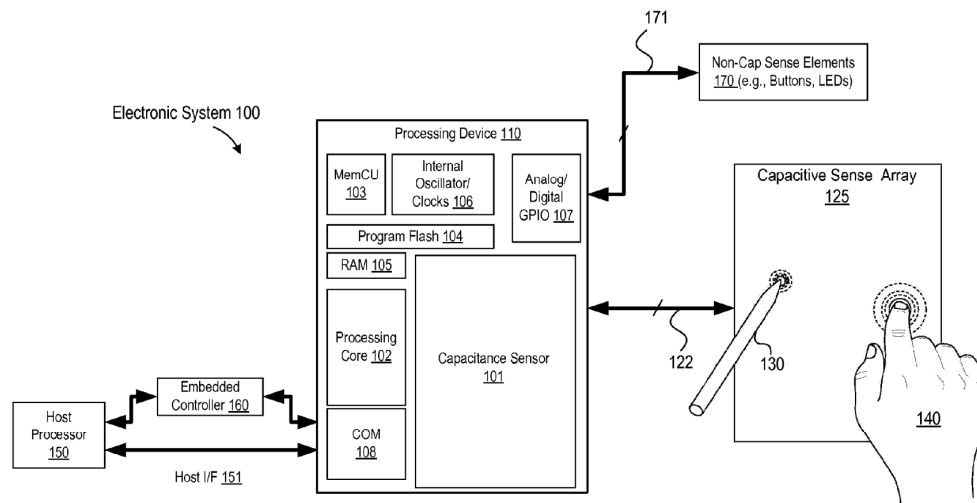


FIG. 1

C. U.S. Patent Application Publication 2012/0105361 (“Kremin’361”) (Ex. 1007)

61. Kremin’361, titled “Capacitive stylus with palm rejection,” was filed August 19, 2011, and claims priority to U.S. Provisional Application Nos. 61/407,522; 61/407,903; 61/407,905; 61/407,906; and 61/407,907, all filed on

October 28, 2010. Kremin'361 published on May 3, 2012. I understand that Kremin'361 is prior art to the '519 patent.

62. Kremin'361 describes a capacitive stylus system that communicates wirelessly with a capacitive touch sensor array to enable precise stylus tracking. Ex. 1007, at ¶ 0052. The stylus transmits a signal via capacitive coupling, which is received by the touch sensor array and processed to determine the stylus location. *Id.* ¶ 0099. The stylus also modulates additional data (e.g., force, button status, battery level, acceleration) into its transmit signal using amplitude shift keying (ASK), enhancing interaction capabilities. *Id.* ¶¶ 0007, 0048, 0089, 0105, 0107. A synchronization mechanism aligns the stylus and touch array timing, ensuring accurate position detection without interfering with finger input. *Id.* ¶¶ 0009, 0067, 0071, 0078. This system supports simultaneous stylus and finger use and enables features like hover detection, all while reducing complexity and cost by eliminating the need for separate inductive sensing hardware. *Id.* ¶¶ 0078, 0099. This cost-reduction motivation reflects similar design constraints addressed by the '519 patent.

D. U.S. Patent Application Publication 2013/0157690 (“Lefevre”) (Ex. 1008)

63. Lefevre, titled “Method and devices for interfacing a plurality of mobile elements with a computer system in real time,” was filed September 2, 2011, and claims priority to French Patent Application FR1057014A, filed on

September 3, 2010. Lefevre published on June 20, 2013. I understand that Lefevre is prior art to the '519 patent.

64. Lefevre discloses a system and method for interfacing multiple mobile elements with a computer system in real time by tracking their position and orientation using electromagnetic fields. Each mobile element includes at least one localization module that can be sequentially activated to emit a signal detectable by a grid-based detection surface, enabling precise determination of its position using inductive coupling and interpolation techniques. Ex. 1008, at ¶¶ 0010–0014, 0050–0055. The system supports both position and orientation tracking by equipping mobile elements with multiple localization modules, and it can dynamically manage the activation of these modules based on their presence on the detection surface. *Id.* ¶¶0022–0023, 0150–0153.
65. Thus, the system improves upon traditional resistive touchscreens (which could only support a single contact with constant pressure needed) and capacitive touchscreens (which require conductive objects connected to the earth to allow for object location detection). *Id.* ¶¶0004-0005. “The process according to the invention thus enables a computer system to determine simply, efficiently, and in real time the position of a large number of mobile elements which can be used to interact with the computer system.” *Id.* ¶ 0015.

66. The localization modules are wirelessly activated and may be powered through internal batteries or inductive power systems, ensuring low latency and scalability. *Id.* ¶¶0027–0035, 0129–0131. Additionally, the system can use either analog or digital identification techniques for module activation, allowing for flexible and efficient interaction with the computer system *Id.* ¶¶0147–¶0148.

E. U.S. Patent No. 9,703,433 (“Chandran”) (Ex. 1009)

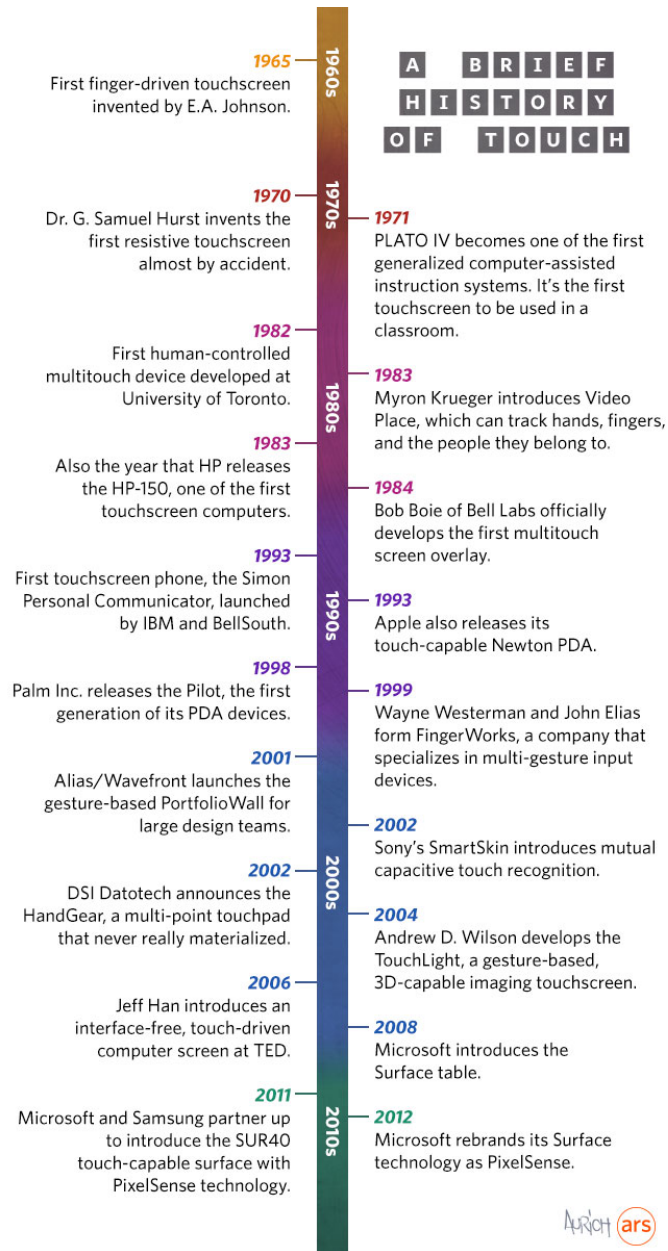
67. Chandran, titled “System and method of communication between a capacitive touch screen and an active stylus,” was filed August 18, 2014. Chandran issued on July 11, 2017. I understand that Chandran is prior art to the ’519 patent.
68. Chandran describes a bidirectional communication system between a capacitive touchscreen and an active stylus. The system uses a time-division multiplexed communication protocol that alternates between panel transmission periods and stylus transmission periods, enabling both the panel and stylus to send modulated signals that can include data like position or stylus-specific information. Ex. 1009, at 4:6–22, 5:8–33. The capacitive panel supports both mutual-capacitance and self-capacitance modes, with the communication occurring during self-capacitance scan periods. *Id.* at 4:23–67. The stylus synchronizes with the panel’s communication frame after

detecting a wake-up signal, and transmits separate signals for column (Y-axis) and row (X-axis) data to allow precise location tracking while minimizing circuit complexity. *Id.* at 7:7–28, 8:10–34. Multiple styluses can be associated with the same panel using a stylus identification process, enabling applications like multi-user drawing or gaming. *Id.* at 9:5–67.

F. Known Techniques in Stylus Technology

69. As of the earliest possible priority date of the '519 patent (February 2015), a POSITA would have been familiar with a wide variety of techniques and components for implementing a stylus for use with a touch-sensitive device. Simple capacitive and/or passive styluses were well known, including use with a conductive surface that can absorb some of a touchscreen's electrostatic field, which registers as a touch at the touch-sensitive device. For example, E.A. Johnson's work in the 1960s laid the groundwork for touchscreens, including resistive technology. Ex. 1010. His paper, "Touch Display—a Novel Input/Output Device for Computers," published in Electronics Letters, is often cited as a pioneering study. Ex. 1011.
70. A POSITA also would have been familiar with resistive touchscreens, which may detect a touch when pressure is applied to a first sheet causing the first sheet to come into contact with a second sheet. A POSITA would have known of simple styluses that could be used to apply pressure to a resistive

touchscreen as well. Companies like HP, Palm, Apple, Sony, Microsoft, and Samsung made advances in touchscreen technology before 2015:



Ex. 1010.

71. Moreover, as of the earliest possible priority date of the '519 patent, a

POSITA would have been familiar with active stylus technologies. Active styluses have their own power sources, and may communicate richer information to a device, such as switch data, pressure data, orientation information, and so forth. In 1993, IBM and BellSouth teamed up to launch the Simon Personal Communicator, one of the first cellphones with touchscreen technology. It featured, among other things, a resistive touchscreen that required the use of a stylus to navigate through menus and to input data. Ex. 1010. A contemporaneous example is the HTC Scribe, which was a pressure-sensitive stylus that offered highlighting and erasing functionality using buttons, among other functionalities. Ex. 1012; Ex. 1013. Other examples include active styluses disclosed in the references discussed herein.

72. My explanation of the state of the art is based on my review of the '519 patent and its prosecution history, including but not limited to the above statements, the prior art, and my firsthand experience as a POSITA as of the relevant priority date.

G. Preexisting Standards

73. In electronic device communications, certain standards, or accepted rules, have been established by those in the field to ensure interoperability between distinct entities and/or devices. Without certain rules defining how electronic

devices communicate, different devices would be unable to communicate with each other effectively.

74. Electronic device communication standards have been published by standards setting bodies. For example, the Internet Engineering Task Force (“IETF”) and the Institute of Electrical and Electronics Engineers (“IEEE”) have promulgated standards for communications between electronics devices. The International Telecommunication Union-Telecommunication Standardization Sector (“ITU-T”) and the International Organization for Standardization (“ISO”) have also developed international telecommunications standards. A POSITA would be familiar with those communications through standard university coursework in electrical engineering or computer engineering, research endeavors in communications between electronic devices, and/or other work in industry.
75. Technical standards in the area of communications between electronic devices standards are relevant prior art because the scope of the ’519 patent includes “sending data” (Ex. 1001, at 3:20), transmission of “downstream packets” (*id.* at 11:58), a “processing system” that includes “electronically-readable instructions, such as firmware code, software code, and/or the like” (*id.* at 4:66-5:1), a “beacon signal may use the Code division multiple access

(CDMA) direct-sequence spread spectrum (DSSS) format” (*id.* at 8:31-32), and pens that “send an ACK,” (*id.* at 12:21).

76. In considering the state of the art at the time of the claimed invention, I considered the following references which predate the ’519 patent and are particularly relevant here.

Reference	Publication Date
IEEE 802.1D - Media Access Control (MAC) Bridges (Ex. 1014)	June 2004
IEEE 802.1ag – Virtual Bridged Local Area Networks, Amendment 5: Connectivity Fault Management (Ex. 1015)	December 2007
IEEE 802.3ah Part 3: Carrier Sense Multiple Access with Collision Detection (CSMA/CD) Access Method and Physical Layer Specifications (Ex. 1016)	September 2004

77. The IEEE 802.1D - Media Access Control (MAC) standard defines how network bridges operate to interconnect multiple local area networks (LANs). One of its key functions is to maintain a Forwarding Database (FDB) or Filtering Database, which is a table of MAC addresses. Ex. 1014, at 5. This is the same concept as the “identification register” in Claim 20[a] of the ’519 Patent. In the IEEE 802.1D standard, a MAC address is defined as a unique identifier assigned to electronic devices for communication within a network. *Id.* at 49. This is the same concept as the “pen identification” in Claim 20[a].

78. The IEEE 802.1ag standard, part of Connectivity Fault Management (CFM), uses Continuity Check Messages (“CCMs”) to monitor and verify network connectivity. CCMs are periodic messages sent to ensure that the network path between endpoints remains operational. CCMs are sent at regular intervals for continuous monitoring of electronics devices. Ex. 1015, at 5. This is the same concept as the “current beacon signal” in Claim 20[d].
79. The IEEE 802.3ah collision detection standard is the primary standard that describes how data packets are sent over a computer network. This standard ensures reliable and efficient data transmission across wired networks using technologies like CSMA/CD (Carrier Sense Multiple Access with Collision Detection) to manage data flow and avoid collisions. Specifically, this standard teaches a method for avoiding collisions between data packets sent between electronic devices: “To avoid data collisions and increase the efficiency of the subscriber access network, ONU’s transmissions are arbitrated.” Ex. 1016, at 421. This is the same concept as the “receive, from the first input device, a collision packet” in Claim 22[a].

H. Motivations to Combine and Expectation of Success

80. In this section I will discuss the various reasons why a POSITA had a motivation to combine prior art, which will deem the Challenged Claims of the ’519 patent obvious because the claims lack the necessary inventive step.

I will discuss why a person skilled in the relevant field would have been driven to merge elements or teachings from prior art to arrive at the claimed invention by examining explicit suggestions in prior art, industry trends, and practical problem-solving incentives.

81. While certain aspects of stylus technology, such as active stylus technology, may involve at least moderately sophisticated electrical and/or computerized technologies, a POSITA nonetheless would be able to combine various features of stylus-type input devices with at least a reasonable expectation of success and to achieve predictable results. For example, a POSITA would have known how to incorporate various components and features within an active stylus device, such as buttons/switches, various other kinds of sensors, computer-readable media, processing components, one or multiple electrodes, and so forth. Additionally, a POSITA would have been able to implement various communication protocols for transmitting data to and from an active stylus. As discussed above, a POSITA would have a relatively high level of knowledge and skill in communication between electronic devices. For example, it is common for an inventor in this field to have at least a master's degree in an electrical or computer science discipline. Accordingly, it would be well within the abilities of a POSITA to combine known techniques in the art in various ways to achieve predictable results.

82. For example, Sundara-Rajan and Kremin'926 are both directed to improving bi-directional communication between active stylus devices and capacitive touchscreens. *See* Ex. 1005, Abstract; Ex. 1006, Abstract. A POSITA would have reasonably looked to the invention of Kremin'926 - the references cited on the face of Sundara-Rajan include a patent application to Ryshtun and a patent application to Wright, both named inventors on Kremin'926. Ex. 1005, 1. A POSITA would have been motivated to combine Sundara-Rajan's disclosure of an active stylus that configures itself to work with different touchscreens and the synchronization and simultaneous detection methods disclosed in Kremin'926 (for synchronizing an active stylus to a capacitive array and concurrently detecting the presence of multiple objects) with reasonable expectation of success and to achieve predictable results.
83. Similarly, Kremin'361 and Sundara-Rajan are both directed to improving bi-directional communication between active stylus devices and capacitive touchscreens. *See* Ex. 1005, Abstract; Ex. 1007, Abstract. The references cited on the face of Sundara-Rajan include a patent application to Ryshtun, a named inventor on Kremin'361. Ex. 1005, at 1. A POSITA would have been motivated to combine the synchronization and simultaneous detection methods disclosed in Kremin'361 (for synchronizing an active stylus to a capacitive array and concurrently detecting the presence of an active stylus

and a passive touch object) with Sundara-Rajan's disclosure of an active stylus that configures itself to work with different touchscreens with reasonable expectation of success and to achieve predictable results.

84. A POSITA would have been motivated to combine Chandran's specific disclosure of bidirectional communication between a capacitive touch screen and an active stylus with Lefevre's disclosure of a more general method for a computer system to determine the location of multiple module elements interacting with the computer system. Lefevre expressly discloses that "there are solutions for detecting the position and/or orientation of real objects on a game board, making it possible to use these objects as an interface for a computer system" and it "possible to use touch screens of the capacitive type." Ex. 1008, at ¶¶ 0003, 0005. Lefevre explains, however, that "in general, solutions based on touch screens or touch film only support a limited number of simultaneous or quasi-simultaneous contacts and do not allow for the determination of a large number of objects." *Id.* at ¶ 0006. Lefevre states that "the object of the invention is thus a method for interfacing in real time a plurality of mobile elements with a computer system." *Id.* at ¶ 0010. Lefevre, however, does not describe how to apply its method to a capacitive touch screen system. A POSITA looking at Lefevre's objective would have looked to Chandran's more specific disclosure of a protocol for simultaneous contact

with a plurality of styluses and/or non-stylus operations in a capacitive system, and vice versa, with reasonable expectation of success and to achieve predictable results.

85. Chandran, in turn, discloses that it is “possible for the control circuitry 120 [of the capacitive touch screen] and active stylus 130 to engage in a bidirectional communication.” Ex. 1009, at 2:49-50. Chandran explains that “establishing a protocol governing such a bidirectional communication is critical to supporting a cooperative relationship between the control circuitry [of the capacitive touch screen] and the active stylus 130.” *Id.* at 2:51-53. Chandran further explains that it is “also important that the protocol support operation of the capacitive sensing panel 100 in non-stylus operations, such as detecting a user finger or hover, in a manner that is perhaps simultaneous with active stylus communication.” *Id.* at 2:54-57. “It is further important that the protocol support operation of the capacitive sensing panel 100 with respect to communicating with a plurality of active styluses.” *Id.* at 2:57-60. Chandran thus explicitly teaches the same general objective as Lefevre—simultaneous interaction with multiple input objects. Thus, a POSITA would utilize these explicit teachings to achieve bidirectional communication between touch screens and styluses with a reasonable expectation of success and to achieve predictable results.

IX. Grounds for Invalidity

A. Ground 1: Claims 1-4, 7, 9, 10, 12-14, 17, 19-21, 23, and 24 are anticipated by and rendered obvious over Sundara-Rajan.

86. It is my opinion that claims 1-4, 7, 9, 10, 12-14, 17, 19-21, 23, and 24 are anticipated by Sundara-Rajan or, at minimum, rendered obvious over Sundara-Rajan in view of the knowledge of a POSITA. Appendix A is a claim chart detailing my invalidity analysis, which compares the prior art to the claim elements and describes the teachings, suggestions, and motivations to combine the references.

B. Ground 2: Claims 1, 2, 4, 7, 12-14, 17, 19-21, and 24 are further obvious over Sundara-Rajan in view of Kremin'926

87. It is my opinion that claims 1, 2, 4, 7, 12-14, 17, 19-21, and 24 are further obvious over Sundara-Rajan in view of Kremin'926. Appendix A is a claim chart detailing my invalidity analysis, which compares the prior art to the claim elements and describes the teachings, suggestions, and motivations to combine the references.
88. Sundara-Rajan and Kremin'926 are both directed to improving bi-directional communication between active styluses and capacitive touchscreens. Ex. 1005, Abstract; Ex. 1006, Abstract. The references cited on the face of Sundara-Rajan include patent applications to Ryshtun and Wright, both named inventors on Kremin'926. Ex. 1005, 1. A POSITA would be motivated to combine Sundara-Rajan's disclosure of an active stylus that configures

itself to work with different touchscreens and the synchronization and simultaneous detection methods disclosed in Kremin'926 (for synchronizing an active stylus to a capacitive array and concurrently detecting the presence of multiple objects).

C. Ground 3: Claims 1, 4, 6, 12, 14, 16, and 20-22 are obvious over Kremin'361 in view of Sundara-Rajan

89. It is my opinion that claims 1, 4, 6, 12, 14, 16, and 20-22 are obvious over Kremin'361 in view of Sundara-Rajan. Appendix B is a claim chart detailing my invalidity analysis, which compares the prior art to the claim elements and describes the teachings, suggestions, and motivations to combine the references.
90. Kremin'361 and Sundara-Rajan both disclose bi-directional communication between active stylus devices and capacitive touchscreens. Ex. 1005, Abstract; Ex. 1007, Abstract. The references cited on the face of Sundara-Rajan include a patent application to Ryshtun, a named inventor on Kremin'361. Ex. 1005, 1. A POSITA would be motivated to combine the synchronization and simultaneous detection methods disclosed in Kremin'361 (for synchronizing an active stylus to a capacitive array and concurrently detecting the presence of an active stylus and a passive touch object) with Sundara-Rajan's disclosure of an active stylus that configures itself to work with different touchscreens.

D. Ground 4: All Challenged Claims are obvious over Lefevre in view of Chandran

91. It is my opinion that all Challenged Claims are obvious over Lefevre in view of Chandran. Appendix C is a claim chart detailing my invalidity analysis, which compares the prior art to the claim elements and describes the teachings, suggestions, and motivations to combine the references.
92. A POSITA would be motivated to combine Chandran's specific disclosure of bidirectional communication between a capacitive touch screen and an active stylus with Lefevre's disclosure of a more general method for a computer system to determine the location of multiple module elements interacting with the computer system. Lefevre discloses "solutions for detecting the position and/or orientation of real objects on a game board, making it possible to use these objects as an interface for a computer system" and it "touch screens of the capacitive type." Ex. 1008, ¶¶0003, 0005. Lefevre explains that "solutions based on touch screens or touch film only support a limited number of simultaneous or quasi-simultaneous contacts and do not allow for the determination of a large number of objects." *Id.* ¶0006. Lefevre states that "the object of the invention is thus a method for interfacing in real time a plurality of mobile elements with a computer system." *Id.* ¶0010. Lefevre, however, does not describe how to apply its method to capacitive touch screens. A POSITA looking at Lefevre's objective would have looked to Chandran's

more specific disclosure of a protocol for simultaneous multi-stylus and non-stylus operations in a capacitive system, and vice versa.

93. Chandran, in turn, discloses that “the control circuitry 120 [of the capacitive touch screen] and active stylus 130 to engage in a bidirectional communication.” Ex. 1009, 2:49-50. Chandran explains that “establishing a protocol governing such a bidirectional communication is critical.” *Id.* 2:51-53. Chandran further explains that it is “also important that the protocol support operation of the capacitive sensing panel 100 in non-stylus operations, such as detecting a user finger or hover, in a manner that is perhaps simultaneous with active stylus communication.” *Id.* 2:54-57. “It is further important that the protocol support operation of the capacitive sensing panel 100 with respect to communicating with a plurality of active stylus-es.” *Id.* 2:57-60. Chandran thus discloses as important the same general objective as Lefevre—simultaneous interaction with multiple input objects.

X. Conclusion

94. In signing this declaration, I recognize that the declaration will be filed as evidence in a contested case before the Patent Trial and Appeal Board of the United States Patent and Trademark Office. I also recognize that I may be subject to cross examination in the case and that cross examination will take

place within the United States. If called for cross-examination, I will appear for cross examination within the United States during the allotted period.

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

Executed this 10th day of September, 2025.

Respectfully submitted,

A handwritten signature in black ink that reads "Ricardo Valerdi". The signature is written in a cursive, flowing style.

Ricardo Valerdi, Ph.D.