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Attorneys for Plaintiff and
Counterclaim-Defendant APPLE INC.

UNITED STATES DISTRICT COURT

NORTHERN DISTRICT OF CALIFORNIA

SAN JOSE DIVISION

APPLE INC., a California corporation,

Plaintiff,

v.

SAMSUNG ELECTRONICS CO., LTD., a Korean business entity; SAMSUNG ELECTRONICS AMERICA, INC., a New York corporation; SAMSUNG TELECOMMUNICATIONS AMERICA, LLC, a Delaware limited liability company,

Defendants.

Case No. 11-cv-01846-LHK (PSG)

DECLARATION OF MICHEL MAHARBIZ, PH.D. IN SUPPORT OF APPLE'S OPPOSITION TO SAMSUNG'S MOTION TO STRIKE EXPERT TESTIMONY

PUBLIC REDACTED VERSION

I, Michel Maharbiz, Ph.D., declare as follows:

1. I am an Associate Professor of Electrical Engineering and Computer Science at Berkeley.

2. I submit the following Declaration on behalf of plaintiff Apple Inc. ("Apple"). If called as a witness in this action, I am competent to testify of my own personal knowledge, to the best of my recollection, as to the matters set forth in this Declaration.

3. I reserve the right to supplement or amend this Declaration, if additional facts and information that affect my opinions become available. My Declaration is based on the materials that have been available to me up to the date of this Declaration.

4. I am being compensated for my work in connection with this matter at the rate of $300 per hour. I also get reimbursed for reasonable travel and out-of-pocket expenses in relation to my work on this case. My compensation is not contingent upon the outcome of this case. Neither the amount of my compensation nor my hourly billing rate depends on whether I am obligated to testify at deposition or trial.

I. PROFESSIONAL AND EDUCATIONAL BACKGROUND

5. I received my Ph.D. in Electrical Engineering and Computer Science from the University of California at Berkeley ("Berkeley") in 2003. I received a Bachelor's of Science degree in Electrical Engineering and Computer Science from Cornell University in 1997. My Ph.D. thesis was on the topic of microfabrication and miniaturization of instrumentation. Before I joined the faculty of Berkeley, I was an Assistant Professor at the Electrical Engineering and Computer Science Department at the University of Michigan at Ann Arbor.

6. I am currently an Associate Professor of Electrical Engineering and Computer Science ("EECS") at Berkeley. I am also a Co-Director of the Berkeley Sensor and Actuator Center (BSAC), which is the National Science Foundation Industry/University Cooperative Research Center for Microsensors and Microactuators. BSAC conducts industry-relevant, interdisciplinary research on micro- and nano-scale sensors, moving mechanical elements, microfluidics, materials, processes and systems that combines knowledge of integrated-circuit, biological, and polymer technologies.

7. The courses I have taught at Berkeley include EE147 ("Introduction to Microelectromechanical Systems (MEMS)"), EE40 ("Introduction to Microelectronic Circuits"), CS150 ("Components and Design Techniques for Digital Systems") and EE105 ("Microelectronic Devices and Circuits"). My classes have covered the topics of touch screens and touch sensor panels. In EE40, for example, I have presented publicly available teardowns of tablets and their touch screens to demonstrate such topics as how a touch screen works, the ITO layers, capacitance, and fabrication.

8. A list of my publications is included in my Curriculum Vitae (attached hereto as Exhibit A is a true and correct copy of my Curriculum Vitae), and includes a textbook on circuits as well as more than 40 journal and technical conference publications in high impact venues. The textbook I have coauthored, "Circuits," covers the topics of touch screens and touch sensor panels and has detailed discussion of many of the components relevant to U.S. Patent 7,663,607 ("the '607 Patent") (attached hereto as Exhibit B is a true and correct copy of the '607 Patent). It also includes a technology brief that analyzes and compares touch screen technologies.

9. My research at Berkeley has covered a variety of topics, including the extreme miniaturization of electronic systems for neural recording and stimulation, microfabrication of flexible polymer microelectrocorticography arrays, energy scavenging devices for ultra-low power CMOS circuits, and microfluidic component design among others. My current research interests include building micro/nano interfaces to cells and organisms and exploring bio-derived fabrication methods. I was the recipient of a 2009 NSF Career Award for research into developing microfabricated interfaces for synthetic biology. I am a Senior Member of the IEEE (Institute of Electrical and Electronics Engineers).

10. I am a cofounder of TweedleTech, a company that applies human interface design principles to create a radio frequency ID based sensor device that detects and identifies multiple components placed on it through the use of a matrix of row and column electrodes. The sensor detects and identifies radio frequency tags that are placed over a platform or substrate and includes a display component in the form of a projector.

11. My research activities have been funded by DARPA, NSF, NIH, and the U.S. Army. My research has also been partially funded over the last several years by grants from private companies. Such grants are usually designated as intended to support a specific research project or research center, and are not gifts to me personally.

12. As of February 18, 2012, I am listed as co-inventor of U.S. Patent Application Nos. 20100331083, 20100004062, and 20090085427. Each is accessible via http://appft1.uspto.gov/netahtml/PTO/search-bool.html.

II. BACKGROUND OF THE '607 PATENT INVENTION

13. If called to testify at trial on the topic of the definition of a person of ordinary skill in the art for the '607 Patent, I expect to testify regarding the skill, education, and experience that a person of ordinary skill in the relevant art would have had at the time of the invention of the '607 Patent. In my opinion, the relevant art involves multipoint touchscreens. In my opinion, a person of ordinary skill in the relevant art of the '607 Patent at the time of the invention would have a Bachelor's degree in electrical engineering, physics, computer engineering, or an equivalent, and two or more years of experience working with input devices.

14. The '607 Patent discloses an elegant touch-screen solution for electronic devices, particularly graphics-based mobile or hand-held devices that have high-resolution displays and require human interaction. As more fully developed below, the claimed inventions of the '607 Patent relate to a specific configuration of conductive lines and circuit elements that make up the touch panel in a display arrangement. The '607 Patent claims recite an innovative combination of elements including the use of a mutual capacitance touch screen in a truly transparent display that can simultaneously detect and generate signals representing the specific location of distinct multiple points of actual or near contact.

15. The '607 Patent relates to a touchscreen that implements novel functions as compared to prior and contemporaneous touchscreen designs. While touchscreens had existed in various forms prior to the '607 Patent, for example resistive touchscreens, self-capacitance touchscreens, electromechanical touchscreens, optical touchscreens, and surface acoustic wave

touchscreens, all prior touchscreen technologies lacked certain features or combination of features.

16. The ’607 Patent discloses a transparent capacitive touch sensor that for the first time offered true multitouch sensing capability. Multitouch sensing capability is the ability to independently and unambiguously recognize and track two, three, four, five or more finger touches as well as the contact of other things like the palm of a hand. The inventors of the ’607 Patent pointed out in the specification (e.g., column 1, line 63 through column 2, line 22) of their patent that the prior systems “lack the ability to track multiple points of contact simultaneously” because, for example, in such systems “an average of all simultaneously occurring touch points are determined and a single point which falls somewhere between the touch points is reported” or it was “impossible to discern the exact position of multiple touch points that fall on the same horizontal or vertical lines due to masking. In either case, faulty results are generated.” Instead of these inadequate prior systems, the ’607 Patent inventors developed a new transparent touch panel that (as recited in independent Claim 1) would detect multiple touches or near touches “that occur at a same time and at distinct locations” and “produce distinct signals representative of a location of the touches on the plane of the touch panel for each of the multiple touches” that can be input on the touch panel.

17. One aspect of the unique combination of claimed elements of the ’607 Patent was the implementation of a special arrangement of circuit elements specifically designed to enable precise sensing of capacitive coupling in the transparent multitouch sensor called a virtual ground charge amplifier, which is exemplified in Figure 13 of the ’607 Patent. A virtual ground charge amplifier includes a capacitor in a negative feedback loop around the amplifier used for detection. By virtue of there being negative feedback and ground at the non-inverting input terminal, the amplifier creates a “virtual ground” at the inverting input terminal. The term “virtual ground” is a term of art. By virtue of there being a capacitor designed into the feedback path, the circuit functions as a charge amplifier: it produces a voltage which is the time integral of the current entering at the input; the time integral of current is charge. (’607 Patent, column 17, lines 48-61.) The “virtual ground charge amplifier” allows the circuit to integrate the current per

unit of time for the purpose of, for example, sensing charge on the capacitor in a manner that is robust to the impact of parasitics in the device.

III. THE '607 PATENT CLEARLY AND UNAMBIGUOUSLY DEFINES A VIRTUAL GROUND CHARGE AMPLIFIER.

18. A person of ordinary skill in the art, after reading the '607 Patent, would have understood immediately that use of the term "virtual ground charge amplifier" in Claim 8 of the '607 Patent referred to column 17 lines 36 through 61 and the circuit depicted in figure 13 of the patent. The '607 Patent only refers to any type of amplifier in three places: Claim 8 ("a virtual ground charge amplifier coupled to the touch panel"), Figure 13 (3:58-59 states "FIG. 13 is a diagram of a charge amplifier, in accordance with one embodiment of the present invention"), and column 17 lines 37 through 61.

19. The concept of the "virtual ground charge amplifier is explained precisely and unambiguously in the specification (column 17, lines 47-61) with reference to Figure 13:

> FIG. 13 is a diagram of an inverting amplifier 240, in accordance with one embodiment of the present invention. The inverting amplifier 240 may generally correspond to the filter 236 shown in FIG. 12. As shown, the inverting amplifier includes a non inverting input that is held at a constant voltage (in this case ground), an inverting input that is coupled to the node and an output that is coupled to the capacitive sensing circuit 230. The output is coupled back to the inverting input through a capacitor. During operation, the input from the node may be disturbed by stray capacitance effects, i.e., parasitic capacitance. If so, the inverting amplifier is configured to drive the input back to the same voltage that it had been previously before the stimulus. As such, the value of the parasitic capacitance doesn't matter.

20. This part of the patent specification plainly states that the "noninverting input" is held constantly at ground and the "inverting amplifier is configured to drive the input back to the same voltage that it had been previously before the stimulus," namely, to ground. As everyone of even less than ordinary skill in the art knows, "ground," sometimes called "Earth" is the reference point in an electrical circuit from which other voltages are measured and is commonly a current return path to the Earth. The "virtual" part of the description "virtual ground" means that the circuit holds the voltage at a "ground" level but does not actually provide a return path for current

to ground. This is a simple and direct explanation of the concept of using a "virtual ground" in the "charge amplifier."

21. I do not believe that anyone of even ordinary skill in the art could miss the direct connection between Claim 8 and the circuit elements depicted in Figure 13 and described exactly in Column 1, lines 36 to 61 of the '607 Patent. The words "virtual ground charge amplifier" are not ambiguous and are plainly discernible to anyone of even ordinary skill in the art.

22. I also conclude that it would have been self-evident to Samsung and to its expert Dr. Von Herzen that the accused Samsung devices (the Galaxy Tab 7.0 and 10.1 devices) included a "virtual ground charge amplifier." I understand from Apple's counsel that in its August 26, 2011 Infringement Contentions, Apple told Samsung that it believed that the "virtual ground charge amplifier" is found in the circuitry of Samsung's devices and that the specific chip in which that circuit is found would be identified in discovery. I also understand that Samsung first identified the chips used in the accused devices on March 16, 2012, in its Supplemental Response to Apple's Interrogatory No. 81. The information provided on March 16, 2012 in fact was incorrect, and Samsung revised its response on March 22, 2012, in its Second Supplemental Response to Apple's Interrogatory No. 81. I have also been informed that on the eve of the close of fact discovery, the document [redacted] was finally produced in this litigation. It was produced by Samsung as SAMNDCA10903768-783 on February 19, 2012. Attached hereto as Exhibit C is a true and correct copy of SAMNDCA10903768-783, Apple also received this document from Atmel (designated ATMEL-SAMSUNG00000286-301) on February 22, 2012. Attached hereto as Exhibit D is a true and correct copy of ATMEL-SAMSUNG00000286-301. This document [redacted] shown in the top figure below (SAMNDCA10903771) [redacted]

[redacted]

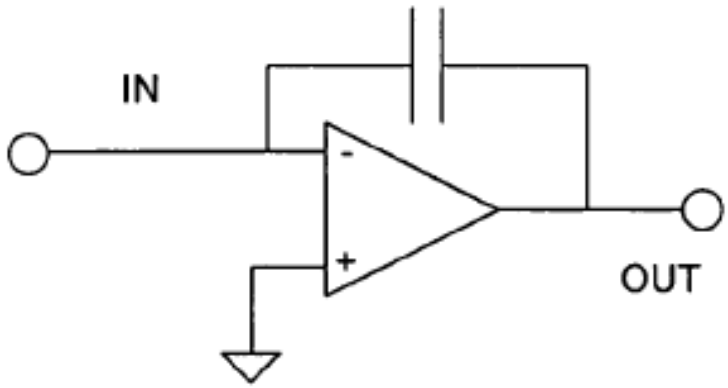

FIG. 13

23. From this information it is plain that Samsung and, with any investigation whatsoever, its expert Dr. Von Herzen, knew full well the precise circuit in the accused devices that was the "virtual ground charge amplifier." In my March 22, 2012 Infringement Expert Report, I concluded based in part on this document, that the Accused Samsung Products contained a virtual ground charge amplifier.

I declare under penalty of perjury under the laws of the United States of America that the foregoing is true and correct and that this Declaration was executed this 31st day of May, 2012, at Berkeley, California.

/s/ Michel Maharbiz
Michel Maharbiz