UNITED STATES DISTRICT COURT
FOR THE DISTRICT OF MASSACHUSETTS

PHILIPS NORTH AMERICA LLC, Plaintiff, v. FITBIT, INC., Defendant.	Civil Action No. 1:19-cv-11586-IT

EXPERT DISCLOSURE OF DR. THOMAS L. MARTIN, PH.D

JUNE 5, 2020

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1. I have been retained as an expert witness on behalf of Philips North America LLC ("Philips") for this matter. In particular, I have been asked to provide expert opinions on testimony on technical matters and with regard to what one of ordinary skill in the art would understand with respect to certain patents at issue in this case. These opinions are set forth below, and I may provide testimony in response to any expert testimony advanced by Fitbit, Inc. as well.

I. BACKGROUND AND QUALIFICATIONS

2. I am a Professor in the Department of Electrical and Computer Engineering at Virginia Polytechnic Institute and State University, more commonly known as "Virginia Tech" where I have been employed since 2001. I was previously an Assistant Professor at the University of Alabama in Huntsville from 1999-2001. A current copy of my curriculum vitae is attached as Exhibit A.

3. As discussed in my curriculum vitae, I have more than 25 years of experience in the area of wearable technologies, with a particular emphasis on activity monitoring technology. In 1992, I began working on wearable computers for campus tour guides using the Global Positioning System (GPS) and aircraft maintenance. Since that time, I have conducted research on a wide variety of wearable computing topics and applications, including electronic textiles, ambulatory medical monitoring of physiological data such as heart rate, activity classification based upon measuring a person's movements using sensors such as accelerometers and gyroscopes, and personal protective equipment using GPS. I have also been affiliated with the International Symposium on Wearable Computers since 1998, having served as general chair, technical program co-chair (3 times), technical program committee member, and steering committee member.

4. My education includes a Bachelor of Science degree in Electrical Engineering in 1992 from the University of Cincinnati, a Master of Science degree in Electrical and Computer Engineering in 1994 from Carnegie Mellon University, and a Ph.D. in Electrical and Computer Engineering in 1999 from Carnegie Mellon University.

5. My research areas include wearable computing (including for health and activity monitoring), pervasive computing, interdisciplinary design teams for smart devices, and electronic textiles (e-textiles). I am the co-director of the Virginia Tech E-textiles Laboratory, which conducts research on hardware and software architectures for e-textile applications, including both smart garments and large-scale fabrics such as home furnishings. Since joining Virginia Tech, I have been the Principal Investigator or co-Principal Investigator on over $6.5M in external research funding. My current research is focused on developing computational architectures and design tools for electronic textiles that will allow domain experts to develop intelligent garments and home furnishings that will work reliably across a range of populations, environments and applications. My goal is to develop intelligent fabrics that look and feel like normal fabric, while providing sensing and computing platforms that fit unobtrusively into a person's normal daily routine. Reviews of my proposals stated that my research is "ground-breaking," "highly innovative," "full of exciting potential," and "already showing a clear impact"; I was said to be "among a small group of pioneers" in electronic textiles. In 2006, I was one of 20 NSF researchers to receive the Presidential Early Career Award for Scientists and Engineers (PECASE) for my research on electronic textiles for wearable computing.

6. One of my ongoing research thrusts is electronic textile garments for monitoring a person's motions using a variety of sensors attached to the clothing, including accelerometers, gyroscopes, magnetometers, and bend sensors. Applications of this research include sports

medicine, treatment of motion-related injuries, physical therapy for stroke victims, and monitoring patients' physiological responses during normal daily routines. I have recently completed a National Science Foundation Smart Health and Wellbeing grant to develop e-textile garments for ambulatory medical monitoring. These garments simultaneously monitor both the patient's physiological characteristics and movements, to annotate physiological data with information about the patient's activities, which are classified based upon measuring the movements of the patient's body segments (torso, arms, and legs) with wearable sensors. The goal is to allow medical personnel to see the relationship of daily activities and physiological response and to use the activities to determine when physiological data is collected, providing a greater insight into the patient's state of health and the dynamics of their wellbeing. I am currently working with colleagues at the University of Minnesota and University of Delaware on a National Science Foundation grant to develop soft exoskeletons for children with mobility impairments of their arms; my portion of the work is to monitor the movements of the arms using stitched stretch sensors and inertial measurement units (IMUs). In earlier grants from the National Science Foundation, dating back to 2002, my colleagues and I investigated a number of medical applications of e-textile garments, including gait analysis (the characteristics of a person's walking movements) and simultaneous monitoring of a person's movements and physiological data.

7. In addition to medical applications, I investigated using the Global Positioning System (GPS) in wearable technology for personal protective equipment in industrial settings. My previous research in this area includes proof-of-concepts of a vest that uses the Global Positioning System (GPS) to alert workers-on-foot at roadside construction sites when there is an imminent risk of being struck by a passing car, as well as a hard hat for construction workers that

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