UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

APPLE, INC.,

Petitioner,

v.

ALIVECOR, INC.,

Patent Owner.

Case IPR2021-00972
U.S. Patent No. 10,638,941

DECLARATION OF DR. IGOR EFIMOV IN SUPPORT OF PATENT OWNER'S PRELIMINARY RESPONSE

I. INTRODUCTION

1. I, Igor R Efimov, Ph.D., have been retained by AliveCor, Inc. ("AliveCor" or "Patent Owner") to provide certain expert opinions in connection with AliveCor's Patent Owner Preliminary Response to the Petition for *Inter Partes* Review of U.S. Patent No. 10,638,941 ("the '941 patent"), IPR2021-00972 ("the 972 Petition") filed by Apple, Inc. ("Apple" or "Petitioner").

II. BACKGROUND AND QUALIFICATIONS

2. I am the Alisann and Terry Collins Professor of Biomedical Engineering at the George Washington University, Washington, D.C. From January 2015 to December 2019, I served as the founding chairman of the Department of Biomedical Engineering at the George Washington University. Previously, from 2004 to 2015, I served as the Lucy & Stanley Lopata Distinguished Professor of Biomedical Engineering at Washington University in Saint Louis, Missouri. I was also a Professor of Medicine, Professor of Radiology, and Professor of Cell Biology & Physiology at the Washington University School of Medicine. I also served on the faculty of the Department of Cardiology of the Cleveland Clinic Foundation (1994-2000) and Department of Biomedical Engineering of Case Western Reserve University (2000-2004), Cleveland Ohio.

3. I received my Master of Science degree in experimental nuclear physics from the Moscow Institute of Physics and Technology, USSR in 1986. In 1992, I further received a Ph.D. in Biophysics from the Moscow Institute of Physics and Technology, after completing a doctoral study on the mechanisms of sudden cardiac death due to ventricular arrhythmias. I completed my postdoctoral training in 1992-1994 in the field of cardiac electrophysiology and arrhythmia at the University of Pittsburgh in Pittsburgh, Pennsylvania. Then, I started my independent cardiac research career in the Department of Cardiology at the Cleveland Clinic Foundation (1994-2000), where I established an NIH-funded laboratory. Cleveland Clinic has been consistently ranked #1 Cardiology program nationwide since 1994 by the U.S. News & World Report.

4. For the past 21 years I have taught undergraduate and graduate courses in Biomedical Engineering at Case Western Reserve University, Washington University in St. Louis, and the George Washington University, including BME 301B Quantitative Physiology, BME 573 Applied Bioelectricity, BME 5909 Physiology of the Heart, BME 1010 Introduction to Biomedical Engineering, BME 3907 Clinical Cardiovascular Engineering, and BME 6045 Cardiovascular Engineering & Technology. In these and other courses, I taught sections on engineering and physiological principles of cardiac electrophysiology, arrhythmia, and electrocardiography. Many of my trainees are currently working

at leading national medical device companies such as Medtronic, St. Jude Medical, Philips Medical, and Boston Scientific, developing novel cardiac antiarrhythmic therapy and diagnostics devices.

5. I also mentored over 30 clinical fellows and postdoctoral research fellows, many of whom are currently professors, cardiologists, cardiac surgeons, and clinical engineers throughout the national and world Universities and hospitals, including Harvard University, MA; University of California, CA; Ohio State University, OH; University of Wisconsin, WI; University of Fukuoka, Japan; University of Bordeaux, France; University of Brno, Czech Republic; Imperial College London, U.K; etc.

6. I have published a book in 2009 on cardiac bioelectric diagnostics and therapy (Efimov I.R., Kroll, M.W., Tchou, P.J., Eds., Cardiac Bioelectric Therapy: Mechanisms and Practical Implications, Springer, 2009. ISBN 978-0-387-79402-0), and I have just published a second updated edition of this book in 2021 (*Efimov I.R., Ng F.S., Laughner J.I., Eds., Cardiac Bioelectric Therapy: Mechanisms and Practical Implications, Springer, 2nd Edition. 2021. ISBN 978-3-030-63354-7).*

7. Most of my 260+ peer-reviewed publications focus on the physiological mechanisms of cardiac arrhythmias, its diagnostics and therapy. In collaboration with Professor John A. Rogers, we have developed novel

implantable, interventional, and wearable electronics platform for monitoring cardiac electrophysiology, diagnosis of heart rhythm disorders due to brady- and tachyarrhythmias and antiarrhythmia therapy. Several high impact publications have been published on that subject recently in leading scientific journals of Nature family. For example, our recent paper on novel bioresorbable electronics platform (Choi YS, Yin RT, Pfenniger A, Koo H, Avila R, Lee KB, Chen SW, Lee G, Li G, Qiao Y, Murillo-Berlioz A, Kiss A, Han S, Lee SM, Li C, Xie Z, Chen YY, Burrell A, Geist B, Jeong H, Kim J, Yoon HJ, Banks A, Kang SK, Zhang ZJ, Haney CR, Sahakian AV, Johnson D, Efimova T, Huang Y, Trachiotis GD, Knight BP, Arora RK, Efimov IR, Rogers JA. Fully implantable and bioresorbable cardiac pacemakers without leads or batteries. Nature Biotechnology, June 28, 2021, https://doi.org/10.1038/s41587-021-00948-x.) was featured by over 150 international news outlets reaching at least 12 million listeners/viewers from 5 continents, including PBS, Guardian, and NIH Research Matters (NIH Director's office online publication).

8. I have also delivered 360+ invited lectures at prestigious professional conferences and leading Universities worldwide, most of them on cardiac arrhythmias and therapy.

9. I am currently serving 5-year term as the Editor-in Chief of Cardiovascular Engineering and Technology, journal of Biomedical Engineering

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