UNITED STATES PATENT AND TRADEMARK OFFICE

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BEFORE THE PATENT TRIAL AND APPEAL BOARD

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LSI CORPORATION and AVAGO TECHNOLOGIES U.S., INC.,
Petitioners,

v.

REGENTS OF THE UNIVERSITY OF MINNESOTA,
Patent Owner.

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Case No. IPR2017-01068
Patent No. 5,859,601

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DECLARATION OF STEVEN W. MCLAUGHLIN

I, Steven W. McLaughlin, hereby declare and state, 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. I am over the age of 21 years and I am competent to make this declaration. These statements were made with the knowledge that willful false statements are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code.

Executed this 12 th day of July, 2020 in Atlanta, Georgia

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Steven W. McLaughlin

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1.	I have been retained by counsel for Regents of the University of Minnesota ("UMN") as a technical expert in connection with the *inter partes* review ("IPR") proceeding identified above for U.S. Patent 5,859,601 ("the '601 Patent"). I submit this declaration in support of UMN's response to the petition.

## I.	BACKGROUND AND QUALIFICATIONS

2.	I am and have been a faculty member of the School of Electrical and Computer Engineering ("ECE") at the Georgia Institute of Technology ("Georgia Tech") since 1996. Currently, I am the Steve W. Chaddick chair of the ECE School. I accepted the role of dean of the College of Engineering for Georgia Tech effective September 15, 2017. From 2007 to 2012, I was vice provost for International Initiatives, a position in which I provided oversight and strategic direction for Georgia Tech's global engagement, education, and economic development initiatives. During that time, I also served as the Steven A. Denning Chair in Global Engagement. I was a Ken Byers Professor from 2005 to 2012 and previously was deputy director of Georgia Tech-Lorraine.

3.	I hold a Bachelor of Science in Electrical Engineering from Northwestern University, a Master of Science in Engineering from Princeton University, and a Ph.D. from the University of Michigan.

4.	My research interests include communications and information theory. I have published in the areas of coding and signal processing for wireless

communications, physical layer security, quantum key distribution, and data storage. I was a co-founder of Whisper Communications, which sought to commercialize physical layer security technologies. I have published more than 250 papers and I am a named inventor of approximately 36 patents. Many of my papers and patents deal with coding techniques for optical and magnetic data storage devices. I also was a Principal Scientist for Calimetrics, where I and my team developed coding, signal processing and other technologies for optical disc recording systems such as CD, DVD and BluRay. I have served as the research and thesis advisor to more than 50 students at the bachelor's, master's, doctoral, and postdoctoral levels. I have been awarded: the Chevalier dans l'Ordre National du Mérite (Knight of the National Order of Merit) by the President of the Republic of France in 2011; the National Science Foundation Presidential Early Career Award for Scientists and Engineers ("PECASE"); an NSF Career Award and NSF Research Initiation Award; the Technical Achievement Award from the Information Storage Industries Consortium ("INSIC"); and the Georgia Tech Graduate Student Association "Friend of the Graduate Student Award."
My curriculum vitae is provided as Appendix A hereto.

II.   MATERIALS REVIEWED

5.   I considered information from various sources in forming my opinions in this declaration. In addition to drawing from over two decades of personal

experience in the field of data storage and coding, I have also reviewed the IPR Petition and its Exhibits, including the '601 Patent (Ex. 1001), the Okada patent (Ex. 1007), the Soljanin Declaration (Ex. 1010) and the tables (Ex. 1011). I also reviewed the deposition transcript for Prof. Soljanin (Ex. 2011) and the exhibits used in that deposition, including Exhibits 2007 to 2010. I also reviewed UMN's response filed herewith in detail and I agree with its analysis and conclusions about alleged anticipation by the Okada patent. I also reviewed the contemporaneously filed Declaration from Prof. Jaekyun Moon (Ex. 2016) and agree with the technical descriptions therein about magnetic recording and the operation of MTR codes.

III.   SUMMARY OF THE '601 PATENT

6.   The '601 Patent relates to digital storage systems, and in particular magnetic data storage systems. '601 Patent (Ex. 1001) at col. 1:9-10 ("The present invention relates in general to digital storage systems.") and col. 2:59-61.

A.   HDD Basics

7.   Hard disk drives ("HDDs") are a type of magnetic data storage system. The write head of a combined "read/write" head in the HDD writes data in concentric recording tracks to a circular magnetic disk in the HDD by magnetizing microscopic "bit regions" along the respective tracks on the disk. Later, when the previously-written data are read, the read head reads the data by detecting changes in the magnetic fields emanating from the big regions along a track. The read head

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