

**UNITED STATES PATENT AND TRADEMARK OFFICE**

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**BEFORE THE PATENT TRIAL AND APPEAL BOARD**

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HTC CORPORATION, HTC AMERICA, INC.,  
and APPLE INC.,  
Petitioners,

v.

INVT SPE LLC,  
Patent Owner.

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Case Nos. IPR2018-01555 and IPR2018-01581  
U.S. Patent No. 7,848,439

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**DECLARATION OF ZHI DING, PH.D. IN SUPPORT OF  
PETITIONERS' CONSOLIDATED REPLY TO  
PATENT OWNER'S CONSOLIDATED RESPONSE**

**INTRODUCTION**

1. My name is Zhi Ding. I have been retained as a technical expert on behalf of HTC Corporation and HTC America, Inc. to provide assistance in the above-captioned matter. I understand that HTC Corporation and HTC America, Inc., along with Apple Inc., are the Petitioners in this proceeding. I have no financial interest in or affiliation with the Petitioners or the Patent Owner, which I understand is INVT SPE LLC. My compensation does not depend upon the outcome of, or my testimony in, this *inter partes* review proceeding or any litigation proceedings.

2. I have reviewed each of the following documents in this proceeding:

<b>EXHIBIT</b>	<b>DESCRIPTION</b>
1001	U.S. Patent No. 7,848,439 to She et al. (“the ’439 Patent”)
1002	File History of U.S. Patent No. 7,848,439 to She et al.
1003	U.S. Patent No. 6,904,283 to Li et al. (“Li”)
1004	U.S. Patent No. 7,221,680 to Vijayan et al. (“Vijayan”)
1005	U.S. Patent No. 6,721,569 to Hashem et al. (“Hashem”)
1006	U.S. Patent No. 5,596,604 to Cioffi et al. (“Cioffi”)
1007	Declaration of Zhi Ding, Ph.D.
1008	Curriculum Vitae of Zhi Ding, Ph.D.
1009	U.S. Patent No. 6,167,031 to Olofsson et al. (“Olofsson”)

Ding Declaration re Petitioners' Consolidated Reply  
(IPR2018-01555 and IPR2018-01581)

EXHIBIT	DESCRIPTION
1018	Jacky S. Chow, Jerry C. Tu, and John M. Cioffi, <i>A Discrete Multitone Transceiver System for HDSL Applications</i> , IEEE JOURNAL ON SELECTED AREAS IN COMMUNICATIONS, Vol. 9, No. 6, Pgs. 895-908 (Aug. 1991)
1019	N.M. Maslin, <i>High data rate transmissions over h.f. links</i> , Radio and Electronic Engineer, Vol. 52, No. 2, Pgs. 75-87 (Feb. 1982)
1020	Sections 6.3.10.1, 6.3.17.4 and 8.1.4.1.2.5 from the IEEE 802.16-2004 Standard
1021	Section 3.7 of Erik Dahlman, Stefan Parkvall, and Johan Sköld, 4G LTE/LTE-ADVANCED FOR MOBILE BROADBAND (2011)
1022	Peter S. Chow, John M. Cioffi, and John A.C. Bingham, <i>A Practical Discrete Multitone Transceiver Loading Algorithm for Data Transmission over Spectrally Shaped Channels</i> , IEEE TRANSACTIONS ON COMMUNICATIONS, Vol. 43, No. 2/3/4, Pg. 773 (1995)
1023	Andreas Czylwik, <i>Adaptive OFDM for wideband radio channels</i> , PROCEEDINGS OF 1996 IEEE GLOBAL TELECOMMUNICATIONS CONFERENCE, Vol. 1, pp. 713-718 (1996)
1024	Alexander M. Wyglinski, Fabrice Labeau, and Peter Kabal, <i>An Efficient Bit Allocation Algorithm for Multicarrier Modulation</i> , IEEE WIRELESS COMMUNICATIONS AND NETWORKING CONFERENCE, pp. 1194-1199 (2004) (Ex. 1024), at Pgs. 1194-95.
2001	Expert Declaration of Dr. Branimir Vojcic
2002	Curriculum Vitae of Dr. Branimir Vojcic
2101	Expert Declaration of Dr. Branimir Vojcic in Support of Patent Owner's Response
2102	Curriculum Vitae of Dr. Branimir Vojcic

3. I understand that the application leading to U.S. Patent No. 7,848,439 (“the ’439 Patent”) was U.S. Application No. 11/719,611 filed on May 17, 2007. This application was a national stage filing of PCT/JP2005/021246, filed on November 18, 2005. The PCT application claimed priority to Chinese Application No. 2004 1 0094967, filed on November 19, 2004, which I have been asked to treat as the effective filing or priority date of the ’439 Patent.

### **QUALIFICATIONS AND PROFESSIONAL EXPERIENCE**

4. I presently serve as Professor in the Department of Electrical and Computer Engineering at the University of California, Davis. I have held this position since my appointment on July 1, 2000. I am also a private technical consultant on various technologies related to information systems. I have more than three decades of research experience on a wide range of topics related to data communications and signal processing.

5. I earned my Bachelor of Science degree in 1982, majoring in wireless engineering from the Nanjing Institute of Technology (later renamed as Southeast University) in Nanjing, China. I earned my Master of Science degree in 1987 in electrical engineering from the University of Toronto in Toronto, Canada. I earned my Ph.D. in 1990 in electrical engineering from Cornell University in Ithaca, New York.

6. My responsibilities as Professor at University of California, Davis, include classroom instruction on various topics of communication systems and signal analysis, as well as mentoring undergraduate students and supervising graduate students in their research and development efforts on various topics related to digital communications. I have directly supervised research and development works ranging from signal transmissions and data detection to wireless networking. As the chief academic advisor, I have also directly supervised the completion of over 20 Masters theses and 27 Ph.D. dissertations on various topics related to digital communications and networking. I have served full time as a faculty member at three major research universities in the United States over the past 29 years, including Auburn University from 1990 to 1998, University of Iowa from 1999 to 2000, and University of California, Davis, from 2000 to present.

7. Since 1990, I have been selected as the principal investigator of multiple highly competitive federal and local research grants, including sixteen major research projects supported by the National Science Foundation and two research projects funded by the U.S. Army Research Office. These competitive research projects focused on developing more efficient and effective digital communication transceivers, networks, and signal processing tools. I have also

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