UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

SIRIUS XM RADIO INC.,
Petitioner,

v.

FRAUNHOFER-GESELLSCHAFT ZUR FÖRDERUNG DER ANGEWANDTEN FORSCHUNG E.V.,
Patent Owner.

Case IPR2018-00689
Patent No. 6,993,084

DECLARATION OF DR. MICHAEL L. HONIG IN SUPPORT OF PATENT OWNER'S PRELIMINARY RESPONSE

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I. Introduction

1. My name is Michael L. Honig, Ph.D. I have been asked by Fraunhofer-Gesellschaft zur Förderung der angewandten Forschung E.V. ("Patent Owner") to review the technologies involved in U.S. 6,993,084 (the "'3084 patent"), the Petition for *inter partes* review of the '3084 patent, the expert declaration of Dr. David Lyon, the cited references, and other pertinent facts and opinions regarding IPR2018-00689. My qualifications are summarized below and are addressed more fully in my CV attached as Exhibit 2004.

2. I am a professor in the Department of Electrical and Computer Engineering at Northwestern University. I have held that position since 1994. At Northwestern University, I have taught courses in wireless communications, analog communications, and digital communications, among others. Prior to joining Northwestern University, I worked in the Systems Principles Research Division at Bellcore in Morristown, New Jersey, and at Bell Laboratories in Holmdel, New Jersey.

3. I earned my Bachelor of Science degree in Electrical Engineering from Stanford University in 1977. I earned my Master of Science and Ph.D. degrees in Electrical Engineering from the University of California, Berkeley in 1978 and 1981, respectively. I have held visiting scholar positions at the Naval Research Laboratory (San Diego), the University of California, Berkeley, the

University of Sydney, Princeton University, the Technical University of Munich, and the Chinese University of Hong Kong.

4. For over 25 years I have been involved in wireless communications including the technologies described in the '3084 patent. While at Bellcore, I studied multi-carrier modulation for digital subscriber lines, and wrote several related reports and research papers. While at Northwestern, I managed a project funded by the European Space Agency aimed at integrating satellite links with terrestrial cellular. A large portion of my work has focused on interference management in wireless systems, including those that use OFDM. I was intimately involved in this area during the time of the '3084 patent.

5. My recent research has focused on wireless networks, including interference mitigation and resource allocation, and market mechanisms for dynamic spectrum allocation. I have led several research projects on those topics funded by industry, the National Science Foundation, and the Army Research Office.

6. I have served as editor and guest editor for several journals, and as a member of the Board of Governors for the IEEE Information Theory Society. I am a Fellow of IEEE, the recipient of a Humboldt Research Award for Senior U.S. Scientists, and a co-recipient of the 2002 IEEE Communications and Information Theory Society paper award. Further details regarding my education and

background can be found in my CV.

7. For the purpose of this declaration, I apply the same skill level as proposed in the Petition, although I reserve the right to explain why this level is too high. I am being compensated for my work on this case at a fixed, hourly rate of $500, plus reimbursement for expenses. My compensation does not depend on the outcome of this case or any issue in it, and I have no interest in this proceeding.

II. Summary of Opinions

8. I have studied the Petition for *inter partes* review of U.S. Patent No. 6,993,084, the expert declaration of Dr. David Lyon, and the cited references submitted with the Petition. Based on my analysis, it is my opinion that the primary reference relied upon in the Petition, Cimini (Ex. 1003) fails to disclose, teach, or suggest limitations of claims 1-3, 6-12, and 14-21 of the '3084 patent.

III. Summary of the '3084 Patent

9. U.S. Patent No. 6,993,084 is entitled "Coarse Frequency Synchronisation in Multicarrier Systems." I will refer to this patent as the "'3084 patent." The '3084 patent relates to a method and apparatus for providing frame synchronization in multi-carrier modulation ("MCM") systems in the presence of frequency offsets. The '3084 patent discloses, among other things, a method and apparatus for frame synchronization of a signal having a frame structure that contains a reference symbol having an amplitude modulated bit sequence, and

where the reference symbol includes a real part and an imaginary part that are equal. The methods and apparatuses of the present invention overcome some of the problems and complexities related to frame synchronization in prior art MCM systems.

IV. Brief Description of Cimini (Ex. 1003)

10. The primary reference for all Grounds in the Petition is U.S. Patent No. 5,914,933, entitled "Clustered OFDM Communication System." I will refer to this reference as "Cimini" or Exhibit 1003. Cimini discloses a method for dividing a block of data symbols into clusters, where each cluster of data symbols generates an independent OFDM signal. The Cimini patent is concerned with mitigating the peak-to-average power problem in OFDM, and combining OFDM with spatial diversity, given multiple antennas at the transmitter. Cimini does not disclose or provide any teaching for frame synchronization using a reference symbol that is generated by performing an amplitude modulation of a bit sequence. Cimini is similarly devoid of any disclosure or teaching of using a reference symbol that has a real part and an imaginary part that are equal.

V. Cimini, Alone or in Combination, Does Not Anticipate or Make Obvious the Challenged Claims

11. I have reviewed and analyzed both the Petition's and Dr. Lyon's declaration regarding the disclosure and teaching of Cimini related to the claim of

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