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1. I, John Moring, hereby declare:

2. I have personal knowledge of the facts set forth herein, and if called as a witness in a legal proceeding in the United States, or elsewhere, could and would testify competently thereto. All statements made herein on my personal knowledge are true, and those statements made on information and belief are believed to be true.

3. I have been asked to address and offer opinions on the technology claimed in U.S. Patent No. 8,131,391B2, specifically in claims 1, 2, 3, 4, 5, 6, and 10 ("challenged claims") and the prior-art technology disclosed in U.S. Patent No. 6,563,892 and the 1998 paper by Haartsen and a 2000 paper by G. B. Giannakis, et al. (See section I for a list of references).

4. I am being compensated at my customary hourly rate for the time spent on developing, forming, and expressing the facts and opinions in this declaration. I have no personal interest in the ultimate outcome of any related proceedings.

I. Materials considered

5. In the course of developing this declaration, I examined the following materials.

- U.S. Patent No. 8,131,391B2 ("the '391 patent");
- Excerpts from the '391 patent file history, including file histories of its parent applications such as Appl. No.: 10/648,012 ("the 2003 application"), Application No. 13/356,949 ("the 2012 application");
- Order No. 12 Construing Terms of the Asserted Patents, Inv. No. 337-TA-943, July 24, 2015 ("ITC claim constructions");
- Decision on Appeal from the United States International Trade Commission in Investigation No. 337-TA-943, June 12, 2017 ("Federal Circuit Opinion")
- U.S. Patent No. 6,563,892 to Haartsen et al. ("the '892 patent" or "the Haartsen patent");

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- Haartsen, J., "Bluetooth—The Universal Radio Interface for Ad Hoc, Wireless Connectivity", Ericsson Review, Telecommunications Technology Journal No. 3, 1998, pp. 110–117 ("the 1998 Haartsen paper");

The two preceding items together comprise "the Haartsen reference."

- Haartsen, J., "The Bluetooth Radio System", IEEE Personal Communications, February 2000 ("the 2000 Haartsen paper");
- Giannakis, G. B., et al., "Load-Adaptive MUI/ISI-Resilient Generalized Multi-Carrier CDMA with Linear and DF Receivers," European Transactions on Telecommunications, Volume 11, Issue 6, pages 527–537; November–December 2000 ("the Giannakis paper");
- Zhou, S., et al., "Frequency-Hopped Generalized Multicarrier CDMA for Multipath and Interference Suppression," MILCOM 2000 Proceedings, October 2000 ("the Zhou paper");
- U.S. Patent No. 5,530,929 to Lindqvist et al.

6. The 1998 Haartsen paper is explicitly mentioned and incorporated by reference in its entirety in the Haartsen patent (collectively, "the Haartsen reference"):

> "Readers interested in various details regarding the Bluetooth technology are referred to the article entitled "BLUETOOTH—The universal radio interface for ad hoc, wireless connectivity" authored by Jaap Haartsen and found in the Ericsson Review, Telecommunications Technology Journal No. 3, 1998, the disclosure of which is incorporated here by reference." ('892 patent at 2:23-29).

7. The Giannakis paper discloses a design for performance improvement in CDMA transmitters and receivers, specifically applicable to "Bluetooth-like" networking, including both reduced intersymbol interference coding and bit error rate (BER) improvement through interleaving/de-interleaving.

8. These references, and the ways they describe the technology disclosed in the challenged claims of the '391 patent, are discussed in subsequent sections of this paper.

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II. Expert background

9. I earned my Bachelor of Science degree in Electrical Engineering in 1981 from the University of Cincinnati, with specialization in computers and communications. I earned my Master of Science degree in Electrical Engineering in 1983 from the University of Southern California (as a Hughes Fellow), with specialization in communications and signal processing. I have worked in the field continuously since 1981.

10. In the early 1980s, I developed and simulated algorithms for advanced portable military wireless networks at Hughes Aircraft. In the late 1980s, I developed and fielded Internet hardware and applications for military use while at TRW. In the early 1990s, I developed standards and products for dynamic management of satellite communication systems at Titan Linkabit. In the mid-1990s, I contributed to the first cellular Internet products, and related projects at Pacific Communication Sciences, Inc.

11. Since 1997 I have consulted in the field full time. Projects are too numerous to list, but include working with wireless location technologies from the late 1990s, including designing and overseeing some of the first field trials of handset location technologies (including GPS) for cellular carriers, and contributing to the standards that described operation of that equipment. I have worked a number of projects involving Bluetooth technology, notably consulting to the Bluetooth Special Interest Group continuously from 2000 through 2007. In this role I supported the qualification and testing efforts and reviewed the specifications released in this period.

12. My current projects include authoring standards for, and otherwise supporting development of, wireless communications for future intelligent highway deployments.

13. I have taught communications courses for the University of Wisconsin-Madison and the University of California-San Diego. I have presented at major technical conferences and contributed to texts in the field. I have four US patents granted in my name, with others pending in the US and internationally. Please see Attachment 2 for a complete CV.

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