

UNITED STATES PATENT AND TRADEMARK OFFICE

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BEFORE THE PATENT TRIAL AND APPEAL BOARD

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**Intel Corporation**  
Petitioner

v.

**Qualcomm Incorporated**  
Patent Owner

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Case IPR2018-01154  
Patent 8,698,558

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**DECLARATION OF DR. ARTHUR W. KELLEY**

I declare that all statements made herein on my own knowledge are true and that all statements made on information and belief are believed to be true, and further, that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code.

By:

Arthur W. Kelley 4/15/2019

Arthur W. Kelley, Ph.D.

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1. I am making this declaration at the request of Qualcomm Incorporated (“Qualcomm” or “Patent Owner”) in the matter of the *Inter Partes* Review of U.S. Patent No. 8,698,558 (“the ’558 Patent”).

2. I am being compensated for my work in this matter at my standard hourly rate of \$450 for consulting services. My compensation in no way depends on the outcome of this proceeding.

3. In preparing this Declaration, I considered the following materials:

- a. The ’558 Patent (Ex. 1201) and its file history (Ex. 1202);
- b. Petition for *Inter Partes* Review of U.S. Patent No. 8,698,558, IPR2018-01154 (Paper 3) (“Petition” or “Paper 3”);
- c. The Declaration of Dr. Alyssa B. Apsel (Ex. 1203);
- d. Chu, W.Y., *et al.*, “*A 10 MHz Bandwidth, 2 mV Ripple PA Regulator for CDMA Transmitters,*” *IEEE Journal of Solid-State Circuits*: 2809-2819 (2008) (“Chu”) (Ex. 1204);
- e. Choi, J., *et al.*, “*Envelope tracking power amplifier robust to battery depletion,*” *Microwave Symposium Digest (MTT), 2010 IEEE MTT-S International*: 1332-36 (2010) (“Choi 2010”) (Ex. 1206);
- f. Blanken, P.G. *et al.*, “*A 50MHz Bandwidth Multi-Mode PA Supply Modulator for GSM, EDGE and UMTS Application,*” *2008 Radio Frequency Integrated Circuits Symposium (IEEE)* 401-04 (2008) (“Blanken”) (Ex. 1210);
- g. Kwak, T.W., *et al.*, “*A 2 W CMOS hybrid switching amplitude modulator for EDGE polar transmitters,*” *IEEE Journal of Solid-State Circuits* 2666-76 (2007) (“Kwak”) (Ex. 1211);

- h. U.S. Patent No. 5,929,702, “Method and Apparatus for High Efficiency High Dynamic Range Power Amplification,” to Myers, *et al.* (“Myers”) (Ex. 1212);
- i. Kim, D. *et al.*, “*High Efficiency and Wideband Envelope Tracking Power Amplifier with Sweet Spot Tracking*,” Radio Frequency Integrated Circuits Symposium (RFIC): 255-258 (2010) (“Kim”) (Ex. 1213);
- j. U.S. Patent No. 6,300,826, “Apparatus and Method for Efficiently Amplifying Wideband Envelope Signals,” to Mathe, *et al.* (“Mathe”) (Ex. 1214);
- k. Maxim Integrated Products, Inc., *MAX9738 – 16VP-P Class G Amplifier with Inverting Boost Converter*, Datasheet 19-3700, Rev. 0 (March 2008) (“Maxim”) (Ex. 1215);
- l. Ertl *et al.*, “*Basic considerations and topologies of switched-mode assisted linear power amplifiers*,” IEEE Transactions On Industrial Electronics, Vol. 44, No. 1 at 116-123 (1997) (“Ertl”) (Ex. 1216);
- m. Kang, D. *et al.*, “*A Multimode/Multiband Power Amplifier With a Boosted Supply Modulator*,” IEEE Transactions on Microwave Theory and Techniques 58.10 (2010): 2598-2608 (“Kang”) (Ex. 1217);
- n. U.S. Patent No. 5,834,977, “Amplifying Circuit with Power Supply Switching Circuit,” to Maehara, *et al.* (“Maehara”) (Ex. 1218);
- o. U.S. Patent No. 5,870,340, “Multiplexer,” to Ohsawa (“Ohsawa”) (Ex. 1219);
- p. U.S. Patent No. 6,566,935, “Power Supply Circuit With a Voltage,” to Renous (“Renous”) (Ex. 1220);
- q. Certificate of Correction for the ’558 Patent (Ex. 1221);

- r. Qualcomm Initial Claim Construction Brief, *Certain Mobile Electronic Devices and Radio Frequency and Processing Components Thereof*, Investigation No. 337-TA-1065 (“Qualcomm Brief”) (Ex. 1222);
- s. Order No. 28: Construing Terms of the Asserted Patents, *Certain Mobile Electronic Devices and Radio Frequency and Processing Components Thereof*, Investigation No. 337-TA-1065 (“Markman Order”) (Ex. 1223);
- t. Razavi, Behzad, “*Design of Analog CMOS Integrated Circuits*,” Excerpts from pgs. 21-22, 28, 47-49, 254-257 (Ex. 1224).

## **I. PROFESSIONAL BACKGROUND**

4. I am an electrical and computer engineering consultant with over 35 years of expertise and experience consulting on semiconductor technologies, including power management integrated circuits. I have provided my opinions and/or testimony as an expert witness in topics relating to power electronics in matters before the International Trade Commission, U.S. district courts, and the U.S. Patent Trial and Appeals Board.

5. I earned bachelor’s (summa cum laude), master’s, and Ph.D. degrees in Electrical Engineering from Duke University. I received my Ph.D. degree in 1984.

6. From 1985 to 1987, I worked as a senior engineer at Sundstrand Corporation, where I worked on power electronics in the aerospace applications field, including commercial aircraft, military aircraft, and spacecraft.

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