

DOCKET NO.: 0107131-00573US2

Filed on behalf of Intel Corporation

By: David L. Cavanaugh, Reg. No. 36,476
John V. Hobgood, Reg. No. 61,540
Benjamin S. Fernandez, Reg. No. 55,172
Wilmer Cutler Pickering Hale and Dorr LLP
1875 Pennsylvania Ave., NW
Washington, DC 20006
Tel: (202) 663-6000
Email: David.Cavanaugh@wilmerhale.com
John.Hobgood@wilmerhale.com
Ben.Fernandez@wilmerhale.com

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

INTEL CORPORATION
Petitioner

v.

QUALCOMM INCORPORATED
Patent Owner

Case IPR2019-00048

DECLARATION OF PATRICK FAY, PH.D.
U.S. PATENT NO. 9,154,356
CLAIMS 1, 9, 10, 17, and 18

TABLE OF CONTENTS

	Page
I. INTRODUCTION	1
II. UNDERSTANDING OF THE LAW	4
III. BACKGROUND TECHNOLOGY.....	10
A. Basic Receiver Front End.....	11
B. Low Noise Amplifiers	16
1. Cascode Configuration.....	17
C. Carrier Aggregation.....	18
D. Optional Receiver Circuits	22
1. Impedance Matching Circuits	23
2. Feedback Circuit	25
3. Attenuation Circuit.....	26
4. Inductors.....	27
IV. OVERVIEW OF THE '356 PATENT	28
A. Independent Claim 1	28
B. Independent Claim 17	33
V. LEVEL OF ORDINARY SKILL IN THE ART	33
VI. CLAIM CONSTRUCTION	34
A. “carrier aggregation”	34
VII. SUMMARY OF THE PRIOR ART REFERENCES.....	36
A. <i>A Scalable 6-to-18 GHz Concurrent Dual-Band Quad-Beam Phased-Array Receiver in CMOS</i> (“Jeon”).....	36
B. U.S. Patent Publication No. 2010/0237947 A1 (“Xiong”)	38
C. 3GPP TR 36.912 Feasibility study for Further Advancements for E-UTRA (LTE-Advanced) (Release 9) (“Feasibility Study”).....	41

D.	<i>Digitally-Controlled RF Passive Attenuator in 65 nm CMOS for Mobile TV Tuner ICs (“Youssef”)</i>	42
VIII.	SUMMARY OF CONCLUSIONS	45
IX.	INVALIDITY OF THE CHALLENGED CLAIMS.....	45
A.	Ground I: Claims 1 and 17-18 Are Obvious Over Jeon in View of Xiong.....	45
1.	Claim 1	45
2.	Claim 17	68
3.	Claim 18.....	70
B.	Ground II: Claims 9 and 10 Are Obvious Over Jeon In View of Xiong and Youssef.....	96
1.	Claim 9.....	96
2.	Claim 10.....	100
C.	Ground III: Claims 1 and 17-18 Are Obvious Over Jeon in View of Xiong and the Feasibility Study.....	106
D.	Ground IV: Claims 9 and 10 Are Obvious Over Jeon In View of Xiong, the Feasibility Study, and Youssef.....	112
1.	Claim 9.....	114
2.	Claim 10.....	114
X.	AVAILABILITY FOR CROSS-EXAMINATION	115
XI.	RIGHT TO SUPPLEMENT.....	116
XII.	JURAT	116

I. INTRODUCTION

1. My name is Patrick Fay.

2. I am a Professor with tenure in the Department of Electrical Engineering at the University of Notre Dame. I earned a Bachelor of Science in Electrical Engineering from the University of Notre Dame in 1991, a Master of Science in Electrical Engineering from the University of Illinois at Urbana-Champaign in 1993, and a Doctorate (Ph.D.) degree in Electrical Engineering from the University of Illinois at Urbana-Champaign in 1996.

3. I have approximately 22 years of experience in the field of electrical engineering, with particular experience in the field of RF transceivers, RF front ends, and related components. I have been the Director of the Notre Dame Nanofabrication Facility since 2003 and established the High-Speed Circuits and Devices Laboratory at Notre Dame in 1998.

4. For example, I have worked and published extensively on high-frequency devices suitable for use in low noise amplifiers, mixers, and oscillators, all of which are fundamental components of RF receivers and RF front ends. I have also published on compact models needed to design circuits with these devices, as well as benchmarking studies comparing these technologies to current approaches.

5. I have taught graduate and undergraduate level courses at the University of Illinois and at Notre Dame in electrical engineering, semiconductor devices, circuit design, and microwave circuit design. I regularly teach courses in analog circuit design. I developed and teach a course on RF and Microwave Circuits for Wireless Communications that combines classwork as well as laboratory measurements and design, with a focus on RF receivers. For these efforts, I was awarded the College of Engineering's Outstanding Teacher Award in 2015.

6. I have authored or co-authored more than 150 peer-reviewed technical publications, more than 160 conference presentations, and have 9 U.S. patents, with others pending, in the areas of inter-chip communication, semiconductor devices for low-power applications, and semiconductor devices for high-frequency applications. My resume includes a sample list of these publications.

7. I was named fellow of the Institute of Electrical and Electronics Engineer (IEEE) in 2016, which is the highest grade of membership conferred by the IEEE Board of Directors on an individual member.

8. In my time as a faculty member at Notre Dame, I have received grants to support research in device technologies suitable for high-performance RF applications. This work has been supported by the Office of Naval Research

Explore Litigation Insights

Docket Alarm provides insights to develop a more informed litigation strategy and the peace of mind of knowing you're on top of things.

Real-Time Litigation Alerts



Keep your litigation team up-to-date with **real-time alerts** and advanced team management tools built for the enterprise, all while greatly reducing PACER spend.

Our comprehensive service means we can handle Federal, State, and Administrative courts across the country.

Advanced Docket Research



With over 230 million records, Docket Alarm's cloud-native docket research platform finds what other services can't. Coverage includes Federal, State, plus PTAB, TTAB, ITC and NLRB decisions, all in one place.

Identify arguments that have been successful in the past with full text, pinpoint searching. Link to case law cited within any court document via Fastcase.

Analytics At Your Fingertips



Learn what happened the last time a particular judge, opposing counsel or company faced cases similar to yours.

Advanced out-of-the-box PTAB and TTAB analytics are always at your fingertips.

API

Docket Alarm offers a powerful API (application programming interface) to developers that want to integrate case filings into their apps.

LAW FIRMS

Build custom dashboards for your attorneys and clients with live data direct from the court.

Automate many repetitive legal tasks like conflict checks, document management, and marketing.

FINANCIAL INSTITUTIONS

Litigation and bankruptcy checks for companies and debtors.

E-DISCOVERY AND LEGAL VENDORS

Sync your system to PACER to automate legal marketing.