

## PATENT ASSIGNMENT COVER SHEET

Electronic Version v1.1  
Stylesheet Version v1.2

EPAS ID: PAT7741701

<b>SUBMISSION TYPE:</b>	NEW ASSIGNMENT
<b>NATURE OF CONVEYANCE:</b>	ASSIGNMENT
<b>CONVEYING PARTY DATA</b>	
<b>Name</b>	<b>Execution Date</b>
NEWRACOM INC.	02/19/2021
<b>RECEIVING PARTY DATA</b>	
<b>Name:</b>	ATLAS GLOBAL TECHNOLOGIES LLC
<b>Street Address:</b>	6136 FRISCO SQUARE BOULEVARD
<b>Internal Address:</b>	SUITE 400
<b>City:</b>	FRISCO
<b>State/Country:</b>	TEXAS
<b>Postal Code:</b>	75034
<b>PROPERTY NUMBERS Total: 1</b>	
<b>Property Type</b>	<b>Number</b>
<b>Application Number:</b>	18154254
<b>CORRESPONDENCE DATA</b>	
<b>Fax Number:</b>	
<i>Correspondence will be sent to the e-mail address first; if that is unsuccessful, it will be sent using a fax number, if provided; if that is unsuccessful, it will be sent via US Mail.</i>	
<b>Phone:</b>	9494808359
<b>Email:</b>	ewooley@acaciares.com
<b>Correspondent Name:</b>	EVAN W. WOOLEY
<b>Address Line 1:</b>	4 PARK PLAZA
<b>Address Line 2:</b>	SUITE 550
<b>Address Line 4:</b>	IRVINE, CALIFORNIA 92614
<b>ATTORNEY DOCKET NUMBER:</b>	AGP0021 US
<b>NAME OF SUBMITTER:</b>	THOMAS J. LAVAN
<b>SIGNATURE:</b>	/Thomas J. Lavan/
<b>DATE SIGNED:</b>	01/13/2023
<b>Total Attachments: 46</b>	
source=Assignment2_AGP0021_US_021921#page1.tif	
source=Assignment2_AGP0021_US_021921#page2.tif	
source=Assignment2_AGP0021_US_021921#page3.tif	
source=Assignment2_AGP0021_US_021921#page4.tif	

source=Assignment2\_AGP0021\_US\_021921#page5.tif  
source=Assignment2\_AGP0021\_US\_021921#page6.tif  
source=Assignment2\_AGP0021\_US\_021921#page7.tif  
source=Assignment2\_AGP0021\_US\_021921#page8.tif  
source=Assignment2\_AGP0021\_US\_021921#page9.tif  
source=Assignment2\_AGP0021\_US\_021921#page10.tif  
source=Assignment2\_AGP0021\_US\_021921#page11.tif  
source=Assignment2\_AGP0021\_US\_021921#page12.tif  
source=Assignment2\_AGP0021\_US\_021921#page13.tif  
source=Assignment2\_AGP0021\_US\_021921#page14.tif  
source=Assignment2\_AGP0021\_US\_021921#page15.tif  
source=Assignment2\_AGP0021\_US\_021921#page16.tif  
source=Assignment2\_AGP0021\_US\_021921#page17.tif  
source=Assignment2\_AGP0021\_US\_021921#page18.tif  
source=Assignment2\_AGP0021\_US\_021921#page19.tif  
source=Assignment2\_AGP0021\_US\_021921#page20.tif  
source=Assignment2\_AGP0021\_US\_021921#page21.tif  
source=Assignment2\_AGP0021\_US\_021921#page22.tif  
source=Assignment2\_AGP0021\_US\_021921#page23.tif  
source=Assignment2\_AGP0021\_US\_021921#page24.tif  
source=Assignment2\_AGP0021\_US\_021921#page25.tif  
source=Assignment2\_AGP0021\_US\_021921#page26.tif  
source=Assignment2\_AGP0021\_US\_021921#page27.tif  
source=Assignment2\_AGP0021\_US\_021921#page28.tif  
source=Assignment2\_AGP0021\_US\_021921#page29.tif  
source=Assignment2\_AGP0021\_US\_021921#page30.tif  
source=Assignment2\_AGP0021\_US\_021921#page31.tif  
source=Assignment2\_AGP0021\_US\_021921#page32.tif  
source=Assignment2\_AGP0021\_US\_021921#page33.tif  
source=Assignment2\_AGP0021\_US\_021921#page34.tif  
source=Assignment2\_AGP0021\_US\_021921#page35.tif  
source=Assignment2\_AGP0021\_US\_021921#page36.tif  
source=Assignment2\_AGP0021\_US\_021921#page37.tif  
source=Assignment2\_AGP0021\_US\_021921#page38.tif  
source=Assignment2\_AGP0021\_US\_021921#page39.tif  
source=Assignment2\_AGP0021\_US\_021921#page40.tif  
source=Assignment2\_AGP0021\_US\_021921#page41.tif  
source=Assignment2\_AGP0021\_US\_021921#page42.tif  
source=Assignment2\_AGP0021\_US\_021921#page43.tif  
source=Assignment2\_AGP0021\_US\_021921#page44.tif  
source=Assignment2\_AGP0021\_US\_021921#page45.tif  
source=Assignment2\_AGP0021\_US\_021921#page46.tif

## ASSIGNMENT

**WHEREAS, NEWRACOM, INC.**, a Delaware corporation, having a place of business at 25361 Commercentre Dr. Suite #200 Lake Forest, CA 92630 (hereafter, together with any successors, legal representatives or assigns thereof, called "Assignor") is the owner of the entire right, title, and interest and assignee of **the patent matters listed on Exhibit A;**

**AND WHEREAS, ATLAS GLOBAL TECHNOLOGIES LLC**, a Texas limited liability company having a place of business at 6136 Frisco Square Blvd., Suite 400, Frisco, TX 75034 (hereafter, together with any successors, legal representatives or assigns thereof, called "ASSIGNEE") wants to acquire the entire right, title and interest in and to **the patent matters listed on Exhibit A**, and all the inventions therein, and Assignor is willing to enter into such assignment.

**NOW, THEREFORE**, effective on February 19, 2021 and in consideration of good and valuable consideration the receipt of which from ASSIGNEE is hereby acknowledged, Assignor has sold, assigned, transferred and set over, and does hereby sell, assign, transfer and set over to ASSIGNEE the entire right, title and interest in and to **the patent matters listed on Exhibit A**, and all patents, patent applications, foreign patents, foreign patent applications, continuations, continuations-in-part, divisionals, extensions, renewals, reissues and re-examinations related to all inventions thereof, including without limitation, all rights to claim priority on the basis thereof, all rights to sue for past, present and future infringement, including the right to collect and receive any damages, royalties, or settlements for such infringements, all rights to sue for injunctive or other equitable relief, and any and all causes of action relating to any of the inventions or discoveries thereof;

**Assignor** hereby covenants that it has full right to convey the entire interest herein assigned, and that it has not executed, and will not execute, any agreement in conflict with this Assignment;

**Assignor** hereby further covenants and agrees that it will communicate to ASSIGNEE any and all facts known to it respecting said patents, and testify in any legal proceeding, sign all lawful papers, execute and deliver all papers and take any actions that may be necessary or desirable to perfect the title to any aforementioned patents and inventions, execute all divisional, continuation, reexamination, reissue and substitute applications, and make all rightful oaths and generally do everything possible to aid ASSIGNEE to obtain and enforce proper patent protection for said inventions in all countries.

**FOR USPTO RECORDING**

**PATENT  
REEL: 064920 FRAME: 0944**

IN TESTIMONY WHEREOF, I hereunto set my hand this 19<sup>th</sup> day of February, 2021.

Neuracom, Inc.  
(Assignor)

By Sokkyulee  
Name SOK KYU LEE  
Title CEO

**CALIFORNIA ALL-PURPOSE ACKNOWLEDGMENT**

**CIVIL CODE § 1189**

A notary public or other officer completing this certificate verifies only the identity of the individual who signed the document to which this certificate is attached, and not the truthfulness, accuracy, or validity of that document.

State of California )  
County of Orange )

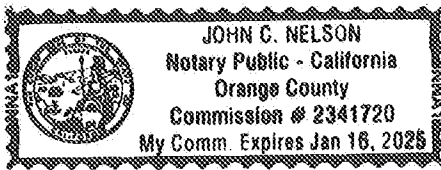
On February 19, 2021 before me, John C. Nelson, Notary Public  
Date Here Insert Name and Title of the Officer

personally appeared Sok Kyu Lee  
Name(s) of Signer(s)

who proved to me on the basis of satisfactory evidence to be the person(s) whose name(s) is/are subscribed to the within instrument and acknowledged to me that he/she/they executed the same in his/her/their authorized capacity(ies), and that by his/her/their signature(s) on the instrument the person(s), or the entity upon behalf of which the person(s) acted, executed the instrument.

I certify under PENALTY OF PERJURY under the laws of the State of California that the foregoing paragraph is true and correct.

WITNESS my hand and official seal.



Signature [Handwritten Signature]  
Signature of Notary Public

Exhibit A

Patent No.	Country	Title of Invention	Filing Date	Application No.	Issue date
	US	HEW OFDMA	3/20/2014	61/968,309	
	US	HEW OFDMA ACK PROCESSOR	4/18/2014	61/981,427	
	KR	METHOD FOR TRANSMITTING AND RECEIVING DATA IN WIRELESS LOCAL AREA NETWORK AND APPARATUS FOR THE SAME	12/18/2014	10-2014-0183466	
	KR	METHOD FOR TRANSMITTING AND RECEIVING DATA IN WIRELESS LOCAL AREA NETWORK AND APPARATUS FOR THE SAME	1/14/2015	10-2015-0006890	
9,712,362	US	Method for transmitting and receiving data in wireless local area network and apparatus for the same	3/20/2015	14/664,690	7/18/2017
10,075,316	US	Method for transmitting and receiving data in wireless local area network and apparatus for the same	6/14/2017	15/623,090	9/11/2018
	US	UL MU-MIMO	4/4/2014	61/975,622	
	KR	UL MU-MIMO	4/2/2015	10-2015-0047098	
9,825,738	US	Acknowledgement method and multi user transmission method	4/3/2015	14/678,724	11/21/2017
	US	Dynamic CCA	4/9/2014	61/977,523	
	KR	Dynamic CCA	4/8/2015	10-2015-0049394	
	US	Operation method of station based on station density in wireless local area network	4/9/2015	14/682,787	
	US	Legacy decodable format	4/11/2014	61/978,776	
	KR	Legacy decodable format	4/2/2015	10-2015-0047099	
9,712,342	US	Frame transmitting method and frame receiving method	4/10/2015	14/684,117	7/18/2017
10,326,618	US	Frame transmitting method and frame receiving method	6/19/2017	15/626,966	6/18/2019
	US	Low power	4/15/2014	61/979,924	
	KR	METHOD FOR LOW POWER COMMUNICATION IN WIRELESS LOCAL AREA NETWORK AND APPARATUS FOR THE SAME	10/31/2014	10-2014-0150292	
	US	Method for low-power communications in wireless local area network and apparatus for the same	4/8/2015	14/682,034	
	US	Unitary analog channel feedback	4/15/2014	61/979,929	
	KR	METHOD FOR BEAMFORMING FEEDBACK BY WIRELESS LOCAL AREA NETWORK DEVICE	4/1/2015	10-2015-0046388	
	US	HEW CCA	4/25/2014	61/984,641	
	KR	HEW CCA	8/18/2014	10-2014-0106840	
9,860,917	US	Method and apparatus for transmitting and receiving frame	4/24/2015	14/695,744	1/2/2018
	US	HEW signaling on legacy frames	4/28/2014	61/985,409	
	US	HEW signaling on legacy frames	12/5/2014	62/088,450	
	KR	HEW signaling on legacy frames	4/7/2015	10-2015-0049155	
9,609,090	US	Signaling method	4/24/2015	14/695,907	3/28/2017
	US	HEW autodetection	4/28/2014	61/985,413	
	KR	METHOD AND APPARATUS FOR TRANSMITTING FRAME, AND METHOD AND APPARATUS FOR DETECTING TRANSMISSION MODE	8/27/2014	10-2014-0112613	
	KR	METHOD FOR TRANSMITTING FRAME AND METHOD FOR DETECTING TRANSMISSION MODE	2/9/2015	10-2015-0019650	

9,716,606	US	Method for transmitting frame and method for detecting transmission mode	4/20/2015	14/691,307	7/25/2017
	US	WLAN downlink using OFDMA	4/29/2014	61/985,981	
	KR	WLAN downlink using OFDMA	4/21/2015	10-2015-0055779	
9,344,221	US	Interleaving and deinterleaving method	4/29/2015	14/700,031	5/17/2016
	US	Narrow Band OFDMA & Half Subcarrier Spacing Transmission	5/9/2014	61/991,396	
	US	Method and apparatus for narrow band reduced subcarrier spacing OFDMA transmission	11/19/2014	62/081,952	
	KR	High Efficiency Narrow Band Reduced Subcarrier Spacing OFDMA Numerology	3/16/2015	10-2015-0036222	
	KR	HIGH EFFICIENCY NARROW BAND REDUCED SUBCARRIER SPACING TONE ALLOCATION	4/6/2015	10-2015-0048209	
	KR	Method and apparatus for narrow band reduced subcarrier spacing OFDMA transmission	5/8/2015	10-2015-0064500	
10,057,899	US	Method for transmitting and receiving frame	5/8/2015	14/708,030	8/21/2018
10,904,878	US	Method for transmitting and receiving frame	7/19/2018	16/039,675	1/26/2021
	KR	CCA level adjustment in WLAN	6/10/2014	10-2014-0070336	
	KR	CCA level adjustment in WLAN	6/9/2015	10-2015-0081311	
9,769,746	US	Operation method of station in wireless local area network	6/10/2015	14/736,068	9/19/2017
	US	Destination Selective Delaying for Short time Power Save	6/25/2014	62/017,122	
	KR	METHOD AND APPARATUS FOR DEFERRING TRANSMISSION	9/3/2014	10-2014-0117058	
	US	Method and apparatus for deferring transmission	6/24/2015	14/749,093	
	KR	Efficient frequency reuse in WLAN	7/4/2014	10-2014-0083751	
	KR	Efficient frequency reuse in WLAN(2)	10/10/2014	10-2014-0136898	
	KR	Efficient frequency reuse in WLAN	7/2/2015	10-2015-0094584	
10,085,258	US	Frame transmitting method and frame receiving method	7/2/2015	14/790,809	9/25/2018
	KR	WLAN segment parsing	7/14/2014	10-2014-0088363	
	KR	OPERATION METHOD OF DEVICE IN WIRELESS LOCAL AREA NETWORK	6/12/2015	10-2015-0083361	
	US	Outdoor PHY for HEW	7/16/2014	62/025,340	
	KR	Outdoor PHY for HEW	7/15/2015	10-2015-0100376	
9,647,816	US	Wireless local area network communications with varying subcarrier spacings	7/16/2015	14/801,311	5/9/2017
	US	Opportunistic OFDMA transmission using Modified NAV	7/16/2014	62/025,343	
	KR	TRANSMISSION METHOD	2/10/2015	10-2015-0020341	
9,698,947	US	Transmission method	6/29/2015	14/753,582	7/4/2017
9,954,656	US	Transmission method	6/2/2017	15/612,883	4/24/2018
10,205,566	US	Transmission method	3/13/2018	15/920,267	2/12/2019
	KR	Wireless LAN and Bluetooth Coexistence Control	7/24/2014	10-2014-0094135	
	KR	METHOD FOR TRANSMITTING AND RECEIVING FRAME IN WIRELESS LOCAL AREA NETWORK AND APPARATUS FOR THE SAME	6/3/2015	10-2015-0078359	
	KR	WLAN NAV update method	7/30/2014	10-2014-0097312	
	KR	WLAN NAV update method	6/16/2015	10-2015-0084899	
9,781,742	US	Method for transmitting and receiving frame in wireless local area network and apparatus for the same	7/30/2015	14/814,276	10/3/2017

10,433,336	US	Method for transmitting and receiving frame in wireless local area network and apparatus for the same	9/1/2017	15/694,513	10/1/2019
	US	System and method for multi-user simultaneous transmission	8/1/2014	62/032,447	
	US	Efficient and Robust Protection Mechanism for Multiuser transmission	9/30/2014	62/057,829	
	PCT	Systems and methods for multi-user simultaneous transmissions	8/3/2015	PCT/US15/43502	
9,408,184	US	Systems and methods for multi-user simultaneous transmissions	8/14/2015	14/827,224	8/2/2016
9,622,267	US	Systems and methods for multi-user simultaneous transmissions	6/27/2016	15/193,368	4/11/2017
AU2015295989	AU	Systems and methods for multi-user simultaneous transmissions	1/5/2017	AU2015295989	4/4/2019
	IN	Systems and methods for multi-user simultaneous transmissions	2/20/2017	IN201747005930	
	KR	WLAN signal field	8/8/2014	10-2014-0102165	
	KR	SIGNALING METHOD	6/1/2015	10-2015-0077542	
	US	System and method for wireless channel assessment	8/19/2014	62/039,350	
	US	System and method for wireless channel assessment	10/28/2014	62/069,659	
9,571,257	US	System and method for wireless channel assessment	8/11/2015	14/824,043	2/14/2017
	KR	METHOD FOR DYNAMIC MODULATION AND FRAME CONFIGURATION BASED ON BANDWIDTH	8/28/2014	10-2014-0113391	
	KR	METHOD FOR DYNAMIC MODULATION AND FRAME CONFIGURATION BASED ON BANDWIDTH	8/27/2015	10-2015-0120912	
	PCT	FRAME TRANSMITTING METHOD AND FRAME RECEIVING METHOD	8/27/2015	PCT/US15/47304	
9,553,699	US	Frame transmitting method and frame receiving method	10/5/2015	14/875,505	1/24/2017
10,243,641	US	Frame transmitting method and frame receiving method	12/9/2016	15/374,363	3/26/2019
CN106576033B	CN	FRAME TRANSMITTING METHOD AND FRAME RECEIVING METHOD	2/10/2017	CN201580043112.8A	12/20/2019
	IN	FRAME TRANSMITTING METHOD AND FRAME RECEIVING METHOD	2/20/2017	IN201747005944	
MX371566	MX	FRAME TRANSMITTING METHOD AND FRAME RECEIVING METHOD	2/28/2017	MX2017002680A	2/4/2020
	EP	FRAME TRANSMITTING METHOD AND FRAME RECEIVING METHOD	3/11/2017	EP15836488.5	
	US	Multiple user transmission method based on OFDMA in WLAN	9/3/2014	62/045,446	
	KR	Multiple user transmission method based on OFDMA in WLAN	9/2/2015	10-2015-0124136	
10,693,532	US	Operation method of station in wireless local area network	9/2/2015	14/843,956	6/23/2020
	US	SOLUTIONS FOR DISTRIBUTED ADAPTIVE CCA MECHANISMS FOR IEEE 802.11 WLANs	9/12/2014	62/049,800	
	US	Adaptive CCA Mechanisms Using RSSI information	11/3/2014	62/074,544	
	US	Adaptive CCA for Wideband and Multiuser Operation	11/14/2014	62/080,033	
9,698,918	US	Distributed adaptive CCA mechanisms	9/11/2015	14/852,226	7/4/2017
	US	System and method for packet information indication in wireless communication systems	9/12/2014	62/050,072	
9,398,571	US	System and method for packet information indication in communication systems	8/26/2015	14/836,749	7/19/2016
	PCT	System and method for packet information indication in communication systems	8/26/2015	PCT/US2015/047050	
9,832,772	US	System and method for packet information indication in communication systems	6/17/2016	15/185,396	11/28/2017

	US	System and method for packet information indication in communication systems	11/22/2017	15/821,573	
	CA	System and method for packet information indication in communication systems	2/10/2017	CA2957037	
CN201580043150.3	CN	System and method for packet information indication in communication systems	2/10/2017	CN201580043150.3A	12/22/2020
	IN	System and method for packet information indication in communication systems	2/20/2017	IN201747005942	
MX371567B	MX	System and method for packet information indication in communication systems	3/9/2017	MX2017003135A	1/31/2020
	EP	System and method for packet information indication in communication systems	3/12/2017	EP15839967.5	
	EP	System and method for packet information indication in communication systems	1/22/2019	EP19153147.4A	
	KR	DYNAMIC SYMBOL LENGTH HIGH EFFICIENCY WIRELESS LOCAL AREA NETWORK ORTHOGONAL FREQUENCY DIVISION MULTIPLE ACCESS	9/16/2014	10-2014-0123014	
	KR	DYNAMIC SYMBOL LENGTH HIGH EFFICIENCY WIRELESS LOCAL AREA NETWORK ORTHOGONAL FREQUENCY DIVISION MULTIPLE ACCESS	9/22/2014	10-2014-0126122	
	KR	DYNAMIC SYMBOL LENGTH HIGH EFFICIENCY WIRELESS LOCAL AREA NETWORK ORTHOGONAL FREQUENCY DIVISION MULTIPLE ACCESS	9/23/2014	10-2014-0127093	
	KR	DYNAMIC SYMBOL LENGTH HEW OFDMA	9/10/2015	10-2015-0128231	
9,774,425	US	Frame transmitting method and frame receiving method	9/15/2015	14/855,326	9/26/2017
	US	Sounding Procedure for OFDMA	9/23/2014	62/054,270	
	KR	SOUNDING METHOD	8/19/2015	10-2015-0116576	
9,763,259	US	Sounding method	9/22/2015	14/862,078	9/12/2017
	US	ACK AGGREGATION USING ORTHOGONAL CODES	9/23/2014	62/054,274	
	US	Acknowledgment Mechanisms for OFDMA Operation	3/7/2015	62/129,847	
	US	Acknowledgment Mechanisms for OFDMA Operation	3/8/2015	62/129,951	
9,742,543	US	Acknowledgment mechanisms for OFDMA operation	7/13/2015	14/798,433	8/22/2017
	KR	HEW UL CDMA	9/23/2014	10-2014-0127126	
	US	Receiver Side CCA	9/26/2014	62/056,146	
	US	Dynamic CCA	3/4/2015	62/128,435	
9,775,117	US	Dynamic clear channel assessment	9/28/2015	14/868,209	9/26/2017
	KR	METHOD FOR MULTI USER TRANSMISSION BASED ON ORTHOGONAL FREQUENCY DIVISION MULTIPLE ACCESS IN WIRELESS LOCAL AREA NETWORK	10/2/2014	10-2014-0133444	
	KR	TRANSMISSION METHOD FOR MULTI USER IN WIRELESS LOCAL AREA NETWORK	10/2/2015	10-2015-0139092	
	US	Efficient BW Request Procedure for UL Multiuser Transmission	10/6/2014	62/060,527	
	US	Methods to Request for Uplink Multiuser Assignments	4/24/2015	62/152,705	
	US	Uplink Multiuser Signaling Methods and Access Request	5/6/2015	62/157,855	
9,991,995	US	Multiuser signaling and access request mechanisms	10/6/2015	14/876,712	6/5/2018
10,523,379	US	Multiuser signaling and access request mechanisms	6/5/2018	16/000,576	12/31/2019
	US	System and method for synchronization of OFDMA transmission	10/8/2014	62/061,503	
9,413,581	US	System and method for synchronization for OFDMA transmission	9/28/2015	14/868,303	8/9/2016
	PCT	System and method for synchronization of OFDMA transmission	9/28/2015	PCT/US2015/052730	



9,912,513	US	System and method for synchronization for OFDMA transmission	7/6/2016	15/203,717	3/6/2018
AU2015328533	AU	System and method for synchronization of OFDMA transmission	1/23/2017	AU2015328533	3/5/2020
	IN	System and method for synchronization of OFDMA transmission	2/2/2017	IN201717003870	
	US	System and method for indicating OFDM symbol duration	10/16/2014	62/064,766	
	US	Compact LTF for Multiuser techniques for next-generation WLAN	10/20/2014	62/066,200	
	KR	METHOD FOR SIGNALING OF CYCLIC PREFIX, GUARD SUBCARRIER, TRANSMISSION POWER FOR UPLINK MULTI USER TRANSMISSION IN WIRELESS LOCAL AREA NETWORK	10/23/2014	10-2014-0143967	
	KR	METHOD FOR SIGNALING OF CYCLIC PREFIX, GUARD SUBCARRIER, TRANSMISSION POWER FOR UPLINK MULTI USER TRANSMISSION IN WIRELESS LOCAL AREA NETWORK	10/23/2015	10-2015-0147967	
	US	UL OFDMA resource assignment rules to achieve robustness toward legacy devices	10/24/2014	62/068,594	
	US	OFDMA Sub-band Allocation Methods	4/13/2015	62/146,828	
	US	Ofdma resource assignment rules to achieve robustness	10/26/2015	14/923,335	
	US	Pilot symbol design for wireless local area network (WLAN) system	10/28/2014	62/069,665	
	US	Pilot symbol design for wireless local area network (WLAN) system	9/4/2015	62/214,823	
9,893,784	US	LTF design for WLAN system	10/28/2015	14/756,914	2/13/2018
	US	Physical layer convergence procedure (PLCP) protocol data unit (PPDU) format for supporting larger channel dispersion	10/28/2014	62/069,673	
9,736,277	US	PPDU format preamble design	10/28/2015	14/756,911	8/15/2017
	US	OFDMA MAP structure for clients with various BW	10/28/2014	62/069,683	
	US	Adaptive HE-SIG-B Design Structure	7/14/2015	62/192,329	
	US	Adaptive HE-SIG-B Design Structure	8/3/2015	62/200,600	
9,877,323	US	OFDMA mapping for clients with various bandwidths	10/20/2015	14/918,414	1/23/2018
10,219,272	US	OFDMA mapping for clients with various bandwidths	1/11/2018	15/868,934	2/26/2019
	US	Method and apparatus for interference aware communication	11/3/2014	62/074,572	
	US	Method and apparatus for interference aware communication	11/7/2014	62/077,068	
	KR	Method and apparatus for interference aware communication	10/6/2015	10-2015-0140512	
10,432,415	US	Method and apparatus for interference aware communications	11/2/2015	14/930,560	10/1/2019
	US	Power Control for OFDMA SDMA	11/5/2014	62/075,696	
10,531,407	US	Power Control for OFDMA SDMA	11/5/2015	14/933,927	1/7/2019
	US	Method and apparatus for response frame transmission rate selection rule	11/7/2014	62/077,073	
	KR	Method and apparatus for response frame transmission rate selection rule	10/8/2015	10-2015-0141660	
	US	Method and apparatus for transmitting frames	11/6/2015	14/935,375	
	US	Method and apparatus for backward compatible non-primary channel cca	11/7/2014	62/077,077	
	KR	Method and apparatus for backward compatible non-primary channel cca	11/3/2015	10-2015-0154116	

10,142,148	US	Method for transmitting frame, clear channel assessment method, and apparatus implementing the same method	11/4/2015	14/932,833	11/27/2018
	US	Tone allocation and interleaving in WLAN downlink with OFDMA	11/10/2014	62/077,768	
	US	Tone allocation and interleaving in WLAN downlink with OFDMA	11/10/2014	62/077,853	
	KR	Tone allocation and interleaving in WLAN downlink with OFDMA	10/13/2015	10-2015-0142586	
	US	Modification of virtual carrier sensing for transmission opportunity	11/10/2014	62/077,771	
	KR	Modification of virtual carrier sensing for transmission opportunity	11/10/2015	10-2015-0157661	
9,848,442	US	Method for transmitting and receiving frame in wireless local area network	11/10/2015	14/937,284	12/19/2017
10,433,338	US	Method for transmitting and receiving frame in wireless local area network	12/18/2017	15/845,544	10/1/2019
	US	Method and apparatus for BSS color indication	11/11/2014	62/078,141	
	US	Method and apparatus for BSS color indication	11/14/2014	62/080,037	
	KR	Method and apparatus for BSS color indication	11/9/2015	10-2015-0156513	
	US	HEW UL Multi-User for OFDMA	11/11/2014	62/078,148	
	US	Dynamic sub-channel Signaling with OFDMA	11/13/2014	62/079,292	
	KR	Dynamic sub-channel Signaling with OFDMA	11/10/2015	10-2015-0157174	
	US	Method and apparatus for robust acknowledgement transmission	11/14/2014	62/080,048	
	KR	Method and apparatus for robust acknowledgement transmission	11/13/2015	10-2015-0159422	
	US	Method and apparatus for high efficiency wireless local area network utilizing simultaneous transmission	11/17/2014	62/080,876	
	US	Method and apparatus for high efficiency wireless local area network utilizing simultaneous transmission	12/22/2014	62/095,688	
	KR	Frame transmitting method	11/13/2015	10-2015-0159429	
9,806,868	US	Frame transmitting method	11/13/2015	14/941,418	10/31/2017
	US	DL OFDMA resource assignment for next generation 802.11 devices	11/21/2014	62/083,136	
	US	Full-band Transmission in DL OFDMA Operation	4/17/2015	62/149,472	
10,469,631	US	Systems and methods for multi-user resource assignments	11/23/2015	14/949,810	11/5/2019
	US	System and method for channel access mechanism in wireless communication systems	11/21/2014	62/083,138	
	US	Apparatus and methods for accessing wireless channels in WLAN	5/5/2015	62/157,357	
9,374,821	US	Channel access mechanism	10/30/2015	14/928,386	6/21/2016
	PCT	Channel access mechanism	10/30/2015	PCT/US2015/058422	
9,936,537	US	Channel access mechanism	4/18/2016	15/132,040	4/3/2018
10,575,367	US	Channel access mechanism	12/26/2017	15/854,353	2/25/2020
EP3222107B1	EP	Channel access mechanism	5/16/2017	EP15861642.5A	1/8/2020
	KR	METHOD FOR DYNAMIC MODULATION AND FRAME CONFIGURATION CONSIDERING OFDMA IN WIRELESS LOCAL AREA NETWORK	11/26/2014	10-2014-0166843	
	KR	METHOD FOR DYNAMIC MODULATION AND FRAME CONFIGURATION CONSIDERING OFDMA IN WIRELESS LOCAL AREA NETWORK	11/26/2015	10-2015-0166243	
10,098,151	US	TRANSMISSION METHOD FOR MULTI USER IN WIRELESS LOCAL AREA NETWORK	11/27/2015	14/953,213	10/9/2018
10,405,351	US	TRANSMISSION METHOD FOR MULTI USER IN	8/21/2018	16/107,498	9/3/2019

		WIRELESS LOCAL AREA NETWORK			
	US	System and method for indicating channel assessment information	12/3/2014	62/086,989	
10,136,346	US	System and method for indicating channel assessment information	11/18/2015	14/944,417	11/20/2018
10,721,642	US	System and method for indicating channel assessment information	10/17/2018	16/162,896	7/21/2020
	US	Methods for efficient DL OFDMA frequency selectivity harvesting	12/8/2014	62/089,121	
9,907,073	US	Efficient dl ofdma frequency selectivity harvesting	8/4/2015	14/818,214	2/27/2018
	US	method and apparatus for robust transmission in large delay spread	12/8/2014	62/089,122	
	US	method and apparatus for robust transmission in large delay spread	12/22/2014	62/095,694	
	KR	method and apparatus for robust transmission in large delay spread	12/1/2015	10-2015-0169744	
	US	Spatial reuse based on distributed reporting	12/12/2014	62/091,372	
9,801,206	US	Spatial reuse based on distributed reporting	12/11/2015	14/966,507	10/24/2017
	KR	METHOD FOR REPRESENTING RESOURCE ALLOCATION INFORMATION FOR ORTHOGONAL FREQUENCY DIVISION MULTIPLE ACCESS IN WIRELESS LOCAL AREA NETWORK	12/16/2014	10-2014-0181542	
	KR	METHOD FOR REPRESENTING RESOURCE ALLOCATION INFORMATION FOR ORTHOGONAL FREQUENCY DIVISION MULTIPLE ACCESS IN WIRELESS LOCAL AREA NETWORK	12/15/2015	10-2015-0178849	
	US	System and method for OFDMA transmission	12/26/2014	62/096,967	
10,575,284	US	Systems and methods for multi-user transmission	12/23/2015	14/998,172	2/25/2020
	KR	1- HEW PPDU Format	7/4/2014	10-2014-0083889	
	KR	2- WIDEBAND HEW PPDU Format	7/14/2014	10-2014-0088362	
	KR	Downlink HEW PPDU Format	7/2/2015	10-2015-0094610	
9,819,460	US	Downlink physical layer protocol data unit format in a high efficiency wireless LAN	7/2/2015	14/790,878	11/14/2017
10,320,537	US	Downlink physical layer protocol data unit format in a high efficiency wireless LAN	11/13/2017	15/811,663	6/11/2019
	US	Uplink HEW PPDU format	9/2/2014	62/044,887	
	US	15- Uplink MU-MIMO HEW PPDU format	9/29/2014	62/057,090	
	KR	Physical layer protocol data unit format in a high efficiency wireless lan	7/2/2015	10-2015-0094611	
10,305,647	US	Physical layer protocol data unit format in a high efficiency wireless lan	7/2/2015	14/790,892	5/28/2019
	PCT	Physical layer protocol data unit format in a high efficiency wireless lan	7/2/2015	PCT/US2015/039058	
EP3164980B1	EP	Physical layer protocol data unit format in a high efficiency wireless lan	1/30/2017	EP15814414.7A	3/11/2020
	US	WLAN DOWNLINK USING OFDMA	7/15/2014	62/024,963	
	KR	OFDMA IN POWER SAVE MODE	7/21/2014	10-2014-0091873	
	KR	Uplink acknowledgment response to downlink multiple user transmission	7/13/2015	10-2015-0098824	
	US	Uplink acknowledgment response to downlink multiple user transmission	7/15/2015	14/800,366	
	KR	PHY-SAP primitives for HEW PPDU	7/28/2014	10-2014-0095766	
	KR	Block ACK procedure for HEW PPDU	7/31/2014	10-2014-0097892	
	KR	Uplink Ack for OFDMA	7/27/2015	10-2015-0105504	
9,866,359	US	Downlink acknowledgment in response to uplink	7/28/2015	14/811,740	1/9/2018

		multiple user transmission			
	KR	Interleaver for HEW PPDU	8/11/2014	10-2014-0103275	
	US	Interleaver for HEW PPDU (9a)	3/18/2015	62/135,094	
	KR	Interleaver Design for HEW PPDU	8/10/2015	10-2015-0112329	
9,532,187	US	Interleaver for physical layer protocol data unit in a high efficiency wireless LAN	8/11/2015	14/823,524	12/27/2016
	KR	Inter Frame Space Procedure for HEW PPDU	8/8/2014	10-2014-0102166	
	US	45-Dynamic EIFS for HEW PPDU	4/13/2015	62/146,906	
	KR	EIFS Control for HEW PPDU	8/10/2015	10-2015-0112278	
9,742,544	US	Dynamic inter-frame space processing in high efficiency wireless LAN	8/10/2015	14/822,601	8/22/2017
	KR	HEW PPDU format for outdoor wireless LAN	8/11/2014	10-2014-0103276	
	US	46- Sub-channel Assignment Rule of HEW PPDU in 2.4 GHz	4/14/2015	62/147,487	
	KR	Variable SIG-B	8/10/2015	10-2015-0112410	
9,673,943	US	Physical layer protocol data unit format in a high efficiency wireless LAN	8/11/2015	14/823,420	6/6/2017
	KR	Transmit Power Control for HEW PPDU	8/12/2014	10-2014-0104230	
	US	Uplink HEW PPDU Spectrum Mask	10/27/2014	62/069,206	
	KR	Transmit Power Control for UL MU	8/10/2015	10-2015-0112479	
9,749,971	US	Transmission power control for device in high efficiency wireless LAN	8/11/2015	14/823,356	8/29/2017
	KR	Rate Selection for HEW Control Response frame	8/18/2014	10-2014-0106841	
	US	Rate Selection Constraints for Uplink MU-MIMO(36)	1/6/2015	62/100,443	
	KR	Rate determination in high efficiency wireless LAN	8/17/2015	10-2015-0115183	
9,985,739	US	Rate determination in high efficiency wireless LAN	8/17/2015	14/828,356	5/29/2018
	US	Rate determination in high efficiency wireless LAN	5/21/2018	15/985,551	
	KR	Padding for HEW PPDU	8/20/2014	10-2014-0108178	
	US	Uplink Multi-User MPDU aggregation mechanism	4/13/2015	62/146,899	
	KR	A-MPDU for OFDMA	8/20/2015	10-2015-0117256	
	US	Physical layer protocol data unit format including padding in a high efficiency wireless lan	8/20/2015	14/831,627	
	KR	STBC for HEW PPDU	8/20/2014	10-2014-0108177	
	KR	STBC for OFDMA	8/20/2015	10-2015-0117257	
10,153,873	US	Physical layer protocol data unit format applied with space time block coding in a high efficiency wireless LAN	8/20/2015	14/831,614	12/11/2018
	US	Beamforming for HEW PPDU	10/6/2014	62/060,429	
	US	49- Beamformed HEW PPDU	5/8/2015	62/159,175	
	KR	Beamformed HEW PPDU Format	10/5/2015	10-2015-0139441	
10,200,165	US	Beamformed transmission in high efficiency wireless LAN	10/5/2015	14/875,665	2/5/2019
10,749,647	US	Beamformed transmission in high efficiency wireless LAN	12/26/2018	16/232,718	8/18/2020
	US	18- Dynamic Sub-Channel Switch Mechanism in HEW BSS	10/10/2014	62/062,745	
	US	EDCA Channel Access in HEW BSS	10/28/2014	62/069,677	
	US	17a- EDCA Channel Access in HEW BSS	8/25/2015	62/209,837	
	KR	EDCA for HEW STA	10/8/2015	10-2015-0141375	

9,900,878	US	Dynamic resource allocation in a high efficiency wireless LAN	10/9/2015	14/880,176	2/20/2018
	US	Channel Width Selection for Uplink MU-MIMO	10/16/2014	62/064,772	
	US	Dynamic Bandwidth Adaptation Mechanism for Uplink MU-MIMO	12/4/2014	62/087,740	
	KR	Channel Bandwidth Selection for UL MU	10/15/2015	10-2015-0144129	
9,949,290	US	Bandwidth determination for multiple user transmission in a high efficiency wireless LAN	10/15/2015	14/884,676	4/17/2018
10,368,269	US	Bandwidth determination for multiple user transmission in a high efficiency wireless LAN	3/7/2018	15/914,954	7/30/2019
	US	Ack Policy for Uplink MU-MIMO	10/16/2014	62/064,785	
	US	Channel Access Mechanism for Uplink MU-MIMO	10/28/2014	62/069,662	
	US	Access Category Control for Uplink MU-MIMO	11/24/2014	62/083,855	
	KR	Channel Access for UL MU	10/15/2015	10-2015-0143921	
9,854,606	US	Method and apparatus for uplink channel access in a high efficiency wireless LAN	10/16/2015	14/885,881	12/26/2017
10,104,688	US	Method and apparatus for uplink channel access in a high efficiency wireless LAN	12/21/2017	15/851,643	10/16/2018
	US	HEW PPDU Protection Mechanism	11/3/2014	62/074,514	
	US	Enhanced Downlink MU-MIMO Procedure	11/14/2014	62/080,026	
	KR	Enhanced MU DATA Transmission & HEW PPDU Protection Mechanism	11/3/2015	10-2015-0153486	
9,917,679	US	Method and apparatus for transmitting response frame based on type in a high efficiency wireless LAN	11/3/2015	14/931,753	3/13/2018
	US	Enhanced MU-MIMO Sounding Procedure	11/18/2014	62/081,484	
	US	51- NDP Sounding in IEEE 802.11ax	6/2/2015	62/170,072	
	KR	Enhanced MU Sounding	11/17/2015	10-2015-0161283	
9,936,488	US	Sounding procedure including uplink multiple-user transmission in a high efficiency wireless LAN	11/17/2015	14/944,180	4/3/2018
10,091,771	US	Sounding procedure including uplink multiple-user transmission in a high efficiency wireless LAN	2/20/2018	15/900,315	10/2/2018
10,448,378	US	Sounding procedure including uplink multiple-user transmission in a high efficiency wireless LAN	9/21/2018	16/138,741	10/15/2019
	US	Dynamic CCA in HEW BSS	11/19/2014	62/081,910	
	US	RTS and CTS Procedure for Dynamic CCA	12/2/2014	62/086,516	
	US	NAV Update Mechanism for Dynamic CCA	12/4/2014	62/087,653	
	US	PHY-SAP primitives for Dynamic CCA	12/15/2014	62/092,138	
	US	Channel Access Mechanism for Dynamic CCA	12/31/2014	62/098,823	
	US	52- TXOP Truncation Mechanism for Dynamic CCA	6/17/2015	62/181,142	
	PCT	Method and apparatus for processing ppdu based on bss identification information in a high efficiency wireless lan	11/18/2015	PCT/IB2015/002169	
10,542,526	US	Method and apparatus for processing ppdu based on bss identification information in a high efficiency wireless lan	5/19/2017	15/600,586	1/21/2020
	EP	Method and apparatus for processing ppdu based on bss identification information in a high efficiency wireless lan	6/19/2017	EP15866341.9A	
	US	Group Addressed Frame in HEW PPDU	12/12/2014	62/091,364	
	US	HEW PPDU SIG Design	12/17/2014	62/093,251	
10,327,226	US	Method and apparatus for resource allocation for multiple user transmission in a High Efficiency wireless LAN	12/10/2015	14/965,701	6/18/2019

	KR	Method and apparatus for resource allocation for multiple user transmission in a High Efficiency wireless LAN	12/11/2015	10-20015-0176580	
	US	160MHz HEW PPDU format	12/30/2014	62/098,256	
	KR	Method and apparatus for wide bandwidth p pdu transmission in a high efficiency wireless lan	12/30/2014	10-2015-0189165	
	US	160MHz HEW PPDU format	12/8/2015	62/264,559	
9,917,933	US	Method and apparatus for wide bandwidth PPDU transmission in a high efficiency wireless LAN	12/29/2015	14/983,247	3/13/2018
	US	Method and apparatus for dynamic bandwidth allocation of multiple channel access	1/5/2015	62/100,011	
	KR	Method and apparatus for dynamic bandwidth allocation of multiple channel access	12/30/2015	10-2015-0189708	
	US	Apparatus and Method for acting as a proxy in providing WLAN service	1/5/2015	62/100,013	
	US	Method and apparatus for low interference transmission and protection	1/12/2015	62/102,495	
	US	unified sounding for 802.11ax	1/14/2015	62/103,353	
	KR	unified sounding for 802.11ax	12/21/2015	10-2015-0183129	
	US	SOUNDING METHOD	1/12/2016	14/994,045	
	US	WLAN BANNER PROTOCOL	1/14/2015	62/103,355	
	US	Pilot Design for OFDMA Systems	1/23/2015	62/106,963	
	US	PS-Poll Procedures for Enhancing OFDMA Operation	1/26/2015	62/107,963	
	US	Wideband Polled-ACK and Block ACK for Enhancing OFDMA Operation	2/4/2015	62/112,095	
9,883,490	US	Implicit sounding for OFDMA operation	1/26/2016	15/007,020	1/30/2018
10,321,403	US	Implicit sounding for OFDMA operation	1/26/2018	15/881,600	6/11/2019
	KR	METHOD FOR FREQUENCY REUSE BASED ON ORTHOGONAL FREQUENCY DIVISION MULTIPLE ACCESS IN WIRELESS LOCAL AREA NETWORK	1/27/2015	10-2015-0012901	
	KR	METHOD FOR SPATIAL REUSE COEXIST WITH WIRELESS LOCAL AREA NETWORK DEVICE	1/27/2015	10-2015-0012918	
	KR	METHOD FOR PROVIDING FREQUENCY RESOURCE ALLOCATION INFORMATION AND USE FREQUENCY OF BASIC SERVICE SET CONSIDERING NEIGHBOR BASIC SERVICE SET	1/27/2015	10-2015-0012929	
	KR	METHOD FOR SPATIAL REUSE COEXIST WITH WIRELESS LOCAL AREA NETWORK DEVICE	1/26/2016	10-2016-0009176	
	US	PHY-SAP Primitive for Transmit Opportunity	1/28/2015	62/108,974	
	KR	TRANSMISSION CONTROL METHOD	1/22/2016	10-2016-0008044	
10,021,721	US	Transmission control method	1/26/2016	15/007,104	7/10/2018
	US	SIG-A Field Design for Auto Detection	1/29/2015	62/109,310	
	US	SIG-A Field Design for Auto Detection	2/17/2015	62/117,145	
	US	SIG-A Field Design for Auto Detection	9/2/2015	62/213,597	
	US	Link Adaptation for Uplink Multi-User Transmission in 802.11 Systems	1/30/2015	62/109,962	
	US	Link Adaptation for OFDMA Systems	2/9/2015	62/113,952	
10,257,324	US	Link adaptation for multi-user transmission in 802.11 systems	1/28/2016	15/008,622	4/9/2019
	US	Implicit OFDMA frequency allocation indication via blind decoding	2/3/2015	62/111,555	
10,149,296	US	Signal field encoding and decoding	1/29/2016	15/011,152	12/4/2018
	US	Methods for Increasing Medium Utilization for Short Frames	2/4/2015	62/112,089	

	US	HEW NDP PPDU format	2/4/2015	62/112,092	
	US	HEW NDP Sounding Protocol	2/17/2015	62/117,127	
	KR	37-HEW NDP PPDU format	2/2/2016	10-2016-0012988	
	US	HIGH-EFFICIENCY (HE) SOUNDING METHODS FOR MIMO AND OFDMA	2/9/2015	62/113,953	
9,960,824	US	High-efficiency (HE) sounding methods for MIMO and OFDMA	2/9/2016	15/019,918	5/1/2018
	US	Uplink Multi-User Control Response	2/17/2015	62/117,133	
	US	Uplink Multi-User Polling Procedure	3/3/2015	62/127,765	
	US	Uplink Multi-User Capability Indication (42)	3/20/2015	62/136,400	
	US	HEW Multi-User PPDU format	3/30/2015	62/140,342	
9,967,877	US	Method and apparatus for frame exchange in a high efficiency wireless LAN	2/16/2016	15/045,198	5/8/2018
10,743,309	US	Method and apparatus for frame exchange in a high efficiency wireless LAN	4/3/2018	15/944,663	8/11/2020
	KR	Method and apparatus for frame exchange in a high efficiency wireless lan	2/17/2016	10-2016-0018255	
	US	Apparatus and methods for multi-user simultaneous transmission	2/17/2015	62/117,135	
9,866,290	US	Apparatus and methods for multi-user simultaneous transmission	2/16/2016	15/045,161	1/9/2018
10,476,561	US	Apparatus and methods for multi-user simultaneous transmission	12/6/2017	15/833,930	11/12/2019
	US	Support of frequency diversity mode for STBC based transmission in OFDMA	2/18/2015	62/117,901	
9,860,099	US	Support of frequency diversity mode for block code based transmission in OFDMA	2/18/2016	15/047,488	1/2/2018
10,523,483	US	Support of frequency diversity mode for block code based transmission in OFDMA	12/29/2017	15/859,192	12/31/2019
	US	Dynamic CCA in DLS and TDLS	2/23/2015	62/119,741	
	KR	Method and apparatus for dynamic channel sensing for direct link in a high efficiency wireless LAN	2/23/2016	10-2016-0021020	
10,178,705	US	Method and apparatus for dynamic channel sensing for direct link in a high efficiency wireless LAN	2/23/2016	15/051,398	1/8/2019
	US	Indexing Methods for Intermediate Rates for Large Spatial Streams	2/24/2015	62/120,309	
	US	Resource Allocation Methods for HE WLAN	2/26/2015	62/121,393	
	US	Mixed Fine/Coarse Sounding Methods for HE STAs for MIMO and OFDMA	2/27/2015	62/121,789	
	US	Mixed fine/coarse sounding methods for he stas for mimo and ofdma	8/14/2015	62/205,628	
10,505,595	US	Mixed fine/coarse sounding methods for he stas for mimo and ofdma	2/29/2016	15/056,953	12/10/2019
	US	Apparatus and methods for efficient wireless channel usage	3/2/2015	62/127,248	
	US	Systems and methods for multiple user simultaneous transmission	12/7/2015	62/264,160	
	US	Systems and methods for channel assessment indication	12/16/2015	62/268,422	
	US	Spatial Reuse Methods	12/21/2015	62/270,469	
10,172,137	US	Apparatus and methods for efficient wireless channel usage	3/2/2016	15/059,237	1/1/2019
	US	Enhancing Wireless Medium Efficiency using CTS-R Frame	3/4/2015	62/128,439	
	US	Pilot tone position in OFDMA	3/4/2015	62/128,444	
9,705,622	US	Support for additional decoding processing time in wireless LAN systems	3/4/2015	15/061,897	7/11/2017
	PCT	Support for additional decoding processing time in	3/4/2015	PCT/US2016/021049	

		wireless LAN systems			
	US	Method of supporting additional decoding processing time in 802.11 systems	3/6/2015	62/129,717	
10,715,267	US	Support for additional decoding processing time in wireless LAN systems	6/2/2017	15/612,170	7/14/2020
EP3266158	EP	Support for additional decoding processing time in wireless LAN systems	3/4/2015	EP16762257.0A	8/5/2020
	CN	Support for additional decoding processing time in wireless LAN systems	3/4/2015	CN201680014047.0A	
	IN	Support for additional decoding processing time in wireless LAN systems	3/4/2015	IN201747031537	
JP6725542	JP	Support for additional decoding processing time in wireless LAN systems	3/4/2015	JP2017564774A	6/29/2020
	US	Method of spatial and frequency interleaving for data transmission for 802.11 systems	3/7/2015	62/129,846	
	US	LTF Multiplexing Schemes for HE WLAN	3/9/2015	62/130,450	
	US	LTF Multiplexing Schemes for HE WLAN	5/14/2015	62/161,823	
	US	LTF Multiplexing Schemes for HE WLAN	7/10/2015	62/191,255	
	US	Apparatus and methods for downlink multi-user transmission	3/23/2015	62/137,138	
	US	Apparatus and methods for transmitting response frames	3/30/2015	62/140,349	
9,531,520	US	Apparatus and method for downlink and uplink multi-user transmissions	3/23/2016	15/078,920	12/27/2016
	PCT	Apparatus and method for downlink and uplink multi-user transmissions	3/23/2016	PCT/US2016/023829	
10,153,886	US	Apparatus and method for downlink and uplink multi-user transmissions	11/15/2016	15/352,435	12/11/2018
	US	CFO pre-compensation and its MAC-PHY interface for uplink multi-user transmission	3/25/2015	62/138,294	
	US	Efficient padding scheme for IEEE 802.11ax	4/9/2015	62/145,428	
9,860,349	US	Method for transmitting and receiving frame, and wireless device implementing the same method	3/25/2016	15/081,578	1/2/2018
10,264,107	US	Method for transmitting and receiving frame, and wireless device implementing the same method	11/22/2017	15/821,597	4/16/2019
	US	LTF Sequence Design for 11ax	3/25/2015	62/138,302	
	US	LTF Sequence Design for 11ax	5/6/2015	62/157,849	
	US	LTF Sequence Design for 11ax	9/3/2015	62/214,139	
	US	LTF Sequence Design for 11ax	9/3/2015	62/214,156	
	US	LTF Sequence Design for 11ax	10/2/2015	62/236,815	
	US	LTF Sequence Design for 11ax	11/4/2015	62/250,944	
	US	LTF Sequence Design for 11ax	12/8/2015	62/264,812	
9,628,310	US	Long training field sequence construction	3/23/2016	15/079,007	4/18/2017
10,327,172	US	Long training field sequence construction	3/7/2017	15/452,567	6/18/2019
	US	Aggregation Methods for DL OFDMA Operation	3/27/2015	62/139,574	
9,998,185	US	AGGREGATION METHODS AND SYSTEMS FOR MULTI-USER MIMO OR OFDMA OPERATION	3/28/2015	15/083,185	6/12/2018
10,790,884	US	AGGREGATION METHODS AND SYSTEMS FOR MULTI-USER MIMO OR OFDMA OPERATION	5/29/2018	15/991,889	9/29/2020
	US	Length Indication in DL OFDMA Operation	4/2/2015	62/142,394	
	US	Aggregation Methods for DL OFDMA Operation	12/28/2015	62/271,870	
	US	Mid-Packet Detection for HE WLAN	3/30/2015	62/140,321	



10,321,483	US	MID-PACKET DETECTION IN WIRELESS LAN	3/30/2016	15/085,336	6/11/2019
	US	Pilot structure for UL MU-MIMO transmissions	3/30/2015	62/140,367	
	US	Method of uplink OFDMA transmissions in 802.11 systems	4/2/2015	62/142,295	
	US	OFDMA Sounding for HE WLAN	4/3/2015	62/142,712	
10,313,976	US	OFDMA sounding for WLAN system	4/4/2016	15/090,535	6/4/2019
	PCT	OFDMA sounding for WLAN system	4/4/2016	PCT/US2016/025889	
	EP	OFDMA sounding for WLAN system	10/17/2017	EP16774411.9A	
	US	Multiuser Aggregation Methods for Data and Control Frames	4/7/2015	62/144,275	
	US	Multiplexing Response Frames for Multicast Services	8/18/2015	62/206,769	
	US	Multiplexing Response Frames for Multicast Services	11/9/2015	62/252,733	
	US	Multiplexing Response Frames for Multicast Services	2/17/2016	62/296,369	
10,027,499	US	Multi-user aggregation methods and systems for data and control frames	4/7/2016	15/093,591	7/17/2018
10,476,692	US	Multi-user aggregation methods and systems for data and control frames	7/16/2018	16/036,726	11/12/2019
	US	Apparatus and methods for sounding wireless channel	4/7/2015	62/144,285	
	US	Apparatus and methods for sounding wireless channel in WLAN systems	4/14/2015	62/147,491	
9,621,238	US	Apparatus and method for sounding wireless channel	4/7/2016	15/093,429	4/11/2017
	US	Receiver Behaviors for UL MU transmission in HE WLAN	4/9/2015	62/145,447	
10,182,361	US	Receiver behavior for uplink multi-user transmission in wireless LAN systems	4/8/2016	15/094,877	1/15/2019
10,412,610	US	Receiver behavior for uplink multi-user transmission in wireless LAN systems	12/6/2018	16/211,612	9/10/2019
	US	BA for UL OFDMA	4/21/2015	62/150,780	
	US	Apparatus and methods for channel access in WLAN	4/21/2015	62/150,783	
	US	Apparatus and methods for random channel access	6/24/2015	62/184,187	
10,028,142	US	Apparatus and methods for channel access in WLAN	4/21/2016	15/134,755	7/17/2018
	US	47- TXOP Limit Rule of Uplink Multi-User Transmission	4/23/2015	62/151,966	
	US	48- Error Recovery Procedure of Uplink Multi-User Transmission	5/8/2015	62/159,170	
	US	53- Backoff Counter based UL Random Access Mechanism	6/18/2015	62/181,725	
	US	54- Enhanced Multicast and Broadcast Service	6/23/2015	62/183,688	
	US	58- UL random access in DFS channel	8/14/2015	62/205,577	
	US	47a- TXOP Limit Rule of Uplink Multi-User Transmission	3/11/2016	62/307,033	
10,116,360	US	Method and apparatus for uplink multi-user transmission in a high efficiency wireless LAN	4/22/2016	15/136,803	10/30/2018
10,840,979	US	Method and apparatus for uplink multi-user transmission in a high efficiency wireless LAN	10/2/2018	16/150,196	11/17/2020
	US	Apparatus and methods for DL MU transmission	4/24/2015	62/152,497	
	US	Apparatus and methods for random access	6/10/2015	62/173,893	
	US	Apparatus and methods for random access	6/17/2015	62/181,141	
	US	Apparatus and methods for UL MU transmissions	9/3/2015	62/214,127	
	US	Apparatus and methods for controlling transmission bandwidth	9/4/2015	62/214,867	
9,794,098	US	Multi-user communication in wireless networks	4/22/2016	15/136,845	10/17/2017

10,257,003	US	Multi-user communication in wireless networks	9/14/2017	15/705,047	4/9/2019
	EP	Multi-user communication in wireless networks	11/23/2017	EP16784037.0A	
	PCT	Multi-user communication in wireless networks	4/22/2016	PCT/US2016/029062	
	US	Preamble for UL MU transmission in HE WLAN	4/24/2015	62/152,509	
9,641,234	US	Preamble and payload for high efficiency (HE) transmission	4/22/2016	15/136,830	5/2/2017
	PCT	Preamble and payload for high efficiency (HE) transmission	4/22/2016	PCT/US2016/029031	
9,893,790	US	Preamble and payload for high efficiency (HE) transmission	3/24/2017	15/469,470	2/13/2018
	US	Preamble design	4/28/2015	62/154,048	
	US	Preamble design	5/8/2015	62/159,193	
	US	Methods to Indicate STA Status for Multiuser and OFDMA Operation	4/30/2015	62/155,387	
	US	Rate Adaptation for Trigger-Based Frames	12/7/2015	62/264,158	
10,057,806	US	Multi-user communication in wireless networks	5/2/2016	15/144,325	8/21/2018
10,433,204	US	Multi-user communication in wireless networks	7/20/2018	16/041,589	10/1/2019
	EP	Multi-user communication in wireless networks	11/28/2017	EP16787304.1A	
	PCT	Multi-user communication in wireless networks	5/2/2016	PCT/US2016/030403	
	US	Method of frequency interleaving for control information in 802.11 systems	5/7/2015	62/158,450	
	US	Pilot transmission and reception for OFDMA	5/8/2015	62/159,187	
9,621,311	US	Pilot transmission and reception for orthogonal frequency division multiple access	5/9/2016	15/150,127	4/11/2017
	PCT	Pilot transmission and reception for orthogonal frequency division multiple access	5/9/2016	PCT/US2016/031501	
10,361,828	US	Pilot transmission and reception for orthogonal frequency division multiple access	2/27/2017	15/444,188	7/23/2019
	US	Uplink Sounding in UL OFDMA for HE WLAN	5/8/2015	62/159,174	
	US	Uplink Sounding in UL OFDMA for HE WLAN	5/28/2015	62/167,780	
	US	Uplink Sounding in UL OFDMA for HE WLAN	10/23/2015	62/245,776	
	US	Uplink Sounding in UL OFDMA for HE WLAN	11/3/2015	62/250,346	
	US	Uplink Sounding in UL OFDMA for HE WLAN	11/5/2015	62/251,594	
10,158,413	US	Uplink sounding for WLAN system	5/6/2016	15/149,025	12/18/2018
	US	Multiplexing Acknowledgment Messages in OFDMA	5/10/2015	62/159,346	
	US	Multiuser Acknowledgment Multiplexing	5/12/2015	62/160,527	
	US	Multiplexing Acknowledgment Messages in Response to DL Frames	7/13/2015	62/191,623	
	US	Multiplexing Acknowledgment Messages in Response to DL Frames	7/16/2015	62/193,305	
10,181,930	US	Multiplexing acknowledgment messages in response to downlink frames	5/10/2016	15/151,433	1/15/2019
	US	EDCA multiplexing methods for uplink multi-user transmission and reception	5/21/2015	62/164,767	
	US	Transmit opportunity transfer and medium recovery methods for uplink multi-user transmissions	5/22/2015	62/165,871	
	US	EDCA for uplink multi-user transmission and reception	5/28/2015	62/167,762	
10,492,223	US	Channel access for multi-user communication	5/20/2016	15/161,121	11/26/2019
	US	Resource request and allocation mechanisms in Uplink OFDMA/MU-MIMO	5/22/2015	62/165,862	
	US	Resource request and allocation mechanisms in Uplink OFDMA/MU-MIMO	7/10/2015	62/191,301	

10,070,458	US	Resource request and allocation for uplink multi-user communication	5/23/2016	15/162,518	9/4/2018
10,314,067	US	Resource request and allocation for uplink multi-user communication	8/9/2018	16/059,372	6/4/2019
	US	Apparatus and methods for multi-user transmission in WLAN systems	5/22/2015	62/165,876	
	US	UL MU MIMO Sounding Methods	5/26/2015	62/166,568	
	US	50- Ack Policy for Downlink MU-MIMO	6/2/2015	62/170,018	
	US	55- A-MPDU for Downlink MU PPDU	8/14/2015	62/205,570	
	US	62- A-MPDU Content for Downlink MU PPDU	11/19/2015	62/257,657	
	US	63- Ack Policy for Uplink and Downlink MU PPDU	11/25/2015	62/260,188	
	US	55a- A-MPDU for Downlink MU PPDU	12/17/2015	62/269,036	
	TW	ACK policy for uplink and downlink MU PPDU	6/1/2016	TW105117214	
9,762,487	US	ACK policy for uplink and downlink MU PPDU	6/1/2016	15/170,044	9/12/2017
	PCT	ACK policy for uplink and downlink MU PPDU	6/1/2016	PCT/US2016/035201	
10,397,110	US	ACK policy for uplink and downlink MU PPDU	8/2/2017	15/666,843	8/27/2019
	US	Methods for Uplink Multiuser Signaling and Transmission	6/2/2015	62/170,012	
	US	Methods for Uplink Multiuser Signaling and Transmission	7/13/2015	62/191,628	
	US	Methods for Uplink Multiuser Signaling and Transmission	10/12/2015	62/240,423	
	US	Cascaded Trigger Frames for Power Saving	3/8/2016	62/305,161	
10,116,361	US	Methods for uplink multiuser signaling and transmission	6/2/2016	15/171,870	10/30/2018
10,892,804	US	Methods for uplink multiuser signaling and transmission	9/28/2018	16/145,732	1/12/2021
	US	Random access PPDU for 802.11 systems	6/2/2015	62/170,057	
10,263,821	US	Random access ppdu for wlan systems	6/1/2016	15/170,890	4/16/2019
	PCT	Random access ppdu for wlan systems	6/1/2016	PCT/US2016/035330	
	US	Reversed Direction Protocol in UL MU	6/4/2015	62/171,194	
	US	Preamble design	6/4/2015	62/171,197	
	US	Preamble design	6/16/2015	62/180,561	
	US	EIFS in UL MU	6/12/2015	62/175,187	
	US	Protection mechanism for multi-user transmission	6/15/2015	62/175,991	
	US	Apparatus and methods for protecting wireless transmission in a shared channel	8/20/2015	62/207,867	
	US	Protection mechanisms for wireless transmission in a shared channel	9/2/2015	62/213,598	
10,701,686	US	PROTECTION MECHANISM FOR MULTI-USER TRANSMISSION	6/15/2016	15/183,570	6/30/2020
	US	Multiuser Protection Methods	6/15/2015	62/175,996	
	US	Multiuser Protection Methods	2/17/2016	62/296,523	
	US	Random Access methods with Priority Information	6/16/2015	62/180,565	
	US	Efficient Block ACK Request (BAR) and Block ACK (BA) Schemes for Multiple STAs in HE LAN	6/18/2015	62/181,745	
	US	CSD options in beacon frame	6/23/2015	62/183,686	
	US	Enhanced CCA Methods	6/24/2015	62/184,190	
	US	Enhanced CCA Methods	11/9/2015	62/252,727	
	US	Enhanced CCA Methods	1/16/2016	62/279,756	

10,135,651	US	ENHANCED CLEAR CHANNEL ASSESSMENT	6/24/2016	15/192,959	11/20/2018
10,693,689	US	ENHANCED CLEAR CHANNEL ASSESSMENT	11/14/2018	16/191,326	6/23/2020
	US	An OFDMA session, transmitting downlink and uplink data within a session	6/30/2015	62/187,134	
	US	Prioritized Transmission in Random Access	6/30/2015	62/187,141	
	US	Prioritized Transmission in Random Access	7/30/2015	62/199,166	
	US	RTS, CTS and Trigger frames when aggressive CCA	6/30/2015	62/187,152	
	US	Compression of Sub-channel Addressing in HE SIG Symbol	7/1/2015	62/187,774	
	US	Methods for Multiuser Identity Addressing and Sub-band Allocation	7/9/2015	62/190,635	
	US	Compression of Sub-channel Addressing in HE SIG Symbol	9/4/2015	62/214,878	
	US	Coding Methods for OFDMA Sub-channel Allocation	9/13/2015	62/217,916	
	US	Indication of Unassigned RUs in HE SIG-B	10/19/2015	62/243,575	
	US	Indication of Unassigned RUs in HE SIG-B	10/27/2015	62/247,123	
10,219,271	US	Bandwidth allocation signalling	7/1/2016	15/201,275	2/26/2019
	US	Apparatus and methods for link adaptation	7/1/2015	62/187,774	
	US	Dynamic Bandwidth Operation in 2.4GHz	7/6/2015	62/189,044	
	US	CCA margin and TX power control methods	7/16/2015	62/193,513	
	US	Resource selection of random access for OFDMA	7/17/2015	62/193,947	
	US	Delayed Uplink Multiuser Transmission	8/7/2015	62/202,748	
	US	Resource Allocation for 2x26RUs in WLAN	8/7/2015	62/202,750	
	US	Resource Allocation for 2x26RUs in WLAN	11/5/2015	62/251,552	
	US	Control information of MU (OFDMA and MU-MIMO) in SIG-B for 11ax	8/7/2015	62/202,756	
	US	Frequency repetition for range extension in 11ax	8/7/2015	62/202,758	
	US	Method of signaling control information for multi-user transmissions in 802.11ax	9/29/2015	62/234,567	
	US	Frequency repetition for range extension in 11ax	6/7/2016	62/347,021	
10,348,471	US	Control information for multi-user transmissions in WLAN systems	8/8/2016	15/231,638	7/9/2019
	PCT	Control information for multi-user transmissions in WLAN systems	8/8/2016	PCT/US2016/046067	
	US	Method of Spatial Reuse Suppression	8/10/2015	62/203,347	
	US	Sounding Methods in HE WLAN	8/11/2015	62/203,833	
	US	56- Carrier Lost Handling for Dynamic CCA	8/14/2015	62/205,573	
	US	57- Sub-channel Assignment Mechanism for Uplink Multi-User Transmission	8/14/2015	62/205,585	
	US	59- Trigger frame in A-MPDU	8/14/2015	62/205,589	
	US	61- Multi-STA Block ACK Operation	10/5/2015	62/237,479	
	US	66- A-MPDU Contents in Response frame of Trigger frame	12/22/2015	62/271,157	
10,129,001	US	Block acknowledgment for multi-user transmissions in WLAN systems	8/15/2016	15/237,566	11/13/2018
10,917,220	US	Block acknowledgment for multi-user transmissions in WLAN systems	10/2/2018	16/150,199	2/9/2021
	US	Pre-Sounding Method for OFDMA in HE WLAN	8/24/2015	62/209,280	
	US	NAV Types	8/26/2015	62/210,420	
	US	TXOP Types	9/9/2015	62/216,274	

	US	METHODS FOR SPATIAL REUSE WITH TXOP TYPES HANDLING	11/11/2015	62/254,131	
10,285,203	US	Network allocation vector types and transmission opportunity types for spatial reuse	8/26/2016	15/249,327	5/7/2019
	US	Apparatus and methods for NAV operation	8/28/2015	62/211,652	
10,411,850	US	Apparatus and method for network allocation vector operations	8/24/2016	15/246,376	9/10/2019
	US	Apparatus and methods for transmission operation in MU manner	8/31/2015	62/212,485	
	US	Channel Sounding Scheme for MIMO-OFDMA in 11ax	9/1/2015	62/213,066	
	US	HEW TXOP power saving mechanism	9/1/2015	62/213,068	
	US	Fragmentation of compressed beamforming frame in channel sounding protocol	9/4/2015	62/214,875	
	US	Method of supporting additional decoding processing time using padding and signal extension in WLAN	9/4/2015	62/214,880	
	US	Method of supporting additional decoding processing time using padding and signal extension in WLAN	9/13/2015	62/217,913	
	US	Method of supporting additional decoding processing time using padding and signal extension in WLAN	9/14/2015	62/218,489	
	US	Method of supporting additional decoding processing time using padding and signal extension in WLAN	10/7/2015	62/238,444	
	US	Method of resource allocation in OFDMA transmission and reception in 802.11 systems	9/10/2015	62/216,948	
	US	Method of resource allocation in OFDMA transmission and reception in 802.11 systems	2/15/2016	62/295,371	
	US	Method of adjusting the last OFDM symbol duration for IEEE 802.11ax	9/13/2015	62/217,914	
	US	Signaling Methods for UL MU Polling and Random Access	9/14/2015	62/218,485	
	US	Encoding Methods for Trigger Frames	9/14/2015	62/218,500	
	US	Back-off Procedures in Random Access	12/7/2015	62/264,154	
	US	Encoding Methods for Trigger Frames	3/11/2016	62/307,021	
	US	METHODS FOR RANDOM ACCESS IN A WIRELESS NETWORK	7/15/2016	62/362,950	
10,154,520	US	Methods for random access in a wireless network	9/14/2016	15/265,794	12/11/2018
	US	Link adaptation for OFDMA Systems	9/14/2015	62/218,492	
	US	Link adaptation for OFDMA Systems	10/7/2015	62/238,450	
	US	Link adaptation for OFDMA Systems	10/13/2015	62/241,061	
	US	Link adaptation for OFDMA Systems	12/29/2015	62/272,626	
	US	Signature OFDM	9/15/2015	62/219,059	
	US	Apparatus and methods for TXOP Duration field in PHY header	9/28/2015	62/233,881	
	US	Apparatus and method for TXOP Duration operation	10/12/2015	62/240,454	
10,257,857	US	Apparatus and methods for TXOP duration field in PHY header	9/28/2016	15/278,597	4/9/2019
	PCT	Apparatus and methods for TXOP duration field in PHY header	9/28/2016	PCT/US2016/054185	
	IN	Apparatus and methods for TXOP duration field in PHY header	3/26/2018	IN201817011062	
EP3357295	EP	Apparatus and methods for TXOP duration field in PHY header	9/28/2018	EP16852491.6A	8/5/2020
	US	Method of signaling resource allocation information and subfield type for multi-user MIMO transmissions	9/29/2015	62/234,558	
	US	Method of signaling resource allocation information and subfield type for multi-user MIMO transmissions	11/4/2015	62/250,950	
	US	Method of signaling resource allocation information and subfield type for multi-user MIMO transmissions	11/5/2015	62/251,554	

	US	Method of signaling resource allocation information and subfield type for multi-user MIMO transmissions	11/9/2015	62/252,886	
	US	Method of signaling resource allocation information and subfield type for multi-user MIMO transmissions	6/1/2016	62/344,158	
9,867,189	US	Resource allocation indication for multi-user multiple-input-multiple-output (MU-MIMO) orthogonal frequency division multiple access (OFDMA) communication	9/29/2016	15/280,888	1/9/2018
	PCT	Resource allocation indication for multi-user multiple-input-multiple-output (MU-MIMO) orthogonal frequency division multiple access (OFDMA) communication	9/29/2016	PCT/US2016/054527	
	EP	Resource allocation indication for multi-user multiple-input-multiple-output (MU-MIMO) orthogonal frequency division multiple access (OFDMA) communication	3/26/2018	EP16852630.9A	
	US	UL transmission format and method	10/2/2015	62/236,417	
	US	Method of channel state information feedback for 802.11ax	10/2/2015	62/236,796	
	US	Link Adaptation for 802.11 system	10/2/2015	62/236,802	
	US	Link Adaptation for 802.11 system	11/6/2015	62/252,353	
10,027,782	US	Link adaptation for 802.11 system	10/3/2016	15/283,780	7/17/2018
	US	60- Dynamic CCA for Concurrent Mode	10/5/2015	62/237,475	
	US	Methods for Exchanging Operation Changes between WLAN STAs	10/12/2015	62/240,417	
	US	Methods for Exchanging Operation Changes between WLAN STAs	7/14/2016	62/362,305	
10,142,993	US	Methods for exchanging operation changes between wlan stations	10/11/2016	15/291,018	11/27/2018
10,681,703	US	Methods for exchanging operation changes between wlan stations	10/26/2018	16/172,608	6/9/2020
	US	Method of channel state information feedback for 802.11ax	10/12/2015	62/240,419	
	US	Protection mechanisms for wireless transmission in a shared channel	5/3/2016	62/331,380	
	US	Protection mechanisms for wireless transmission in a shared channel	5/6/2016	62/333,077	
	US	Method of generating scrambling sequence for RF combined frames	5/7/2016	62/333,192	
	TW	Protection methods for wireless transmissions	10/12/2016	TW105132916A	
9,667,394	US	Protection methods for wireless transmissions	10/12/2016	15/291,947	5/30/2017
	PCT	Protection methods for wireless transmissions	10/12/2016	PCT/US2016/056651	
	CN	Protection methods for wireless transmissions	6/11/2018	CN201680072477.8A	
10,020,919	US	Protection methods for wireless transmissions	4/25/2017	15/497,094	7/10/2018
	US	Apparatus and methods for virtual channel sensing	10/12/2015	62/240,458	
	US	Apparatus and methods for channel sensing	10/15/2015	62/242,197	
	US	Systems and methods for channel assessment and transmit power control	2/9/2016	62/293,260	
10,470,138	US	Apparatus and methods for virtual channel sensing	10/12/2016	15/292,054	11/5/2019
	US	HEW PS poll and UASPD power saving mechanism	10/19/2015	62/243,580	
	US	Compressed-Trigger-Frame-format-for-11ax	10/28/2015	62/247,562	
	US	Compressed-Trigger-Frame-format-for-11ax	5/27/2016	62/342,786	
	US	Simplified scheduling information for acknowledgement in a wireless communication system	10/28/2016	15/337,753	

	PCT	Simplified scheduling information for acknowledgement in a wireless communication system	10/28/2016	PCT/US2016/059547	
	US	Early Detection Procedure of Legacy Frame and Decision Timing for SR	10/28/2015	62/247,566	
	US	Early Detection Procedure of Legacy Frame and Decision Timing for SR	11/18/2015	62/257,116	
	US	Early Detection Procedure of Legacy Frame and Decision Timing for SR	5/6/2016	62/333,083	
	US	Early Detection Procedure of Legacy Frame and Decision Timing for SR	5/19/2016	62/338,986	
	US	Early Detection Procedure of Legacy Frame and Decision Timing for SR	6/6/2016	62/346,229	
	US	Early Detection Procedure of Legacy Frame and Decision Timing for SR	8/31/2016	62/382,168	
	US	Early Detection Procedure of Legacy Frame and Decision Timing for SR	9/27/2016	62/400,563	
	US	Early Detection Procedure of Legacy Frame and Decision Timing for SR	10/7/2016	62/405,530	
10,470,128	US	Early detection procedure of high-efficiency frame and decision timing for spatial reuse	11/18/2016	15/356,496	11/5/2019
	US	Power Savings with Color ID for Multiple BSSID Aps	11/3/2015	62/250,353	
	US	Overload and Fairness Control Mechanisms in HE Uplink Random Access	11/3/2015	62/250,357	
	US	Method of Channel State Information Feedback Segmentation for 802.11 systems	11/3/2015	62/250,369	
	US	Method of scrambling control field information	11/3/2015	62/250,373	
	US	Method of scrambling control field information	2/11/2016	62/294,248	
	US	Method of scrambling control field information	2/11/2016	62/294,269	
	US	Method of scrambling control field information	2/12/2016	62/294,968	
	US	Method of scrambling control field information	2/24/2016	62/299,468	
9,832,058	US	Apparatus and method for scrambling control field information for wireless communications	11/1/2016	15/340,939	11/28/2017
TW1669925B	TW	Apparatus and method for scrambling control field information for wireless communications	11/2/2016	TW105135571A	8/21/2019
	PCT	Apparatus and method for scrambling control field information for wireless communications	11/2/2016	PCT/US2016/060107	
	US	Method of transmission mode indication in high efficiency WLAN	11/3/2015	62/250,382	
	US	Aggregated HE Control Contents in an AMPDU	11/3/2015	62/250,408	
	US	Aggregated HE Control Contents in an AMPDU	2/23/2016	62/298,859	
	US	Aggregated HE Control Contents in an AMPDU	4/15/2016	62/323,555	
	US	Multi-type Trigger frame	6/1/2016	62/344,199	
	US	Aggregated HE Control Contents in an AMPDU	10/21/2016	62/411,449	
10,420,121	US	Aggregated HE control content in A-MPDU	11/3/2016	15/343,072	9/17/2019
	US	Efficient Operation Methods in Receiver Operation Mode Change in HE WLAN	11/3/2015	62/250,415	
	US	Adaptive Power Loading in HE WLAN	11/5/2015	62/251,545	
	US	CCA Mechanisms for uplink multi-user transmission	11/6/2015	62/252,232	
	US	HEW control field (QoS control field and extended QoS HE control field)	11/6/2015	62/252,370	
	US	Method of supporting additional decoding processing time in 802.11 systems	11/5/2015	62/251,549	
	US	Method of transmission and reception of user specific control field information	11/9/2015	62/252,737	
	US	Method of transmission and reception of user specific control field information	12/4/2015	62/263,482	

	US	Method of transmission and reception of user specific control field information	12/17/2015	62/269,011	
	US	Method of transmission and reception of user specific control field information	12/18/2015	62/269,686	
	TW	Communication of user specific control information in a wireless network	11/8/2016	TW105136297A	
9,742,433	US	Communication of user specific control information in a wireless network	11/8/2016	15/346,577	8/22/2017
	PCT	Communication of user specific control information in a wireless network	11/8/2016	PCT/US2016/060957	
10,270,463	US	Communication of user specific control information in a wireless network	7/12/2017	15/648,333	4/23/2019
	US	Pilot sequence for channel estimation of edge bands of 802.11 preamble	11/11/2015	62/254,055	
9,686,757	US	Peak to average power ratio (PAPR) reduction in a wireless network	11/6/2016	15/347,178	6/20/2017
10,142,151	US	Peak to average power ratio (PAPR) reduction in a wireless network	5/15/2017	15/595,005	11/27/2018
	US	NDP frame structure and Feedback information generation for UL MU-MIMO	11/18/2015	62/257,197	
	US	Signaling Methods for Compressed SIG-B in HE WLAN	11/20/2015	62/257,944	
	US	Signaling Methods for Compressed SIG-B in HE WLAN	1/13/2016	62/278,384	
	US	Systems and methods for packet transmission in shared wireless medium	11/25/2015	62/259,987	
	US	Systems and methods for packet transmission in shared wireless medium	2/26/2016	62/300,235	
	US	64- Admission Control Procedure for Uplink MU PPDU transmission	11/25/2015	62/260,190	
	US	64a- Admission Control Procedure for Uplink MU PPDU transmission	8/5/2016	62/371,535	
	US	65- Efficient TXOP operation in multiple BSSID	11/25/2015	62/260,218	
10,153,820	US	Receiver address field for multi-user transmissions in wlan systems	11/23/2016	15/360,887	12/11/2018
	US	Method of multiple NAV operation	12/14/2015	62/267,214	
	US	Method of multiple NAV operation	10/5/2016	62/404,608	
10,321,485	US	Multiple network allocation vector operation	12/14/2016	15/379,400	6/11/2019
	US	NDP frame format for UL MU-MIMO	12/17/2015	62/269,018	
	US	Apparatus and method for two duration field operation	12/21/2015	62/270,470	
	US	Method of CF-END operation with multiple NAV values	12/21/2015	62/270,475	
	US	67- Management frame in DL MU PPDU	12/22/2015	62/271,162	
	US	Apparatus and method for NDP operation in MU for 11ax	12/28/2015	62/272,029	
	US	MULTIPLE NETWORK ALLOCATION VECTOR OPERATION	12/28/2015	62/272,033	
9,801,184	US	Multiple network allocation vector operation	12/28/2016	15/393,084	10/24/2017
	PCT	Multiple network allocation vector operation	12/28/2016	PCT/US2016/069004	
EP3398179	EP	Multiple network allocation vector operation	6/26/2018	EP16882603.0A	11/4/2020
	CN	Multiple network allocation vector operation	6/26/2018	CN201680082797.1A	
10,021,694	US	Multiple network allocation vector operation	9/21/2017	15/711,872	7/10/2018
	US	Retransmission of Fragment frame in A-MPDU	1/12/2016	62/277,864	
	US	Link adaptation for OFDMA Systems	1/13/2016	62/278,326	
	US	Link adaptation for OFDMA Systems	4/13/2016	62/322,181	
	US	Link adaptation for OFDMA Systems	4/19/2016	62/324,815	



	US	Long training field sequence for high efficiency WLAN	1/15/2015	62/279,554	
	US	Low Coderate Transmission for 802.11 Systems	2/4/2016	62/291,444	
	US	Low Coderate Transmission for 802.11 Systems	2/8/2016	62/292,747	
	US	Low Coderate Transmission for 802.11 Systems	2/18/2016	62/297,048	
	US	69- Method to operate a spatial reuse (SR) mechanism in TXOP	2/8/2016	62/292,738	
	US	Definition of Control Information Type in HE control field in MAC header	2/9/2016	62/293,272	
	US	Dynamic packet detection threshold configuration for medium idle/busy status identification	2/12/2016	62/294,965	
	US	Systems and methods for scheduling information delivery for UL MU transmission	2/17/2016	62/296,377	
	US	Method to transmit a management frame in a DL MU PDU	2/20/2016	62/297,844	
	US	Method to transmit a management frame in a DL MU PDU	3/14/2016	62/308,124	
	US	Method to control transmit power in a spatial reuse TXOP	2/20/2016	62/297,845	
	US	Method to control transmit power in a spatial reuse TXOP	3/2/2016	62/302,691	
	US	Method to control transmit power in a spatial reuse TXOP	3/8/2016	62/305,403	
	US	Tone mapping for 20MHz only STA in 802.11 Systems	2/20/2016	62/352,415	
	US	Tone mapping for 20MHz only STA in 802.11 Systems	3/4/2016	62/303,636	
	US	72- Method to truncate TXOP for Regular NAV	4/8/2016	62/320,405	
	US	72a- Method to truncate TXOP for Regular NAV	8/10/2016	62/373,290	
	US	CSI feedback design for IEEE 802.11 systems	4/8/2016	62/320,394	
	US	Methods to support Spatial Reuse for the secondary channels	4/11/2016	62/321,129	
	US	Methods to support Spatial Reuse for the secondary channels	4/18/2016	62/324,275	
	US	Link adaptation for OFDMA Systems	4/29/2016	62/329,972	
	US	Methods to indicate a non-contiguous channel bonding	5/10/2016	62/334,159	
	US	73- Method to operate a power management of HE STA	5/13/2016	62/336,186	
	US	MU Protection Mechanisms and Spatial Reuse	5/27/2016	62/342,579	
	US	Receiver behavior for 802.11 Systems	5/27/2016	62/342,790	
	US	Method of phase rotation for non-contiguous channel bonding	5/27/2016	62/342,793	
	US	Method of phase rotation for non-contiguous channel bonding	6/3/2016	62/345,688	
	US	Method of phase rotation for non-contiguous channel bonding	6/8/2016	62/347,525	
	US	Method of phase rotation for non-contiguous channel bonding	7/20/2016	62/364,549	
	US	Method of phase rotation for non-contiguous channel bonding	6/3/2016	62/345,640	
	US	Method of channel switching operation of WLAN device	6/10/2016	62/348,748	
	US	Signaling and Rules for Spatial Reuse	6/16/2016	62/351,220	
	US	Signaling and Rules for Spatial Reuse	8/11/2016	62/373,775	
	US	Association Identification Configuration in Multiple BSS deployments	6/17/2016	62/351,472	
	US	Association Identification Configuration in Multiple BSS deployments	7/27/2016	62/367,237	

	US	Methods of prioritizing spatial reuse parameters	6/24/2016	62/354,584	
	US	Methods of prioritizing spatial reuse parameters	7/5/2016	62/358,484	
	US	Methods of prioritizing spatial reuse parameters	2/28/2017	62/465,067	
	US	Methods of prioritizing spatial reuse parameters	4/26/2017	62/490,518	
	US	Indication methods of spatial reuse parameters signaling on different channel bandwidth	6/27/2016	62/355,252	
	US	Indication methods of spatial reuse parameters signaling on different channel bandwidth	6/29/2016	62/356,445	
	US	Indication methods of spatial reuse parameters signaling on different channel bandwidth	7/1/2016	62/357,855	
	US	Signaling of Duration in PHY Preamble	6/29/2016	62/356,442	
	US	Signaling of Duration in PHY Preamble	8/8/2016	62/372,075	
	US	Signaling of Duration in PHY Preamble	8/26/2016	62/380,149	
	US	Signaling for Multiuser Request for Acknowledgment	7/6/2016	62/359,101	
	US	Signaling for Multiuser Request for Acknowledgment	7/19/2016	62/364,148	
	US	Signaling for Multiuser Request for Acknowledgment	8/5/2016	62/371,528	
	US	Apparatus and method for two duration field operation	7/7/2016	62/359,623	
	US	High Efficiency PPDU transmit time configuration during 2.4GHz and 5GHz band operation	7/11/2016	62/360,915	
	US	High Efficiency PPDU transmit time configuration during 2.4GHz and 5GHz band operation	8/29/2016	62/380,926	
10,470,214	US	SIGNALING IN A HIGH EFFICIENCY WIRELESS NETWORK	7/11/2017	15/647,197	11/5/2019
EP3270537B1	EP	SIGNALING OF PACKET AND SIGNAL EXTENSIONS IN HE-PPDU DATA UNIT IN A WIRELESS COMMUNICATION NETWORK	7/11/2017	EP17180624.3A	2/13/2019
	US	Receiver behavior for 802.11 Systems	7/15/2016	62/362,965	
	US	Operation optimization for wake-up receivers	7/27/2016	62/367,539	
	US	Operation optimization for wake-up receivers	1/3/2017	62/441,905	
	US	Method of frame exchanges of extended range mode	8/8/2016	62/372,243	
	US	Method of frame exchanges of extended range mode	11/3/2016	62/417,225	
	US	Apparatus and method for two duration field operation	8/11/2016	62/373,794	
	US	Apparatus and method for two duration field operation	8/25/2016	62/379,516	
	US	Rules for Adjustments of Thresholds for Spatial Reuse Operation	8/22/2016	62/378,118	
	US	Rules for Adjustments of Thresholds for Spatial Reuse Operation	8/26/2016	62/380,141	
	US	Rules for Adjustments of Thresholds for Spatial Reuse Operation	9/12/2016	62/393,570	
	US	Rules for Adjustments of Thresholds for Spatial Reuse Operation	10/28/2016	62/414,458	
	US	STBC operation when receiving the control information for Operating Mode Change in HE A-Control field	12/20/2016	62/437,001	
	US	DYNAMIC TRANSMIT CHAIN AVAILABILITY SIGNALING IN WIRELESS DEVICES	12/15/2017	15/844,388	
	US	A modified random access STA's behavior	1/7/2017	62/443,667	
	US	TRIGGER-BASED RANDOM ACCESS FOR WIRELESS DEVICE	1/5/2018	15/863,802	
	US	Rules for Spatial Reuse Group Operation	1/27/2017	62/451,586	
	US	The method of Doppler mode in 11ax	5/26/2017	62/511,914	

10,749,996	US	DOPPLER MODE IN A WIRELESS NETWORK	5/11/2018	15/978,030	8/18/2020
	EP	Preamble and payload for high efficiency (HE) transmission	4/22/2016	EP16784026.3A	
	US	Uplink sounding for WLAN system	11/27/2018	16/201,996	
10,327,246	US	Method and apparatus for wide bandwidth PPDU transmission in a high efficiency wireless LAN	1/25/2018	15/880,307	6/18/2019
	US	Apparatus and methods for TXOP duration field in PHY header	2/25/2019	16/284,929	
10,804,929	US	Communication of user specific control information in a wireless network	3/7/2019	16/295,806	10/13/2020
	EP	Random access ppdu for wlan systems	6/1/2016	EP16804358.6A	
	US	Efficient dl ofdma frequency selectivity harvesting	1/30/2018	15/884,252	
	US	Apparatus and methods for efficient wireless channel usage	11/21/2018	16/198,628	
	EP	Apparatus and method for downlink and uplink multi-user transmissions	9/11/2017	EP16769635.0A	
AU2016261488	AU	Pilot transmission and reception for orthogonal frequency division multiple access	12/5/2017	AU2016261488	9/10/2020
	CN	Pilot transmission and reception for orthogonal frequency division multiple access	1/8/2018	CN201680040375.8A	
	EP	Pilot transmission and reception for orthogonal frequency division multiple access	12/6/2017	EP16793330.8A	
	IN	Pilot transmission and reception for orthogonal frequency division multiple access	12/6/2017	IN201717043758	
JP6791879	JP	Pilot transmission and reception for orthogonal frequency division multiple access	11/7/2017	JP2017558428A	11/9/2020
MX370399B	MX	Pilot transmission and reception for orthogonal frequency division multiple access	11/8/2017	MX2017014352A	4/13/2020
	IN	Resource allocation indication for multi-user multiple-input-multiple-output (MU-MIMO) orthogonal frequency division multiple access (OFDMA) communication	3/26/2018	IN201817011893	
	IN	Protection methods for wireless transmissions	4/30/2018	IN201817016180	
	CN	Communication of user specific control information in a wireless network	7/9/2018	CN201680078380.8A	
	EP	Communication of user specific control information in a wireless network	5/23/2018	EP16864851.7A	
	IN	Communication of user specific control information in a wireless network	5/29/2018	IN201817020045	
	IN	Multiple network allocation vector operation	12/28/2016	IN201817023415	
	PCT	DOPPLER MODE IN A WIRELESS NETWORK	5/25/2018	PCT/US18/34766	
10,541,792	US	Physical layer protocol data unit format in a high efficiency wireless lan	4/10/2019	16/380,923	1/21/2020
10,630,519	US	Random access ppdu for wlan systems	3/12/2019	16/351,280	4/21/2020
	US	Multiple network allocation vector operation	5/6/2019	16/404,591	
	US	Long training field sequence construction	5/7/2019	16/405,933	
	EP	Control information for multi-user transmissions in WLAN systems	8/8/2016	EP16835765.5A	
	US	FRAME TRANSMITTING METHOD AND FRAME RECEIVING METHOD	6/13/2019	16/440,635	
10,516,519	US	Method and apparatus for transmitting response frame based on type in a high efficiency wireless LAN	1/30/2018	15/884,137	12/24/2019
	US	Control information for multi-user transmissions in WLAN systems	6/21/2019	16/449,245	
10,630,444	US	Pilot transmission and reception for orthogonal frequency division multiple access	6/17/2017	16/443,683	4/21/2020
10,623,219	US	Multi-user communication in wireless networks	2/27/2019	16/288,030	4/14/2020
CN108370259B	CN	Apparatus and method for scrambling control field	11/2/2016	CN201680071429.7A	9/6/2019

		information for wireless communications			
	EP	Apparatus and method for scrambling control field information for wireless communications	11/2/2016	EP16862871.7A	
TW1703848B	TW	Apparatus and method for scrambling control field information for wireless communications	11/2/2016	TW108119027	9/1/2020
	US	ACK policy for uplink and downlink MU PPDU	7/10/2019	16/507,968	
	US	Aggregated HE control content in A-MPDU	8/6/2019	16/532,906	
	CN	Apparatus and method for scrambling control field information for wireless communications	8/13/2019	CN201910743394.2A	
10,879,977	US	Receiver address field for multi-user transmissions in wlan systems	11/27/2018	16/201,980	12/29/2020
10,805,956	US	SIGNALING OF PACKET AND SIGNAL EXTENSIONS IN HE-PPDU DATA UNIT IN A WIRELESS COMMUNICATION NETWORK	9/19/2019	16/576,624	10/13/2020
	US	Early detection procedure of high-efficiency frame and decision timing for spatial reuse	10/11/2019	16/600,369	
	CN	Random access ppdu for wlan systems	6/1/2016	CN201680038441.8A	
	CN	Control information for multi-user transmissions in WLAN systems	8/8/2016	CN201680046537.9A	
	CN	Apparatus and methods for TXOP duration field in PHY header	9/28/2019	CN201680056667.0A	
EP3363140	EP	Protection methods for wireless transmissions	10/31/2019	EP16856117.3A	8/12/2020
	IN	DOPPLER MODE IN A WIRELESS NETWORK	12/20/2019	IN201947053092	
	EP	DOPPLER MODE IN A WIRELESS NETWORK	12/19/2019	EP18806952.0A	
	CN	FRAME TRANSMITTING METHOD AND FRAME RECEIVING METHOD	11/26/2019	CN201911176622.9	
	CA	DOPPLER MODE IN A WIRELESS NETWORK	11/22/2019	CA3064834	
10,756,851	US	Multiplexing acknowledgment messages in response to downlink frames	11/28/2019	16/203,501	8/25/2020
	CN	DOPPLER MODE IN A WIRELESS NETWORK	2/3/2020	CN201880050567.6	
	US	Random access ppdu for wlan systems	3/12/2020	16/817,525	
	US	Pilot transmission and reception for orthogonal frequency division multiple access	3/11/2020	16/816,092	
	IN	Control information for multi-user transmissions in WLAN systems	8/8/2016	IN201817003431	
	US	Operation method of station in wireless local area network	5/15/2020	16/875,752	
	US	DOPPLER MODE IN A WIRELESS NETWORK	7/9/2020	16/924,979	
	US	Support for additional decoding processing time in wireless LAN systems	6/5/2020	16/894,531	
	IN	Random access ppdu for wlan systems	12/26/2017	IN201717046600	
	IN	Apparatus and method for scrambling control field information for wireless communications	11/2/2016	IN201817017495	
DE3222107B1	DE	Channel access mechanism	5/16/2017	EP15861642.5A	1/8/2020
GB3222107B1	GB	Channel access mechanism	5/16/2017	EP15861642.5A	1/8/2020
FR3222107B1	FR	Channel access mechanism	5/16/2017	EP15861642.5A	1/8/2020
IE3222107B1	IE	Channel access mechanism	5/16/2017	EP15861642.5A	1/8/2020
DE3164980B1	DE	Physical layer protocol data unit format in a high efficiency wireless lan	1/30/2017	EP15814414.7A	3/11/2020
GB3164980B1	GB	Physical layer protocol data unit format in a high efficiency wireless lan	1/30/2017	EP15814414.7A	3/11/2020
IE3164980B1	IE	Physical layer protocol data unit format in a high efficiency wireless lan	1/30/2017	EP15814414.7A	3/11/2020
DE3266158	DE	Support for additional decoding processing time in wireless LAN systems	3/4/2015	EP16762257.0A	8/5/2020

GB3266158	GB	Support for additional decoding processing time in wireless LAN systems	3/4/2015	EP16762257.0A	8/5/2020
FR3266158	FR	Support for additional decoding processing time in wireless LAN systems	3/4/2015	EP16762257.0A	8/5/2020
DE3357295	DE	Apparatus and methods for TXOP duration field in PHY header	9/28/2018	EP16852491.6A	8/5/2020
GB3357295	GB	Apparatus and methods for TXOP duration field in PHY header	9/28/2018	EP16852491.6A	8/5/2020
FR3357295	FR	Apparatus and methods for TXOP duration field in PHY header	9/28/2018	EP16852491.6A	8/5/2020
DE3363140	DE	Protection methods for wireless transmissions	10/31/2019	EP16856117.3A	8/12/2020
GB3363140	GB	Protection methods for wireless transmissions	10/31/2019	EP16856117.3A	8/12/2020
FR3363140	FR	Protection methods for wireless transmissions	10/31/2019	EP16856117.3A	8/12/2020
DE3270537B1	DE	SIGNALING OF PACKET AND SIGNAL EXTENSIONS IN HE-PPDU DATA UNIT IN A WIRELESS COMMUNICATION NETWORK	7/11/2017	EP17180624.3A	2/13/2019
GB3270537B1	GB	SIGNALING OF PACKET AND SIGNAL EXTENSIONS IN HE-PPDU DATA UNIT IN A WIRELESS COMMUNICATION NETWORK	7/11/2017	EP17180624.3A	2/13/2019
FR3270537B1	FR	SIGNALING OF PACKET AND SIGNAL EXTENSIONS IN HE-PPDU DATA UNIT IN A WIRELESS COMMUNICATION NETWORK	7/11/2017	EP17180624.3A	2/13/2019
	EP	Multiple network allocation vector operation	9/25/2020	EP20198458.0	
	US	SIGNALING OF PACKET AND SIGNAL EXTENSIONS IN HE-PPDU DATA UNIT IN A WIRELESS COMMUNICATION NETWORK	9/14/2020	17/020,524	
	US	Method and apparatus for uplink multi-user transmission in a high efficiency wireless LAN	10/2/2020	17/061,449	
	US	Communication of user specific control information in a wireless network	9/16/2020	17/023,332	
DE3398179	DE	Multiple network allocation vector operation	6/26/2018	EP16882603.0A	11/4/2020
GB3398179	GB	Multiple network allocation vector operation	6/26/2018	EP16882603.0A	11/4/2020
FR3398179	FR	Multiple network allocation vector operation	6/26/2018	EP16882603.0A	11/4/2020
	US	AGGREGATION METHODS AND SYSTEMS FOR MULTI-USER MIMO OR OFDMA OPERATION	9/28/2020	17/035,507	
	JP	Pilot transmission and reception for orthogonal frequency division multiple access	11/5/2020	JP2020184783	
	US	Receiver address field for multi-user transmissions in wlan systems	12/1/2020	17/108,930	
	US	Methods for uplink multifuser signaling and transmission	12/10/2020	17/118,525	
	CN	System and method for packet information indication in communication systems	12/7/2020	CN202011418191.5	
	US	Block acknowledgment for multi-user transmissions in WLAN systems	1/5/2021	17/142,105	
	US	Method for transmitting and receiving frame	12/31/2020	17/139,826	
10,904,920	US	TRIGGER-BASED RANDOM ACCESS FOR WIRELESS DEVICE	12/31/2020	17/139,884	1/26/2021
	KR	HEW CCA	1/27/2021	10-2021-0011499	

PATENT

RECORDED: 03/08/2023

REEL: 064920 FRAME: 0970