

TRADEMARK ASSIGNMENT COVER SHEET

Electronic Version v1.1
Stylesheet Version v1.2

ETAS ID: TM711692

SUBMISSION TYPE:	NEW ASSIGNMENT		
NATURE OF CONVEYANCE:	SECURITY INTEREST		
CONVEYING PARTY DATA			
Name	Formerly	Execution Date	Entity Type
PARALLEL WIRELESS, INC.		02/25/2022	Corporation: DELAWARE
RECEIVING PARTY DATA			
Name:	Venture Lending & Leasing IX, Inc.		
Street Address:	104 La Mesa Drive, Suite 102		
City:	Portola Valley		
State/Country:	CALIFORNIA		
Postal Code:	94028		
Entity Type:	Corporation: MARYLAND		
Name:	WTI Fund X, Inc.		
Street Address:	104 La Mesa Drive, Suite 102		
City:	Portola Valley		
State/Country:	CALIFORNIA		
Postal Code:	94028		
Entity Type:	Corporation: MARYLAND		
PROPERTY NUMBERS Total: 19			
Property Type	Number	Word Mark	
Registration Number:	5277022	CWS	
Registration Number:	5083877	HETNET SERVICES CLOUD	
Registration Number:	5056404	HETNET GATEWAY	
Registration Number:	5106713	CONVERGED WIRELESS SYSTEM	
Registration Number:	4923518	UNI-MANAGE	
Registration Number:	5015420	PARALLEL WIRELESS	
Registration Number:	4914400	UNI-MANAGE EMS	
Registration Number:	5022996	PARALLEL WIRELESS HETNET SERVICES CLOUD	
Registration Number:	4832579	P	
Registration Number:	4744465	BYOC	
Registration Number:	4590063	LMLTE	
Registration Number:	4573333	PARALLEL WIRELESS	
Serial Number:	88578830	REIMAGINE YOUR NETWORK	

OP \$490.00 5277022

Property Type	Number	Word Mark
Serial Number:	88539835	PARALLEL WIRELESS
Serial Number:	88411438	5G STARTS HERE
Serial Number:	88337537	ALL G
Serial Number:	87640948	BHM
Serial Number:	86903595	PARALLEL WIRELESS
Serial Number:	86317019	BYOC

CORRESPONDENCE DATA

Fax Number: 4157774961
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.
Phone: 415 981 1400
Email: nsust@foxrothschild.com
Correspondent Name: Jeff Klugman
Address Line 1: 1 Front Street
Address Line 2: Suite 3200
Address Line 4: San Francisco, CALIFORNIA 94111

NAME OF SUBMITTER:	Jeffrey T. Klugman
SIGNATURE:	/Jeffrey T. Klugman/
DATE SIGNED:	03/02/2022

Total Attachments: 30
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INTELLECTUAL PROPERTY SECURITY AGREEMENT

This Intellectual Property Security Agreement (this “Agreement”) is made as of February 25, 2022, between PARALLEL WIRELESS, INC., a Delaware corporation (“Grantor”), and VENTURE LENDING & LEASING IX, INC. (“Fund 9”) and WTI FUND X, INC. (“Fund 10”), both Maryland corporations (sometimes referred to herein individually and together as “Secured Party”).

RECITALS

A. Pursuant to that certain Loan and Security Agreement of even date herewith between Grantor, as borrower, and Secured Party, as lender (as amended, restated, supplemented or otherwise modified from time to time, the “Loan Agreement”), Secured Party has agreed to make certain advances of money and to extend certain financial accommodations to Grantor (the “Loans”) in the amounts and manner set forth in the Loan Agreement. All capitalized terms used herein without definition shall have the meanings ascribed to them in the Loan Agreement.

B. Secured Party is willing to make the Loans to Grantor, but only upon the condition, among others, that Grantor shall grant to Secured Party a security interest in substantially all of Grantor’s personal property whether presently existing or hereafter acquired. To that end, Grantor has executed in favor of Secured Party the Loan Agreement granting a security interest in all Collateral, and is executing this Agreement with respect to certain items of Intellectual Property, in particular.

NOW, THEREFORE, THE PARTIES HERETO AGREE AS FOLLOWS:

1. Grant of Security Interest. As collateral security for the prompt and complete payment and performance of all of Grantor’s present or future Obligations, Grantor hereby grants a security interest to Secured Party, as security, in and to Grantor’s entire right, title and interest in, to and under the following Intellectual Property, now owned or hereafter acquired by Grantor or in which Grantor now holds or hereafter acquires any interest (all of which shall collectively be called the “Collateral” for purposes of this Agreement):

(a) Any and all copyrights, whether registered or unregistered, held pursuant to the laws of the United States, any State thereof or of any other country; all registrations, applications and recordings in the United States Copyright Office or in any similar office or agency of the United States, and State thereof or any other country; all continuations, renewals, or extensions thereof; and any registrations to be issued under any pending applications, including without limitation those set forth on Exhibit A attached hereto (collectively, the “Copyrights”);

(b) All letters patent of, or rights corresponding thereto in, the United States or any other country, all registrations and recordings thereof, and all applications for letters patent of, or rights corresponding thereto in, the United States or any other country, including, without limitation, registrations, recordings and applications in the United States Patent and Trademark Office or in any similar office or agency of the United States, any State thereof or any other country; all reissues, continuations, continuations-in-part or extensions thereof; all petty patents, divisionals, and patents of addition; and all patents to be issued under any such applications, including without limitation the patents and patent applications set forth on Exhibit B attached hereto (collectively, the “Patents”);

(c) All trademarks, trade names, corporate names, business names, trade styles, service marks, logos, other source or business identifiers, prints and labels on which any of the foregoing have appeared or appear, designs and general intangibles of like nature, now existing or hereafter adopted or acquired, all registrations and recordings thereof, and any applications in connection therewith, including, without limitation, registrations, recordings and applications in the United States Patent and Trademark Office or in any similar office or agency of the United States, any State thereof or any other country or any political subdivision thereof, and reissues, extensions or

renewals thereof, and the entire goodwill of the business of Grantor connected with and symbolized by such trademarks, including without limitation those set forth on Exhibit C attached hereto (collectively, the “Trademarks”);

(d) Any and all claims for damages by way of past, present and future infringement of any of the rights included above, with the right, but not the obligation, to sue for and collect such damages for said use or infringement of the intellectual property rights identified above;

(e) All licenses or other rights to use any of the Copyrights, Patents or Trademarks, and all license fees and royalties arising from such use to the extent permitted by such license or rights;

(f) All amendments, renewals and extensions of any of the Copyrights, Trademarks or Patents;
and

(g) All proceeds and products of the foregoing, including without limitation all payments under insurance or any indemnity or warranty payable in respect of any of the foregoing.

Notwithstanding the foregoing the term “Collateral” shall not include: (a) “intent-to-use” trademarks at all times prior to the first use thereof, whether by the actual use thereof in commerce, the recording of a statement of use with the United States Patent and Trademark Office or otherwise, but only to the extent the granting of a security interest in such “intent to use” trademarks would adversely affect Grantor’s rights to such trademarks under applicable law or (b) any contract, instrument or chattel paper in which Grantor has any right, title or interest if and to the extent such contract, instrument or chattel paper includes a provision containing a restriction on assignment such that the creation of a security interest in the right, title or interest of Grantor therein would be prohibited and would, in and of itself, cause or result in a default thereunder enabling another person party to such contract, instrument or chattel paper to enforce any remedy with respect thereto; provided, however, that the foregoing exclusion shall not apply if (i) such prohibition has been waived or such other person has otherwise consented to the creation hereunder of a security interest in such contract, instrument or chattel paper, or (ii) such prohibition would be rendered ineffective pursuant to Sections 9-407(a) or 9-408(a) of the UCC, as applicable and as then in effect in any relevant jurisdiction, or any other applicable law (including the Bankruptcy Code or principles of equity); provided further that immediately upon the ineffectiveness, lapse or termination of any such provision, the term “Collateral” shall include, and Grantor shall be deemed to have granted a security interest in, all its rights, title and interests in and to such contract, instrument or chattel paper as if such provision had never been in effect; and provided further that the foregoing exclusion shall in no way be construed so as to limit, impair or otherwise affect Secured Party’s unconditional continuing security interest in and to all rights, title and interests of Grantor in or to any payment obligations or other rights to receive monies due or to become due under any such contract, instrument or chattel paper and in any such monies and other proceeds of such contract, instrument or chattel paper.

2. Covenants and Warranties. Grantor represents, warrants, covenants and agrees as follows:

(a) Grantor has rights (as defined in the UCC) in the Collateral, except for Permitted Liens;

(b) During the term of this Agreement, Grantor will not transfer or otherwise encumber any interest in the Collateral, except for Permitted Liens and except for transfers otherwise permitted under the Loan Agreement;

(c) To its knowledge, each of the material Patents is valid and enforceable, and no material part of the Collateral has been judged invalid or unenforceable, in whole or in part, and no claim has been made that any material part of the Collateral violates the rights of any third party;

(d) **Grantor shall deliver to Secured Party within thirty (30) days of the last day of each fiscal quarter in which there is a material change or update to the reported contents from the previous quarter, a report signed by Grantor, in form reasonably acceptable to Secured Party, listing (i) any applications or**

registrations that Grantor has made or filed in respect of any patents, copyrights or trademarks, (ii) the status of any outstanding applications or registrations and (iii) any material change in the composition of the Collateral;

(e) Grantor shall use reasonable commercial efforts to (i) protect, defend and maintain the validity and enforceability of the Trademarks, Patents and Copyrights material to Grantor's business, (ii) detect infringements of the Trademarks, Patents and Copyrights material to Grantor's business and promptly advise Secured Party in writing of material infringements detected, and (iii) not allow any material Trademarks, Patents or Copyrights material to Grantor's business to be abandoned, forfeited or dedicated to the public unless Grantor deems it to be in the best interest of Grantor's business;

(f) Grantor shall apply for registration (to the extent registerable and not already registered) with the United States Patent and Trademark Office or the United States Copyright Office, as applicable: (i) those intellectual property rights listed on Exhibits A, B and C hereto within thirty (30) days of the date of this Agreement; and (ii) those additional intellectual property rights developed or acquired by Grantor from time to time in connection with any product or service, prior to the sale or licensing of such product or the rendering of such service to any third party (including without limitation revisions or additions to the intellectual property rights listed on such Exhibits A, B and C), except, in each case, with respect to such rights that Grantor determines in its sole but reasonable commercial judgment need not be registered to protect its own business interests. Grantor shall, from time to time, execute and file such other instruments, and take such further actions as Secured Party may reasonably request from time to time to perfect or continue the perfection of Secured Party's interest in the Collateral; and

(g) Grantor shall not enter into any agreement that would materially impair or conflict with Grantor's obligations hereunder without Secured Party's prior written consent, which consent shall not be unreasonably withheld or delayed.

3. Further Assurances; Attorney in Fact.

(a) On a continuing basis, Grantor will make, execute, acknowledge and deliver, and file and record in the proper filing and recording places in the United States, all such instruments, including appropriate financing and continuation statements and collateral agreements and filings with the United States Patent and Trademark Office and the Register of Copyrights, and take all such action as may reasonably be deemed necessary or advisable and are reasonably requested by Secured Party, to perfect Secured Party's security interest in all Copyrights, Patents and Trademarks and otherwise to carry out the intent and purposes of this Agreement, or for assuring and confirming to Secured Party the grant or perfection of a security interest in all Collateral.

(b) Grantor hereby irrevocably appoints Secured Party as Grantor's attorney-in-fact, with full authority in the place and stead of Grantor and in the name of Grantor, from time to time in Secured Party's reasonable discretion, to take any of the following actions (i) to modify, in its sole discretion, this Agreement without first obtaining Grantor's approval or signature to such modification solely by amending Exhibits A, B and C, hereof, as appropriate, to include reference to any right, title or interest in any Copyrights, Patents or Trademarks acquired by Grantor after the execution hereof or to delete any reference to any right, title or interest in any Copyrights, Patents or Trademarks in which Grantor no longer has or claims any right, title or interest, (ii) to file, in its sole discretion, one or more financing or continuation statements and amendments thereto, relative to any of the Collateral without the signature of Grantor where permitted by law, and (iii) subject to the Forbearance Period, after the occurrence and during the continuance of an Event of Default, to transfer the Collateral into the name of Secured Party or a third party to the extent permitted under the California Uniform Commercial Code.

4. Events of Default. The occurrence of any of the following shall constitute an Event of Default under this Agreement:

(a) An Event of Default under the Loan Agreement; or

(b) Grantor breaches in any material respect any warranty or agreement made by Grantor in this Agreement and, as to any breach that is capable of cure, Grantor fails to cure such breach within thirty (30) days of the sooner to occur of Grantor's receipt of notice of such breach from Secured Party or the date on which such breach first becomes known to a responsible officer of Grantor.

5. Amendments. This Agreement may be amended only by a written instrument signed by both parties hereto, except for amendments permitted under Section 3 hereof to be made by Secured Party alone.

6. Counterparts. This Agreement may be executed in two or more counterparts, each of which shall be deemed an original but all of which together shall constitute the same instrument.

7. Several Nature of Secured Party's Obligations and Rights; Pari Passu Security Interests. This Agreement is and shall be interpreted for all purposes as separate and distinct agreements between Grantor and Fund 9, on the one hand, and Grantor and Fund 10, on the other hand, and nothing in this Agreement shall be deemed a joint venture, partnership or other association between Fund 9 and Fund 10. Each reference in this Agreement to "Secured Party" shall mean and refer to each of Fund 9 and Fund 10, singly and independent of one another. Without limiting the generality of the foregoing, the covenants and other obligations of "Secured Party" under this Agreement are several and not joint obligations of Fund 9 and Fund 10, and all rights and remedies of "Secured Party" under this Agreement may be exercised by Fund 9 and/or Fund 10 independently of one another. The security interests granted by Grantor to each of Fund 9 and Fund 10 hereunder and under the Loan Agreement shall be deemed to have been granted and perfected at the same time and shall be of equal priority.

[Signature Pages Follow]

[Signature page to Intellectual Property Security Agreement]

IN WITNESS WHEREOF, the parties have executed this Agreement as of the date first above written.

GRANTOR:

PARALLEL WIRELESS, INC.

By: Christopher Sullivan
Name: Christopher Sullivan
Title: Chief Financial Officer

Address for Notices:

100 Innovative Way
Nashua, NH 03062
Attn: General Counsel
Phone #: 603-589-9937

SECURED PARTY:

VENTURE LENDING & LEASING IX, INC.

By: _____
Name: _____
Title: _____

Address for Notices:

104 La Mesa Dr., Suite 102
Portola Valley, CA 94028
Attn: Chief Financial Officer
Fax # 650-234-4343
Phone # 650-234-4300

SECURED PARTY:

WTI FUND X, INC.

By: _____
Name: _____
Title: _____

Address for Notices:

104 La Mesa Dr., Suite 102
Portola Valley, CA 94028
Attn: Chief Financial Officer
Fax # 650-234-4343
Phone # 650-234-4300

[Signature page to Intellectual Property Security Agreement]

IN WITNESS WHEREOF, the parties have executed this Agreement as of the date first above written.

GRANTOR:

PARALLEL WIRELESS, INC.


By: _____
Name: _____
Title: _____

Address for Notices:

100 Innovative Way
Nashua, NH 03062
Attn: General Counsel
Phone #: 603-589-9937

SECURED PARTY:

VENTURE LENDING & LEASING IX, INC.


By:  _____
Name: David Wanek
Title: President and CEO

Address for Notices:

104 La Mesa Dr., Suite 102
Portola Valley, CA 94028
Attn: Chief Financial Officer
Fax # 650-234-4343
Phone # 650-234-4300

SECURED PARTY:

WTI FUND X, INC.

By:  _____
Name: David Wanek
Title: President and CEO

Address for Notices:

104 La Mesa Dr., Suite 102
Portola Valley, CA 94028
Attn: Chief Financial Officer
Fax # 650-234-4343
Phone # 650-234-4300

EXHIBIT A

Copyrights

Description

Registration Number

Registration Date

None

EXHIBIT B

Patents

Utility:

Filing Date	Grant Date	Application No.	
February 26, 2019	October 26, 2021	16/286548	Microcomponent Massive MIMO Arrays
October 26, 2021	-	17/511519	Microcomponent Massive MIMO Arrays
January 29, 2021	-	17/264776	System and Method for Massive MIMO Communication (IN
May 4, 2020	-	16/866540	Minature Antenna Array With Polar Combining Architectur
July 7, 2021	-	17/369951	6G ORAN STAR Array With Simultaneous Transmit And F
May 8, 2013	November 4, 2014	13/889631	Heterogeneous Mesh Network and a Multi-RAT Node Use
September 12, 2013	August 18, 2015	14/024717	Heterogeneous Self-Organizing Network for Access and E
September 24, 2013	November 8, 2016	14/034915	Dynamic Multi-Access Wireless Network Virtualization
January 3, 2014	August 11, 2015	14/146857	Heterogeneous Self-Organizing Network for Access and E
November 3, 2014	September 10, 2019	14/531996	Heterogeneous Mesh Network and a Multi-RAT Node Use
July 20, 2015	July 3, 2018	14/804016	Heterogeneous Self-Organizing Network for Access and E
May 31, 2016	November 19, 2019	15/169274	Dynamic Multi-Access Wireless Network Virtualization
June 20, 2018	December 15, 2020	16/013727	Heterogeneous Mesh Network and a Multi-RAT Node Use
July 3, 2018	-	16/026772	Heterogeneous Self-Organizing Network for Access and E
February 11, 2020	-	16/787957	Heterogeneous Self-Organizing Network and a Multi-RAT
November 19, 2019	October 19, 2021	16/688292	Dynamic Multi-Access Wireless Network Virtualization
February 10, 2020	-	16/786973	Heterogeneous Self-Organizing Network for Access and E
February 11, 2020	November 30, 2021	16/788115	Dynamic Multi-Access Wireless Network Virtualization
May 18, 2020	-	16/876710	Heterogeneous Self-Organizing Network for Access and E
December 15, 2020	-	17/123096	Heterogeneous Mesh Network and a Multi-RAT Node Use
April 17, 2015	-	14/436852	Wireless Broadband Network with Integrated Streaming M
February 18, 2014	October 21, 2014	14/183176	Methods of incorporating an Ad Hoc Cellular Network into
June 23, 2014	April 11, 2017	14/311765	Methods of Incorporating an Ad Hoc Cellular Network into
June 23, 2014	July 10, 2018	14/311829	Methods of Incorporating an Ad Hoc Cellular Network into
June 23, 2014	September 27, 2016	14/311835	Methods of Incorporating an Ad Hoc Cellular Network into
June 23, 2014	January 5, 2016	14/311839	Methods of Incorporating an Ad Hoc Cellular Network into
January 5, 2016	July 10, 2018	14/988508	Methods of Incorporating an Ad Hoc Cellular Network into
July 10, 2018	September 15, 2020	16/031735	Methods of Incorporating an Ad Hoc Cellular Network into
April 1, 2018	August 24, 2021	16/372082	TV Whitespace for Public Safety
February 12, 2020	October 12, 2021	16/789082	Methods of Incorporating an Ad Hoc Cellular Network into
September 15, 2015	May 29, 2018	14/777246	Methods of Enabling Base Station Functionality in a User
May 29, 2018	January 21, 2020	15/991741	Methods of Enabling Base Station Functionality in a User
January 21, 2020	-	16/748499	Methods of Enabling Base Station Functionality in a User
March 14, 2014	February 28, 2017	14/211355	Start-Up Sequence and Configuration for a Radio Node
May 29, 2014	September 27, 2016	14/289821	Method of Connecting Security Gateway to a Mesh Netwo
September 27, 2016	October 24, 2017	15/278017	Method of Connecting Security Gateway to a Mesh Netwo
May 29, 2014	-	14/290280	Intelligent Mesh Network Selection

November 15, 2016	June 18, 2019	15/351914	Intelligent Mesh Network Selection
August 6, 2014	July 5, 2016	14/453365	Systems and Methods for Providing LTE-Based Backhaul
July 5, 2016	December 25, 2018	15/202496	Systems and Methods for Providing LTE-Based Backhaul
December 14, 2018	November 24, 2020	16/220960	Systems and Methods for Providing LTE-Based Backhaul
November 24, 2020	-	17/103842	Systems and Methods for Providing LTE-Based Backhaul
August 7, 2014	February 19, 2019	14/454670	Multi-RAT Node Used for Search and Rescue
February 5, 2019	December 10, 2019	16/267970	Multi-RAT Node Used for Search and Rescue
September 29, 2014	February 21, 2017	14/500989	Adjusting Transmit Power Across a Network
February 21, 2017	November 27, 2018	15/438641	Adjusting Transmit Power Across a Network
June 10, 2019	-	16/436072	Adjusting Transmit Power Across a Network
October 3, 2014	October 31, 2017	14/506587	Multicast and Broadcast Services Over a Mesh Network
October 31, 2017	November 19, 2019	15/800030	Multicast and Broadcast Services Over a Mesh Network
November 19, 2019	January 4, 2022	16/688756	Multicast and Broadcast Services Over a Mesh Network
October 8, 2014	September 17, 2019	14/510074	Parameter Optimization and Event Prediction Based on C
September 17, 2019	January 18, 2022	16/573014	Parameter Optimization and Event Prediction Based on C
October 24, 2014	April 17, 2018	14/523401	Full Duplex Services Using RTS/CTS
November 14, 2014	August 7, 2018	14/542544	Adjacent Channel Interference Cancellation in Multi-Chan
December 15, 2014	October 25, 2016	14/571250	Virtualization of the Evolved Packet Core to Create a Loca
October 25, 2016	February 25, 2020	15/334270	Virtualization of the Evolved Packet Core to Create a Loca
February 25, 2020	August 17, 2021	16/800295	Virtualization of the Evolved Packet Core to Create a Loca
March 9, 2015	March 17, 2020	14/642544	Federated X2 Gateway
September 29, 2017	June 1, 2021	15/721728	Handovers with Simplified Network Topology
October 12, 2017	August 11, 2020	15/782819	X2 Brokering Between Inter-3GPP Release eNodeB's
January 28, 2020	-	16/774186	Federated X2 Gateway
August 11, 2020	-	16/990947	X2 Brokering Between Inter-3GPP Release eNodeB's
December 20, 2021	-	17/555772	Federated X2 Gateway
May 13, 2015	November 28, 2017	14/711293	Multi-Egress Backhaul
November 28, 2017	October 15, 2019	15/823808	Multi-Egress Backhaul
October 15, 2019	February 16, 2021	16/653359	Multi-Egress Backhaul
June 9, 2015	March 19, 2019	14/735007	Frequency and Phase Synchronization Using Full Duplex F
July 22, 2015	November 6, 2018	14/806594	Signaling Storm Reduction from Radio Networks
November 6, 2018	September 21, 2021	16/181794	Signaling Storm Reduction from Radio Networks
February 17, 2020	October 26, 2021	16/792556	Signaling Storm Reduction from Radio Networks
August 10, 2015	February 20, 2018	14/822839	Congestion and Overload Reduction
February 20, 2018	January 12, 2021	15/900615	Congestion and Overload Reduction
December 22, 2020	-	17/131710	Congestion and Overload Reduction
August 17, 2015	September 8, 2020	14/828432	Inter-Cell Interference Mitigation
September 1, 2020	-	17/009651	Inter-Cell Interference Mitigation
September 24, 2015	February 28, 2017	14/864194	Radio Operation Switch Based on GPS Mobility Data
February 28, 2017	March 20, 2018	15/445531	Radio Operation Switch Based on GPS Mobility Data
March 20, 2018	June 25, 2019	15/926739	Radio Operation Switch Based on GPS Mobility Data
June 25, 2019	August 11, 2020	16/451271	Radio Operation Switch Based on GPS Mobility Data
August 11, 2020	September 7, 2021	16/990960	Radio Operation Switch Based on GPS Mobility Data

October 6, 2015	March 20, 2018	14/876808	Full-Duplex Mesh Networks
March 20, 2018	May 26, 2020	15/926723	Full-Duplex Mesh Networks
May 26, 2020	-	16/883978	Full-Duplex Mesh Networks
November 19, 2015	March 6, 2018	14/946749	Enhanced Mobile Base Station
March 6, 2018	July 9, 2019	15/913618	Enhanced Mobile Base Station
March 7, 2018	October 9, 2018	15/914891	Enhanced Mobile Base Station
July 9, 2019	October 27, 2020	16/506624	Enhanced Mobile Base Station
October 27, 2020	-	17/081868	Enhanced Mobile Base Station
November 9, 2015	August 25, 2020	14/936267	Self-Calibrating and Self-Adjusting Network
April 3, 2017	August 11, 2020	15/478206	Signal Quality Database
August 11, 2020	-	16/990944	Signal Quality Database
August 25, 2020	October 26, 2021	17/002410	Self-Calibrating and Self-Adjusting Network
November 2, 2015	February 19, 2019	14/930535	Improved Tracking Area Planning
February 19, 2019	June 30, 2020	16/279744	Tracking Area Planning
June 30, 2020	-	16/917783	Tracking Area Planning
September 14, 2015	March 12, 2019	14/853647	Low-Latency Inter-eNodeB Coordinated Multi-Point Trans
March 12, 2019	June 2, 2020	16/299233	Low-Latency Inter-eNodeB Coordinated Multi-Point Trans
June 2, 2020	-	16/890983	Low-Latency Inter-eNodeB Coordinated Multi-Point Trans
January 20, 2016	November 13, 2018	15/002383	Multi-RAT Heterogeneous Carrier Aggregation
November 13, 2018	June 2, 2020	16/189907	Multi-RAT Heterogeneous Carrier Aggregation
June 2, 2020	-	16/890980	Multi-RAT Heterogeneous Carrier Aggregation
September 28, 2015	September 26, 2017	14/868074	Enabling High-Power UE Transmission
September 26, 2017	July 2, 2019	15/716428	Enabling High-Power UE Transmission
July 2, 2019	-	16/460228	Enabling High-Power UE Transmission
November 19, 2015	March 20, 2018	14/946129	HealthCheck Access Point
April 24, 2018	April 23, 2019	15/961121	HealthCheck Access Point
March 20, 2018	April 28, 2020	15/926769	HealthCheck Access Point
April 28, 2020	-	16/861188	HealthCheck Access Point
October 26, 2015	October 30, 2018	14/923392	Out-of-Band Power Down Notification
July 25, 2016	May 15, 2018	15/219267	SON Controlled-DFS
May 15, 2018	April 28, 2020	15/980320	SON Controlled-DFS
April 28, 2020	-	16/861188	SON Controlled-DFS
April 21, 2016	July 10, 2018	15/135535	SIM Whitelisting and Multi-Operator Core Networks
July 10, 2018	-	16/031670	SIM Whitelisting and Multi-Operator Core Networks
November 21, 2019	October 5, 2021	16/691599	SIM Whitelisting and Multi-Operator Core Networks
October 5, 2021	-	17/494297	SIM Whitelisting and Multi-Operator Core Networks
October 20, 2016	February 20, 2018	15/299459	X2 Protocol Programmability
February 20, 2018	December 17, 2019	15/900439	X2 Protocol Programmability
December 17, 2019	January 26, 2021	16/717579	X2 Protocol Programmability
February 25, 2020	December 8, 2020	16/801136	Xx/Xn Protocol Programmability
December 8, 2020	-	17/115786	Xx/Xn Protocol Programmability
November 16, 2015	December 11, 2018	14/942950	Seamless Mobile Handover
December 10, 2018	December 10, 2019	16/215200	Seamless Mobile Handover

January 31, 2019	November 2, 2021	16/264429	Community Self-Managed Radio Access Network
November 2, 2021	-	17/517606	Community Self-Managed Radio Access Network
March 2, 2016	August 21, 2018	15/059284	Software-Enabled Remote Licensing and Provisioning
August 22, 2018	September 1, 2020	16/107656	Software-Enabled Remote Licensing and Provisioning
September 1, 2020	-	17/009602	Software-Enabled Remote Licensing and Provisioning
January 13, 2017	July 21, 2020	15/406660	Inter-Cell Fractional Frequency Reuse Scheduler
February 19, 2020	November 30, 2021	16/794889	Inter-Cell Fractional Frequency Reuse Scheduler
July 21, 2020	December 28, 2021	16/934794	Inter-Cell Fractional Frequency Reuse Scheduler
November 30, 2021	-	17/539048	Inter-Cell Fractional Frequency Reuse Scheduler
December 28, 2021	-	17/563402	Inter-Cell Fractional Frequency Reuse Scheduler
March 21, 2016	October 8, 2019	15/076644	Content-Aware Inter-RAT RAB Steering
October 8, 2019	-	16/596153	Content-Aware Inter-RAT RAB Steering
March 30, 2016	October 9, 2018	15/086030	Power Management for Vehicle-Mounted Base Station
October 9, 2018	January 25, 2022	16/155514	Power Management for Vehicle-Mounted Base Station
August 18, 2016	December 8, 2020	15/241060	Cell ID Disambiguation
December 31, 2018	December 22, 2020	16/237191	Cell ID Disambiguation
December 22, 2020	-	17/131730	Cell ID Disambiguation
April 27, 2021	-	17/242095	Neighbor Relations for Moving Cells
November 10, 2017	April 13, 2021	15/810003	Hand-in With Topology Hiding
July 5, 2018	April 13, 2021	16/028069	Hand-in With Topology Hiding
April 13, 2021	-	17/229209	Hand-in With Topology Hiding
August 15, 2017	March 19, 2019	15/678104	S2 Proxy for Multi-Architecture Virtualization
September 15, 2017	January 7, 2020	15/706663	VoIP and Native Carrier Call Integration
March 19, 2019	December 1, 2020	16/357385	Convergence Proxy for Core Network Virtualization
January 7, 2020	-	16/736380	VoIP and Native Carrier Call Integration
March 8, 2021	-	17/195343	Convergence Proxy for Core Network Virtualization
May 11, 2021	-	17/317881	VoIP and Native Carrier Call Integration
January 25, 2022	-	17/584184	VoIP and Native Carrier Call Integration
April 18, 2016	November 13, 2018	15/132229	MaxMesh: Mesh Backhaul Routing
October 23, 2018	-	16/168247	MaxMesh: Mesh Backhaul Routing
July 20, 2020	-	16/932967	MaxMesh: Mesh Backhaul Routing
May 9, 2016	May 15, 2018	15/149941	Virtual Guard Bands
May 15, 2018	August 13, 2019	15/980346	Virtual Guard Bands
August 13, 2019	November 9, 2021	16/539690	Virtual Guard Bands
May 15, 2020	-	16/875858	Virtual Guard Bands
September 15, 2020	-	17/021287	Virtual Guard Bands
June 3, 2016	June 11, 2019	15/173613	Inter-PGW Handover Architecture
June 11, 2019	June 1, 2021	16/437950	Inter-PGW Handover Architecture
March 30, 2021	-	17/217431	Inter-PGW Handover Architecture
March 11, 2019	October 26, 2021	16/298072	Role Assignment for Caching
October 26, 2021	-	17/511527	Role Assignment for Caching
November 20, 2019	May 18, 2021	16/689821	Secure Software Update in a Wireless Mesh Radio Network
May 18, 2021	-	17/323977	Secure Software Update in a Wireless Mesh Radio Network

May 24, 2016	November 16, 2021	15/162593	Wireless Backhaul Resiliency
November 15, 2021	-	17/526826	Wireless Backhaul Resiliency
June 20, 2016	February 12, 2019	15/187762	SSID to QCI Mapping
October 30, 2018	April 27, 2021	16/174976	SSID to QCI Mapping
June 8, 2016	April 3, 2018	15/177336	Single-Radome Multi-Antenna Assembly
July 11, 2016	October 6, 2020	15/207494	Enhanced X2 Protocol
October 6, 2020	-	17/064289	Enhanced X2 Protocol
August 24, 2017	March 12, 2019	15/686152	Optimized Train Solution
March 11, 2019	December 8, 2020	16/298562	Optimized Train Solution
December 8, 2020	-	17/115030	Optimized Train Solution
September 12, 2016	May 16, 2017	15/263365	Antenna-Integrated Radio with Wireless Fronthaul
May 16, 2017	January 8, 2019	15/597095	Antenna-Integrated Radio with Wireless Fronthaul
January 7, 2019	July 14, 2020	16/241527	Antenna-Integrated Radio with Wireless Fronthaul
July 14, 2020	November 2, 2021	16/929101	Antenna Integrated Radio with Wireless Fronthaul
November 2, 2021	-	17/517602	Antenna Integrated Radio with Wireless Fronthaul
September 8, 2016	June 19, 2018	15/260315	RAN for Multimedia Delivery
June 19, 2018	January 5, 2021	16/012601	RAN for Multimedia Delivery
June 19, 2018	February 12, 2019	16/012105	RAN for Multimedia Delivery
January 8, 2019	December 17, 2019	16/243002	RAN for Multimedia Delivery
December 17, 2019	March 2, 2021	16/717687	RAN for Multimedia Delivery
June 30, 2017	September 15, 2020	15/640429	Intelligent RAN Flow Management and Distributed Policy
September 15, 2020	-	17/021995	Intelligent RAN Flow Management and Distributed Policy
March 20, 2017	April 16, 2019	15/464333	luGW Architecture
March 27, 2017	March 19, 2019	15/470430	Base Station Grouping for Topology Hiding
September 22, 2017	June 18, 2019	15/713584	luGW Architecture with RTP Localization
February 5, 2018	-	15/889202	UE Mobility Across Super-Cells
March 18, 2019	August 18, 2020	16/357222	Base Station Grouping for Topology Hiding
April 16, 2019	November 17, 2020	16/385565	luGW Architecture
June 18, 2019	April 20, 2021	16/444704	luGW Architecture with RTP Localization
February 25, 2020	April 20, 2021	16/800389	Base Station Grouping for Topology Hiding
November 17, 2020	-	16/950750	luGW Architecture
April 20, 2021	-	17/235890	luGW Architecture with RTP Localization
September 1, 2017	September 1, 2020	15/694762	Multi-Radio Access Technology Paging
July 31, 2018	June 9, 2020	16/051345	Paging Optimization for VeNB
June 9, 2020	June 15, 2021	16/897179	Paging Optimization for VeNB
September 1, 2020	June 22, 2021	17/009627	Multi-Radio Access Technology Paging
June 15, 2021	-	17/348729	Paging Optimization for VeNB
September 7, 2017	April 28, 2020	15/698638	Multi-Stage Handover
April 28, 2020	-	16/861194	Multi-Stage Handover
October 31, 2016	September 14, 2021	15/339916	Elastic Local and Global Scheduling For Cellular Infrastructure
February 25, 2020	-	16/800263	Elastic Scheduling
September 14, 2021	-	17/475328	Elastic Local and Global Scheduling For Cellular Infrastructure
February 17, 2017	-	15/436758	Handling Unresponsive MMEs

TBF	-	TBF	Handling Unresponsive MMEs
May 26, 2017	July 2, 2019	15/607425	End-to-End Prioritization for Mobile Base Station
July 2, 2019	-	16/460162	End-to-End Prioritization for Mobile Base Station
February 25, 2020	-	16/801065	End-to-End Prioritization for Mobile Base Station
April 6, 2021	-	17/223450	End-to-End Prioritization for Mobile Base Station
November 3, 2017	April 7, 2020	15/803737	Traffic Shaping and End-to-End Prioritization
April 7, 2020	May 18, 2021	16/842222	Traffic Shaping and End-to-End Prioritization
May 18, 2021	-	17/323984	Traffic Shaping and End-to-End Prioritization
April 4, 2017	November 20, 2018	15/479273	PHY Error Indication Messaging
November 20, 2018	September 1, 2020	16/196763	PHY Error Indication Messaging
September 1, 2020	-	17/009638	PHY Error Indication Messaging
April 10, 2017	April 9, 2019	15/484121	Uplink Measurements for Wireless Systems
April 9, 2019	April 14, 2020	16/378850	Uplink Measurements for Wireless Systems
April 14, 2020	February 23, 2021	16/848744	Uplink Measurements for Wireless Systems
February 23, 2021	-	17/183337	Uplink Measurements for Wireless Systems
November 30, 2017	-	15/828427	Enhanced CSFB
April 17, 2017	June 4, 2019	15/489722	Mitigation of Negative Delay via Half CP Shift
June 4, 2019	December 1, 2020	16/430757	Mitigation of Negative Delay via Half CP Shift
December 1, 2020	-	17/109136	Mitigation of Negative Delay via Half CP Shift
December 1, 2020	-	17/109139	Convergence Proxy for Core Network Virtualization
December 8, 2017	June 16, 2020	15/836754	Dynamic Public Warning System for In-Vehicle eNodeB
June 16, 2020	August 17, 2021	16/902516	Dynamic Public Warning System for In-Vehicle eNodeB
January 27, 2018	February 23, 2021	15/883083	CDMA/EVDO Virtualization
February 23, 2021	-	17/183339	CDMA/EVDO Virtualization
January 23, 2018	August 4, 2020	15/878412	Systems and Methods for a Scalable Heterogeneous Network
August 4, 2020	-	16/947514	Systems and Methods for a Scalable Heterogeneous Network
January 16, 2018	December 15, 2020	15/872889	Multi-Stage Secure Network Element Certificate Provisioning
December 15, 2020	-	17/123093	Multi-Stage Secure Network Element Certificate Provisioning
January 8, 2018	March 23, 2021	15/865252	X2 Brokering with Aggregation Optimization
April 24, 2018	-	15/961719	X2 Brokering with Aggregation Optimization
March 22, 2021	-	17/208335	X2 Brokering with Aggregation Optimization
January 31, 2022	-	17/589757	X2 Brokering with Aggregation Optimization
October 18, 2018	-	16/164790	Virtualized Cell Architecture
February 26, 2018	October 22, 2019	15/905820	SON Accounting for Max Supported Geographical Distance
October 22, 2019	January 26, 2021	16/660344	SON Accounting for Max Supported Geographical Distance
January 26, 2021	-	17/159097	SON Accounting for Max Supported Geographical Distance
February 16, 2018	May 7, 2019	15/932241	Sinter and Intrasearch Beacon
May 7, 2019	September 15, 2020	16/405311	Sinter and Intrasearch Beacon
September 15, 2020	-	17/021986	Sinter and Intrasearch Beacon
May 8, 2018	-	15/974669	Base Station with Interference Monitoring Circuit
February 19, 2019	March 2, 2021	16/279601	Out-of-Band Monitoring and Provisioning
March 2, 2021	-	17/190117	Out-of-Band Monitoring and Provisioning
May 18, 2018	-	15/984318	Mobile Base Station Drive Test Optimization

July 6, 2020	-	16/921833	Mesh Connectivity Establishment and Use-Cases
December 15, 2018	November 30, 2021	16/192794	Two-Factor Authentication in a Cellular Radio Access Network
November 30, 2021	-	17/539038	Two-Factor Authentication in a Cellular Radio Access Network
March 5, 2019	March 24, 2020	16/293461	Base Station Power Management Using Solar Panel and Energy Storage
March 24, 2020	January 5, 2021	16/828864	Base Station Power Management Using Solar Panel and Energy Storage
January 5, 2021	-	17/141859	Base Station Power Management Using Solar Panel and Energy Storage
November 27, 2018	-	16/202083	Access Network Collective Admission Control
March 10, 2020	-	16/813244	Energy-Efficient Base Station with Synchronization
November 6, 2018	February 9, 2021	16/182601	Updating Multiple Packet Filters in a Single Bearer Context
TBF	-	TBF	Updating Multiple Packet Filters in a Single Bearer Context
April 12, 2019	-	16/383134	Extended Data Indication for Indication of DPCCCH Decoding
July 23, 2019	November 30, 2021	16/520242	Multipath TCP with Mesh Access
November 30, 2021	-	17/539068	Multipath TCP with Mesh Access
February 8, 2019	-	16/271778	Data Pipeline for Scalable Analytics and Management
April 30, 2019	-	16/399280	Fluid Spray to Cool Telecommunications Equipment
February 4, 2020	-	16/782057	Hybrid Base Station and RRH
February 25, 2020	-	16/801144	2G Over IP Architecture
September 8, 2020	-	17/014346	2G HetNet Gateway System Architecture
August 5, 2019	-	16/532322	SIB Scheduling for Private Networks
May 18, 2020	-	16/876576	Mesh Link-Aware DFS
July 31, 2019	-	16/528608	Distributed Multi-HNG SON
July 31, 2019	-	16/528616	Service Bus for Telecom Infrastructure
May 20, 2019	February 2, 2021	16/417492	Machine Learning for Channel Estimation
May 28, 2019	September 21, 2021	16/424479	5G Interoperability Architecture
September 21, 2021	-	17/481265	5G Interoperability Architecture
February 11, 2020	-	16/788304	5G Native Architecture
October 16, 2019	-	16/655225	Radio Access Network Dynamic Functional Splits
August 12, 2019	-	16/538742	Network Address Translation with TEID
April 6, 2020	-	16/841674	Decentralized SON and RAN Management Using Blockchain
May 11, 2020	-	16/871700	Wi-Fi Backhaul Dynamic Link Distance
January 24, 2020	November 2, 2021	16/751902	Improved Power Budget Calculation Using Power Headroom
November 2, 2021	-	17/517605	Improved Power Budget Calculation Using Power Headroom
November 5, 2019	December 7, 2021	16/675220	Locally-Generated TEIDs for Core High Availability
December 7, 2021	-	17/543976	Locally-Generated TEIDs for Core High Availability
September 9, 2019	February 9, 2021	16/564929	Statistical Projection for Controlling BLER
May 18, 2021	-	17/323980	Statistical Projection for Controlling BLER
March 16, 2020	-	16/820387	Multi UE and Multi Message Support in Tunnel Management
September 19, 2019	October 5, 2021	16/576369	High Resolution Timing Advance Estimation Based on PR
September 25, 2019	August 24, 2021	16/582811	High Resolution Timing Advance Estimation Based on PR
October 5, 2021	-	17/494335	High Resolution Timing Advance Estimation Based on PR
January 3, 2020	January 18, 2022	16/733947	2G/3G Signals Over 4G/5G Virtual RAN Architecture
January 18, 2022	-	17/577675	2G/3G Signals Over 4G/5G Virtual RAN Architecture

November 14, 2019	-	16/684585	Idle Mode Signaling Reduction Core Offload
June 22, 2020	-	16/908731	Unique IP Address Allocation in Ad-Hoc Base Station
March 23, 2020	-	16/827492	Diameter Multifold Message
December 17, 2019	-	16/718001	Manpack Base Station
March 2, 2020	-	16/806430	Quantum Cipher On Phase Inversion
December 23, 2019	-	16/724958	Distributed Cloud HNG Fabric
March 30, 2020	-	16/834573	Distributed HSS Using Blockchain
April 8, 2020	-	16/843973	Mobile Base Station Bubble Network
April 13, 2020	-	16/847618	Using Low Earth Orbit Satellites to Overcome Latency
January 25, 2021	-	17/157998	5G Slice Pricing Function
April 20, 2020	-	16/853745	vRAN with PCIe Fronthaul
June 1, 2020	-	16/889796	MME Load Balancer
September 15, 2020	-	17/022077	4G/5G Core Interworking
April 27, 2020	-	16/860051	Demand-Based Dynamic Carrier Scaling
August 3, 2020	-	16/984140	Blind Fast Network Synchronization
May 26, 2020	-	16/884039	Streaming Media Quality of Experience Prediction for Netw
January 31, 2022	-	17/589694	Streaming Media Quality of Experience Prediction for Netw
June 9, 2020	-	16/896195	Adaptive MME Selective Method for an Incoming UE
November 2, 2020	-	17/087513	Accelerated Route Lookup for IPSec Tunnel
June 15, 2020	-	16/902260	Multi-RAT Dual Connectivity
July 20, 2020	-	16/933925	5G Mobile Network Solution with 5G Standalone (SA) Rac
July 12, 2020	-	16/927988	5G Mobile Network With Intelligent 5G Non-Standalone (N
October 6, 2021	-	17/495284	SON Assisted Optimized RAT Selection For UE In A Virtu
July 27, 2020	-	16/940385	5G Enhanced HetNet Gateway
July 27, 2020	-	16/947298	5G Enhanced HetNet Gateway
September 21, 2020	-	17/027519	Support for CUPS PFCP Session at UE Level for Serving
August 31, 2020	-	17/008422	Support for Linking of Packet Detection Rule (PDR) for Op
August 24, 2020	-	17/001677	Integrated Base Station Security System
June 24, 2021	-	17/356875	Lawful Intercept (LI) for Vehicles Using Cameras Installed
August 11, 2020	-	16/991014	Virtual Baseband Radio Unit
August 17, 2020	-	16/995354	SON Assisted RAT Selection for UE in a Virtualized RAN
September 8, 2020	-	17/015063	Prioritized Connectivity Service Based on Geography Us
October 26, 2020	-	17/080836	Randomized SPI for Distributed IPsec
October 1, 2020	-	17/061484	5G/4G/3G/2G Cloud-Native OpenRAN Architecture
October 1, 2020	-	17/061575	Real-Time Any-G SON
October 1, 2021	-	17/492555	Real-Time Any-G SON
October 13, 2020	-	17/069858	Distributing UEs For Service With Throughput and Delay C
November 10, 2020	-	17/094806	Decomposition and Distribution for Network Functions For
October 13, 2020	-	17/069859	Creating Sector-Carriers with Unequal Pairing of Uplink an
January 11, 2021	-	17/146492	Fine-Granularity RAN Slicing Control
December 13, 2021	-	17/549842	Continuously Evolving Network Infrastructure with Real-Ti
December 9, 2020	-	17/117107	5G OpenRAN Controller
February 8, 2021	-	17/170167	FAR ID Provisioning During Dedicated Bearer Creation

January 19, 2021	-	17/152324	Slow eNodeB/HNB Identification and Impact Mitigation
March 8, 2021	-	17/195360	Multiple Context Issue for Single UE in the Network
October 12, 2021	-	17/499021	Enterprise Multi-Technology Core and Subscriber Management
April 2, 2021	-	17/221762	Uplink Link Adaptation in 5G Base Stations
February 1, 2021	-	17/164835	Method for Securing OpenRAN Interfaces
April 21, 2021	-	17/237042	Over-the-Air Testing for 5G NR Beamforming
November 15, 2021	-	17/526248	4G/5G Dynamic Spectrum Sharing (DSS) Analysis
February 4, 2021	-	17/168171	OpenRAN Networking Infrastructure
April 26, 2021	-	17/241052	QCI Based Traffic-Offload of PDN Traffic at Trusted Wifi A
September 20, 2021	-	17/480138	Paging Optimization
March 16, 2021	-	17/203740	OpenRAN Solution Suite
January 6, 2022	-	17/569626	Handling of SCTP Packets with T-bit Set at SCTP Load B
March 18, 2021	-	17/206115	Backhaul Estimation Scheduling
July 28, 2021	-	17/387979	AI Based Traffic Classification
September 27, 2021	-	17/486907	A Method to Retrieve Security Keys of UE in Gateways
May 18, 2021	-	17/323772	Sounding Signals for Sub-Meter Base Station Localization
August 2, 2021	-	17/391794	Non-Terrestrial Network Round Trip Delay Mitigation with
October 18, 2021	-	17/504499	Handover Forking Support for Improving Handover Success
October 12, 2021	-	17/499276	Inter Virtual-eNodeB Optimized Handover for Gateway Co
October 25, 2021	-	17/509199	Diameter Charging-Rule Inheritance Support
November 1, 2021	-	17/516679	Enhanced VoLTE PDCP Protection Using Hybrid Approach
November 15, 2021	-	17/526275	Handling Variable Payload Lengths Which Are Based On
December 20, 2021	-	17/556085	Adaptive TTI Bundling Configuration

Provisionals

Filing Date	App. No.	Title
9/27/2010	61/386847	Utilizing Fixed Ad-Hoc Networks techniques in Wireless Base Stations for data transport
9/25/2012	61/705440	Multi-Access and Backhaul Wireless Systems and Methods
10/19/2012	61/716194	A means for wireless cellular base stations streaming multimedia from local resources
10/25/2012	61/718503	Software Defined Networking Approach for Wireless Base Station with Backhaul
11/9/2012	61/724312	Method of Optimizing Paging Over LTE Radio
11/10/2012	61/724963	Multi Access Wireless System Virtualization Methods
11/10/2012	61/724964	Multi Access Wireless System Virtualization Methods
11/13/2012	61/725865	Novel method of location based PCI selection in radio networks
11/21/2012	61/729158	Dynamic Frequency Selection Using SON, UE Location and Power Information
11/23/2012	61/729489	Dynamic Discovery of Uni-Cloud Node by Uni-RAN
2/17/2013	61/765729	Situation Aware Mobile Wireless Base Station for First Responders
3/14/2013	61/783193	Automatic Access And Backhaul Role Switch for Networking Resources
3/14/2013	61/783293	Method of Automatically Disabling Trace Logging Information
3/14/2013	61/784002	Method of Dynamically Altering Operational Parameters of a Base Station
3/15/2013	61/790008	Low-Power, Self-Optimizing Base Station
3/15/2013	61/787832	Method of Directly Connecting UEs
3/15/2013	61/790785	Base station tamper detection and recovery mechanism
3/15/2013	61/790105	Forming Backhaul Links Using Wireless Equipment
3/15/2013	61/793351	Start-up sequence and configuration for radio node
4/15/2013	61/812119	Heterogeneous Mesh Network and a Multi-RAT Node Used Therein
5/23/2013	61/826750	Method of Disabling Incoming Calls within a Network
5/23/2013	61/826786	Method of Disabling Incoming Calls within a Network
5/29/2013	61/828508	Directional Antenna Optimization for Base Stations
5/31/2013	61/829503	Method of Connecting Security Gateway to Mesh Network
6/26/2013	61/839496	Directional Antenna Optimization for Base Stations
7/24/2013	61/858035	Situation Aware Mobile Wireless Base Station for First Responders with RSSI Measurement
8/6/2013	61/862688	Uplink and Downlink Role Reversal
8/7/2013	61/863135	Multi-RAT Node Used for Search and Rescue
9/27/2013	61/883664	Situation Aware Mobile Wireless Base Station for First Responders
9/27/2013	61/883610	Method for Holistically Controlling Base Station Transmit Power
10/3/2013	61/886441	Method for Providing MBMS Services Over an LTE Mesh Network
10/8/2013	61/888330	Parameter Optimization and Event Prediction Based on Cell Heuristics
10/24/2013	61/894961	Methods for implementing full duplex services over a mesh network
10/29/2013	61/896940	Situation Aware Mobile Wireless Base Station for First Responders
10/29/2013	61/896719	Multi-RAT Node Used for Search and Rescue
11/14/2013	61/904280	Methods for Adjacent Channel Interference (ACI) Cancellation in Multi-Radio/Multi-Channel Systems
12/13/2013	61/915753	Virtualization of the Evolved Packet Core to Create Local EPC
12/16/2013	61/916831	Land Mobile LTE Device, Methods, and Networks
1/13/2014	61/926620	Situation Aware Mobile Wireless Base Station for First Responders
1/13/2014	61/926644	Directional Antenna Optimization for Base Stations
1/13/2014	61/926675	Uplink and Downlink Role Reversal
3/7/2014	61/949455	Federated X2 Gateway
4/7/2014	61/976146	Federated X2 Gateway
5/13/2014	61/992648	Intelligently Pooling or Adapting Wireless Bandwidth
6/9/2014	62/009610	Method for Time, Frequency and Phase Synchronization Using Full Duplex Radios Over Wireless Mesh Networks

7/22/2014	62/027716	Signaling Storm Reduction From Radio Networks
8/8/2014	62/035361	Methods for Congestion and Overload Control of MME
8/15/2014	62/037982	Inter-Cell Interference Mitigation
9/12/2014	62/049889	Low-Latency Inter-eNB Coordinated Multi-Point Transmission
9/24/2014	62/054442	Radio Operation Switch Based on GPS Mobility Data
9/26/2014	62/056455	Enabling High-Power UE Transmission
10/6/2014	62/060237	Full-Duplex LTE Mesh Networks
10/27/2014	62/069036	Out-of-Band Power Down Notification
11/3/2014	62/074533	Improved Tracking Area Planning
11/7/2014	62/076571	Self-Calibrating and Self-Adjusting Network
11/14/2014	62/081930	HealthCheck Access Point
11/14/2014	62/080255	Enabling Soft Handovers
11/19/2014	62/082111	Enhanced Mobile Base Stations
1/20/2015	62/105333	Multi-RAT Carrier Aggregation
3/2/2015	62/127136	Software-Enabled Remote Licensing and Provisioning
3/20/2015	62/135,984	Content-Aware Inter-RAT RAB Steering
3/30/2015	62/140401	Power Management for Vehicle-Mounted Base Stations
4/17/2015	62/149435	MaxMesh; Mesh Backhaul Routing
4/21/2015	62/150717	SIM Whitelisting and Multi-Operator Core Network
4/21/2015	62/150843	On-Chip and Off-Chip Transceiver With ICIC
5/7/2015	62/158192	Virtual Guard Band
5/22/2015	62/165458	Wireless Backhaul Resiliency
5/26/2015	62/166401	Inter-Cell Interference Coordination
6/3/2015	62/170158	Inter-PGW Handover Architecture
6/8/2015	62/172742	Single-Radome Multi-Antenna Assembly
6/18/2015	62/181325	SSID to QCI Mapping
7/10/2015	62/191029	Enhanced X2 Protocol
7/24/2015	62/196537	DFS Management in an IBSS Network Using Centralized SON
7/25/2015	62/198558	Single-Radome Multi-Antenna Assembly
8/18/2015	62/206666	Cell ID Disambiguation
9/8/2015	62/215562	RAN for Multimedia Delivery
9/11/2015	62/217557	Antenna-Integrated Radio with Wireless Fronthaul
9/30/2015	62/235178	Heterogeneous Network Gateway
10/20/2015	62/244127	X2 Protocol Programmability
10/31/2015	62/249210	Elastic Scheduling
1/13/2016	62/278319	Inter-Cell Fractional Frequency Reuse Scheduler
2/17/2016	62/296486	Handling unresponsive S1 active MME in MME Pooling scenario; Handling calls when all MMEs are overloaded
3/18/2016	62/310173	luGW Architecture
4/1/2016	62/317315	Signal Quality Database
4/4/2016	62/318029	Advancement of FAPI Error Indication Messaging for 4G Systems (IEEE Paper)
4/9/2016	62/320472	Uplink Measurements for LTE 4G Systems
4/15/2016	62/322968	Mitigation of Negative Delay via Half CP Shift (IEEE Paper)
5/26/2016	62/342001	End-to-End Prioritization for Mobile Base Station
6/1/2016	62/343963	Inter-Cell Fractional Frequency Reuse Scheduler
6/30/2016	62/356781	Intelligent RAN Flow Management and Distributed Policy Enforcement
8/15/2016	62/375341	S2 Proxy for Multi-Architecture Virtualization
8/24/2016	62/379058	Optimized Train Solution
9/1/2016	62/382354	Multi-Radio Access Technology Paging

9/7/2016	62/384681	Multi-Stage Handover with ICIC
9/15/2016	62/395354	VoIP and Native Carrier Call Integration
9/22/2016	62/398201	RTP Localization for Multi-Core Networks
9/29/2016	62/401695	Handovers with Simplified Network Topology
10/11/2016	62/406835	Method of Supporting X2 Brokering Between Inter-3GPP Release eNodeB's
10/11/2016	62/406928	Method of Supporting X2 Brokering Between Inter-3GPP Release eNodeB's
10/12/2016	62/407368	Method of Supporting X2 Brokering Between Inter-3GPP Release eNodeB's
11/3/2016	62/417109	Traffic Shaping for Mesh Backhaul
11/10/2016	62/420099	Hand-in With Topology Hiding
11/16/2016	62/422951	Method for Using Doubly Linked List of Data Buffers Between Threads Running on Two Core System to Achieve
11/30/2016	62/428298	Enhanced CSFB
12/8/2016	62/431468	Dynamic Public Warning Systems for In-Vehicle eNodeB
1/6/2017	62/443486	X2 Brokering with Aggregation Optimization
1/13/2017	62/446158	Multi-Stage Secure Network Element Certificate Provisioning in a Distributed Mobile Access Network
1/23/2017	62/449508	Scaling and Redundancy for Telecom Access/Core Functions like Venb, Vhnb, Vmnc etc.
1/27/2017	62/451333	CDMA/EVDO Virtualization
2/3/2017	62/454633	UE Mobility Across Super-Cells
2/16/2017	62/459639	Sinter and Intrasearch Beacon
2/24/2017	62/463468	SON Accounting for Max Supported Geographical Distance
5/8/2017	62/503305	Base Station with Interference Monitoring
5/18/2017	62/507984	Mobile Base Station Drive Test Optimization
10/18/2017	62/574152	Virtualized Cell Architecture
11/6/2017	62/582231	Efficient Method to Update Packet Filters on Devices in Wireless Network
11/15/2017	62/586334	Two-Factor Authentication in a Cellular Radio Access Network
11/27/2017	62/591134	Mesh & LTE Access Collective Admission Control
1/31/2018	62/624302	Community Self-Managed Radio Access Network
2/8/2018	62/628229	Data Pipeline for Scalable Analytics and Management
2/16/2018	62/631595	Out-of-band Monitoring and Provisioning
2/26/2018	62/635294	Microcomponent Massive MIMO Arrays
3/5/2018	62/638887	Base Station Power Management Using Solar Panel and Battery Forecasting
3/12/2018	62/641955	Role Assignment for Caching
4/13/2018	62/657408	Extended Data Indication for Indication of DPCCCH Decoding Problems
4/20/2018	62/660642	Neighbor Relations for Moving Cells
4/30/2018	62/664676	Water Spray System to Cool Telecoms Equipment
5/18/2018	62/673722	Machine Learning for Channel Estimation
5/25/2018	62/676906	5G Interoperability Architecture
7/23/2018	62/702257	Multipath TCP with Mesh Access
7/30/2018	62/712172	System and Method for Massive MIMO Communication (INO-71639US01)
7/31/2018	62/712954	Distributed Multi-HNG SON
7/31/2018	62/712968	Service Bus for Telecom Infrastructure
8/3/2018	62/714478	SIB Scheduling for Private Networks
8/11/2018	62/717794	Network Address Translations with TEID
9/7/2018	62/728726	Statistical Projection for Controlling BLER
9/19/2018	62/733446	High Resolution Timing Advance Estimation based on PRACH
9/25/2018	62/736341	Enhancing UE Position Accuracy Using PRACH in LTE Network
10/1/2018	62/739638	Data Pipeline for Scalable Analytics and Management
10/5/2018	62/741938	Sparse IFFT Algorithm for LTE PRACH

10/16/2018	62/746546	Radio Access Network Dynamic Functional Splits
11/5/2018	62/755959	Locally-Generated TEIDs for Core High Availability
11/14/2018	62/767256	Idle Mode Signaling Reduction Core Offload
11/17/2018	62/780479	Manpack Base Station
11/20/2018	62/769882	Secure Software Update in a Wireless Mesh Radio Network Using Peer-to-Peer File Sharing
11/21/2018	62/770460	Statistical Projection for Controlling BLER
12/22/2018	62/784404	Distributed Cloud HNG Fabric
1/3/2019	62/788081	2G/3G Signals Over 4G/5G Virtual RAN Architecture
1/15/2019	62/792565	Statistical Projection for Controlling BLER
1/24/2019	62/796260	HSDPA Power Budget Calculation Based On Non-HSDPA Power Headroom
2/4/2019	62/801032	Hybrid Base Station and RRH
2/11/2019	62/804209	5G Native Architecture
2/25/2019	62/810317	2G Over IP Architecture
3/1/2019	62/812359	Quantum Cipher On Phase Inversion
3/8/2019	62/816027	Energy-Efficient Base Station with Synchronization
3/15/2019	62/819420	Multi UE and Multi Message Support in Tunnel Management Messages
3/22/2019	62/822647	Diameter Multifold Message
3/29/2019	62/826563	Distributed HSS for Blockchain
4/4/2019	62/829141	Decentralized SON and RAN Management Using Blockchain
4/8/2019	62/831141	Mobile Base Station Drive Test Optimization
4/12/2019	62/833266	Using Low Earth Orbit Satellites to Overcome Latency
4/19/2019	62/836466	vRAN with PCIe Fronthaul
4/26/2019	62/839083	Demand-Based Dynamic Carrier Scaling
5/3/2019	62/843360	Miniature Antenna Array With Polar Combining Architecture
5/10/2019	62/846253	Wi-Fi Backhaul Dynamic Link Distance
5/17/2019	62/849500	Mesh Link-Aware DFS
5/24/2019	62/852483	Streaming Media Quality of Experience Prediction for Network Slice Selection in 5G Networks
5/31/2019	62/855533	MME Load Balancer
6/7/2019	62/858955	Adaptive MME Selection Method for an Incoming UE
6/14/2019	62/861374	Multi-RAT Dual Connectivity
6/21/2019	62/864568	Unique IP Address Allocation in Ad-Hoc Base Station
7/3/2019	62/870310	Mesh Connectivity Establishment and Use-Cases
7/12/2019	62/873463	5G Mobile Network Solution With Intelligent 5G Non-Standalone (NSA) Radio Access Network (RAN) Solution
7/19/2019	62/876264	5G Mobile Network Solution with 5G Standalone (SA) Radio Access Network (RAN) with Evolved Packet Core (E
7/26/2019	62/879200	5G Enhanced HetNet Gateway
8/2/2019	62/882179	Blind Fast Network Synchronization
8/11/2019	62/885309	Virtual Baseband Radio Unit
8/16/2019	62/887968	SON Assisted Optimized RAT Selection for UE in a Virtualized RAN Environment
8/24/2019	62/890683	Integrated Base Station Security System
8/30/2019	62/893931	Support for Linking of Packet Detection Rule (PDR) for Optimizing Throughput of Combined Serving Gateway (S
9/6/2019	62/897256	Prioritized Connectivity Service Based on Geography Using HNG
9/15/2019	62/900647	4G/5G Core Interworking
9/20/2019	62/903366	Support for CUPS PFCP Session at UE Level for Serving Gateway
10/1/2019	62/909226	5G/4G/3G/2G Cloud-Native OpenRAN Architecture
10/1/2019	62/908837	Real-Time Any-G SON
10/10/2019	62/913415	Distributing UEs For Service With Throughput and Delay Guarantees
10/11/2019	62/914047	Creating Sector-Carriers with Unequal Pairing of Uplink and Downlink Bandwidths to Match Differing Uplink and D

10/25/2019	62/926160	Randomized SPI for Distributed IPsec
11/1/2019	62/929578	Accelerated Route Lookup for IPsec Tunnel
11/10/2019	62/933519	Decomposition and Distribution for Network Functions For Deployment Flexibility
12/9/2019	62/945876	5G OpenRAN Controller
1/10/2020	62/959447	Fine-Granularity RAN Slicing Control
1/17/2020	62/962452	Slow eNodeB and HNB Identification and Impact Mitigation
1/24/2020	62/965436	5G Slice Pricing Function
1/31/2020	62/968814	Method for Securing OpenRAN Interfaces
2/4/2020	62/970134	OpenRAN Networking Infrastructure
2/7/2020	62/971563	FAR ID Provisioning During Dedicated Bearer Creation
3/6/2020	62/986350	Multiple Context Issue for Single UE in the Network
3/16/2020	62/990307	OpenRAN Solution Suite
3/19/2020	62/991582	Backhaul Estimation Scheduling
4/2/2020	63/004087	Uplink Link Adaptation in 5G Base Stations
4/7/2020	63/006714	OpenRan Solution Suite
4/21/2020	63/013460	Over-the-Air Testing for 5G NR Beamforming
4/24/2020	63/015282	QCI Based Traffic-Offload of PDN Traffic at Trusted Wifi Access Gateway
5/11/2020	63/023236	HetNet Gateway Software for Network Builds
5/18/2020	63/026189	Sounding Signals for Sub Meter Base Station Localization
7/7/2020	62/705598	6G ORAN STAR Array With Simultaneous Transmit and Receive
7/28/2020	63/057294	AI Based Traffic Classification
8/2/2020	62/706130	Non-Terrestrial Network Round Trip Delay Mitigation with Predictive Blind Link Adaptation
8/13/2020	63/065157	Adaptive UL Retransmission Support for Improving RRC Connection Setup Success Rate In LTE
9/18/2020	63/080260	Paging Optimization
9/25/2020	63/083263	A Method to Retrieve Security Keys of UE from MME in Gateways
10/6/2020	63/088012	SON Assisted Optimized RAT Selection For U In A Virtualized RAN Environment
10/9/2020	63/089814	Enterprise Multi-Technology Core and Subscriber Management
10/9/2020	63/089844	Inter Virtual-eNodeB Optimized Handover for Gateway Core Network (GWCN)
10/16/2020	63/092535	Handover Forking Support for Improving Handover Success Rate in LTE
10/23/2020	63/104571	Diameter Charging-Rule Inheritance Support
10/30/2020	63/107487	Enhanced VoLTE PDCP Protection Using Hybrid Approach
11/6/2020	63/110402	Handling Variable Payload Lengths Which Are Based On Different AMR Audio Codec Rates
11/13/2020	63/113249	4G/5G Dynamic Spectrum Sharing (DSS) Analysis
12/11/2020	63/124293	Continuously Evolving Network Infrastructure with Real-Time Intelligence
12/18/2020	63/127496	Adaptive TTI Bundling Configuration
1/6/2021	63/134329	Handling of SCTP Packets with T-bit set at SCTP Load Balancer
2/5/2021	63/146445	GTPC (S11 and S5 Interface) Optimization for EPC Core Nodes
2/19/2021	63/151435	S1AP Optimal Retransmission
2/26/2021	63/154601	Mechanism for Provisioning Source IP for Tunneled Packets From User Plane
3/5/2021	63/157335	Method for Handling of an Inbound SCTP Packet at an SCTP Load Balancer and Tunneling Methodology
3/24/2021	63/165199	AI Based AutoComplete for Network Node Configuration
3/31/2021	63/168418	Support for Threshold as Well as Quota Based Usage-Monitoring for the Same Monitoring Key
4/2/2021	63/170163	Support for Reporting Failure of Multiple Rules in PFCP Response Messages
4/16/2021	63/175623	Method to Reduce PGW Initiated GTPC Signaling During S1-Handover With SGW Relocation
4/30/2021	63/182081	CSFB with RIM Without Network Support
5/19/2021	63/190850	Optimized X2 Cell Reporting
6/4/2021	63/197043	Dynamic VoLTE Allocation (DVA)

6/11/2021	63/209430	4G-5G Open RAN User Plane Path
6/18/2021	63/212149	RACH Response Preamble Prioritization
6/25/2021	63/214966	Access Network Bit Rate Recommendation for VoLTE Codec Change using Dynamic VoLTE Allocation
7/2/2021	63/217803	Provision for Near-RT RIC to Update Policy Capabilities on A1 Interface
7/9/2021	63/219879	X2GW Multi-Cell Support
7/16/2021	63/222475	4G/5G Open RAN CU-UP Pool Solution
7/23/2021	63/224929	Methodology for Achieving Highly Scalable and Distributed Secured Connectivity per IPSEC Tunnel
7/28/2021	63/226729	System, Apparatus and Methods for Hybrid Functional Splits Design with Support for Advanced Features in Cellular Networks
7/30/2021	63/227515	Optimized S1-X2 Handovers
8/3/2021	63/228833	ENDC Connectivity with Virtualized eNBs
8/13/2021	63/232914	REST Resilient Client-Server Reconciliation for Telecom Networks
8/17/2021	63/233950	4G/5G Open RAN CU-UP High Availability Solution
8/20/2021	63/235220	OpenRAN Intelligent Dynamic CU-UP Scaling Solution
8/24/2021	63/236277	Distributed Paging Optimization
8/27/2021	63/237603	Enhanced Downlink Link Adaptation (DLAA) for Spectral Efficiency Maximization
9/3/2021	63/240398	Dynamic RACH Response Backoff Indicator
9/10/2021	63/242522	Reducing the Number of CPU Allocated to an LTE Cell by Reducing the Number of Preambles
9/17/2021	63/245259	Embedded 2G/NB-IoT Co-deployment with 4G/5G LTE
10/1/2021	63/251333	Real-Time PHY model at RAN Edge
10/12/2021	63/254731	Network Location Service
10/22/2021	63/270758	Energy Savings in Cellular Networks
10/29/2021	63/273464	Channel Denoising with AI Modeling
11/5/2021	63/276085	REST Client Scaling over HTTP/1.1
11/12/2021	63/278730	Optimization of E2 Signaling and Reducing Load and Complexity on eNodeBs/gNodeBs
11/19/2021	63/281203	Dynamic Multipath Searcher Revisit Rate for a WCDMA Receiver
12/3/2021	63/285543	Mechanism For Achieving Ultra-Low Latency Packet Processing At CU-UP
12/10/2021	63/288138	Minimizing Fronthaul Data Load and Beam Management realization in Cellular Non terrestrial Networks Using SA
12/17/2021	63/290913	CU-CP High Availability
12/23/2021	63/293277	Internal Service/Function Discovery
12/29/2021	63/294443	Singleton Micro-Service High Availability
1/7/2022	63/297282	User Level Mobility Load Balancing
1/17/2022	63/300106	Telecom Microservice Rolling Upgrades
1/21/2022	63/301623	Intelligent Detection of DDoS Attack Against IPsec On Cloud Native Framework
1/28/2022	63/304075	Full Adaptive Target BLER LTE Feature

PCT:

Earliest Priority Date	Application No.	Title
9/25/2012	PCT/US13/61677	Heterogeneous Mesh Network and a Multi-RAT Node Used Therein
9/25/2012	PCT/US13/61656	Heterogeneous Self-Organizing Network for Access and Backhaul
9/25/2012	PCT/US13/61599	Dynamic Multi-Access Wireless Network Virtualization
10/19/2012	PCT/US13/65573	Methods of incorporating an Ad Hoc Cellular Network into a Fixed Cellular Network
7/24/2013	PCT/US14/16938	Methods of incorporating an Ad Hoc Cellular Network into a Fixed Cellular Network
3/15/2013	PCT/US14/29145	Methods of Enabling Base Station Functionality in a User Equipment
8/7/2013	PCT/US14/50238	Multi-RAT Node Used for Search and Rescue
3/7/2014	PCT/US15/19501	Federated X2 Gateway
5/13/2014	PCT/US15/30668	Multi-Egress Backhaul
7/22/2014	PCT/US15/41631	Signaling Storm Reduction from Radio Networks
11/3/2014	PCT/US15/58689	Improved Tracking Area Planning
11/7/2014	PCT/US15/59771	Self-Calibrating and Self-Adjusting Network
3/30/2015	PCT/US16/25101	Power Management for Vehicle-Mounted Base Station
4/21/2015	PCT/US16/28718	SIM Whitelisting and Multi-Operator Core Networks
7/10/2015	PCT/US16/41824	Enhanced X2 Protocol
8/15/2015	PCT/US16/47660	Cell ID Disambiguation
9/11/2015	PCT/US16/51400	Antenna-Integrated Radio with Wireless Fronthaul
10/20/2015	PCT/US16/58003	X2 Protocol Programmability
10/31/2015	PCT/US16/59799	Elastic Scheduling
1/13/2016	PCT/US17/13577	Inter-Cell Fractional Frequency Reuse Scheduler
3/18/2016	PCT/US17/23265	4G/LTE Architecture
5/26/2016	PCT/US17/34873	End-to-End Prioritization for Mobile Base Station
6/30/2016	PCT/US17/40528	Intelligent RAN Flow Management and Distributed Policy Enforcement
8/15/2016	PCT/US17/47038	S2 Proxy for Multi-Architecture Virtualization
9/29/2016	PCT/US17/54639	Handovers with Simplified Network Topology
11/30/2016	PCT/US17/64100	Enhanced CSFB
1/6/2016	PCT/US18/12852	X2 Brokering with Aggregation Optimization
10/18/2017	PCT/US18/56599	Virtualized Cell Architecture
11/27/2017	PCT/US18/62681	Access Network Collective Admission Control
2/8/2018	PCT/US19/17381	Data Pipeline for Scalable Analytics and Management
2/26/2018	PCT/US19/19689	Microcomponent Massive MIMO Arrays
4/24/2018	PCT/US19/28875	Xx Brokering with Aggregation Optimization
5/20/2018	PCT/US19/33174	Machine Learning for Channel Estimation
5/28/2018	PCT/US19/34231	5G Interoperability Architecture
7/31/2018	PCT/US19/44562	Distributed Multi-HNG SON
7/30/2018	PCT/US19/44246	System and Method for Massive MIMO Communication (INO-71639WO01)
10/16/2018	PCT/US19/56623	Radio Access Network Dynamic Functional Splits
11/5/2018	PCT/US19/59948	Locally-Generated TEIDs for Core High Availability
1/3/2019	PCT/US20/12213	2G/3G Signals Over 4G/5G Virtual RAN Architecture
2/4/2019	PCT/US20/16678	Hybrid Base Station and RRH

4/26/2019	PCT/US20/70005	Demand-Based Dynamic Carrier Scaling
10/1/2019	PCT/US20/53875	Real-Time Any-G SON
3/18/2020	PCT/US21/23049	Backhaul Estimation Scheduling
7/7/2020	PCT/US21/40766	6G ORAN STAR Array With Simultaneous Transmit And Receive
9/8/2020	PCT/US21/49517	2G HetNet Gateway System Architecture

National:

3/23/2021	-	7/30/2018	201980062492.8	System and Method for Massive Mimo Communication (INO-71
1/29/2021	-	7/30/2018	19844775.7	System and Method for Massive Mimo Communication (INO-71
2/18/2021	-	7/30/2018	10-2021-7004879	System and Method for Massive Mimo Communication (INO-71
3/24/2015	11/6/2020		201380049717.9.	Heterogeneous Mesh Network and a Multi-RAT Node Used The
3/24/2015	9/29/2020		201380049789.3.	Heterogeneous Self-Organizing Network for Access and Backha
3/25/2015	11/7/2018		13840788.7	Heterogeneous Mesh Network and a Multi-RAT Node Used The
3/25/2015	7/15/2020		13841824.9	Heterogeneous Self-Organizing Network for Access and Backha
4/21/2015	-		13842755.4	Dynamic Multi-Access Wireless Network Virtualization
8/2/2018	12/9/2020		18187135.1	Heterogeneous Mesh Network and a Multi-RAT Node Used The
4/21/2015	-		1096/KOLNP/2015	Heterogeneous Mesh Network and a Multi-RAT Node Used The
2/18/2014	7/6/2017		14751640.5	Methods of Incorporating an Ad Hoc Cellular Network into a Fixe
4/24/2015	1/12/2018		15165083.5	Methods of Incorporating an Ad Hoc Cellular Network into a Fixe
5/4/2016	-		16105053.5	Methods of Incorporating an Ad Hoc Cellular Network into a Fixe
9/30/2015	9/23/2020	3/15/2013	14763509.8	Methods of Enabling Base Station Functionality in a User Equip
9/29/2016	12/15/2021	3/7/2014	15713067.5	Federated X2 Gateway
3/28/2019	-	9/29/2016	17857598.1	Handovers with Simplified Network Topology
5/31/2016	-	3/7/2014	10-2016-7014534	Federated X2 Gateway
5/13/2015	12/26/2018	5/13/2014	15726449	Multi-Egress Backhaul
11/9/2015	6/23/2021	11/7/2014	15797751.3	Self-Calibrating and Self-Adjusting Network
11/1/2017	9/22/2021	4/21/2015	16783889.5	SIM Whitelisting and Multi-Operator Core Networks
4/27/2018	9/28/2021	10/20/2015	201680063058.8	X2 Protocol Programmability
5/15/2018	9/8/2021	10/20/2015	16858255.9	X2 Protocol Programmability
7/20/2018	6/3/2021	1/13/2016	2017207499	Inter-cell Fractional Frequency Reuse Scheduler
5/11/2021	-	1/13/2016	2021202983	Inter-cell Fractional Frequency Reuse Scheduler
8/27/2018	-	1/13/2016	3015883	Inter-cell Fractional Frequency Reuse Scheduler
7/31/2018	-	1/13/2016	17739113.3	Inter-cell Fractional Frequency Reuse Scheduler
7/19/2018	-	1/13/2016	201817027063	Inter-cell Fractional Frequency Reuse Scheduler
10/10/2017	-	3/30/2015	16774149.5	Power Management for Vehicle-Mounted Base Station
3/7/2018	11/25/2020	8/18/2015	16837883.4	Cell Id Disambiguation
2/15/2019	-	8/15/2019	17842029.5	Convergence Proxy for Core Network Virtualization
7/11/2016	-	7/10/2015	2016291625	Enhanced X2 Protocol
7/11/2016	-	7/10/2015	2992142	Enhanced X2 Protocol
7/11/2016	11/11/2019	7/10/2015	16825016.5	Enhanced X2 Protocol
4/5/2018	-	9/11/2015	16845303.3	Antenna-Integrated Radio With Wireless Fronthaul
1/17/2019	-	6/30/2016	17821433.4	Intelligent RAN Flow Management and Distributed Policy Enforc
9/18/2019	9/29/2020	3/18/2016	3057061	luGW Architecture
9/25/2018	2/17/2021	3/18/2016	17767711.9	luGW Architecture
2/12/2021	-	3/18/2016	21156953.8	luGW Architecture
5/18/2018	-	10/31/2015	2016344036	Elastic Scheduling
4/14/2021	-	10/31/2015	2021202267	Elastic Scheduling

4/27/2018	-	10/31/2015	3003597	Elastic Scheduling
4/27/2018	11/19/2021	10/31/2015	201680063059.2	Elastic Scheduling
5/15/2018	-	10/31/2015	16861069.9	Elastic Scheduling
5/15/2018	-	10/31/2015	201817018227	Elastic Scheduling
11/15/2018	-	5/26/2016	17803740.4	End-to-end Prioritization for Mobile Base Station
9/4/2019	-	1/6/2017	201880015978.1	X2 Brokering With Aggregation Optimization
7/15/2019	-	1/6/2017	18736428.6	X2 Brokering With Aggregation Optimization
11/6/2020	-	4/25/2018	19791798.2	Xx Brokering With Aggregation Optimization
8/5/2019	-	1/6/2017	10-2019-7022991	X2 Brokering With Aggregation Optimization
10/22/2021	-	2/4/2019	3137867	Hybrid Base Station and RRH
9/30/2021	-	2/4/2019	202080026974.0	Hybrid Base Station and RRH
9/3/2021	-	2/4/2019	20752510.6	Hybrid Base Station and RRH
4/21/2021	-	7/31/2018	19843069.6	Distributed Multi-HNG SON
10/21/2020	-	5/25/2018	19806448.7	5G Interoperability Architecture
4/23/2021	-	10/16/2018	19874446.8	Radio Access Network Dynamic Functional Splits
5/11/2021	-	11/5/2018	19883130.7	Locally-Generated TEIDs for Core High Availability
10/3/2019	-	10/3/2019	201931040102	2G HetNet Gateway System Architecture
10/29/2021	-	4/26/2019	20794635.1	Demand-Based Dynamic Carrier Scaling
5/5/2021	-	5/5/2021	202111020543	Lawful Intercept (LI) for Vehicles Using Cameras Installed/Mour

EP Validations:

2/6/2019	3/21/2019	EP13842755.4	Dynamic Multi-Access Wireless Network Virtualization
11/7/2018	9/25/2013	EP13840788.7	Heterogenous Mesh Network and A Multi-Rat Node Used Therein
7/15/2020	8/13/2020	EP13841824.9	Heterogeneous Self-Organizing Network for Access and Backhaul
2/6/2019	3/20/2019	EP13842755.4	Dynamic Multi-Access Wireless Network Virtualization
2/6/2019	4/3/2019	EP13842755.4	Dynamic Multi-Access Wireless Network Virtualization
2/6/2019	4/2/2019	EP13842755.4	Dynamic Multi-Access Wireless Network Virtualization
11/7/2018	9/25/2013	EP13840788.7	Heterogenous Mesh Network and A Multi-Rat Node Used Therein
7/15/2020	8/13/2020	EP13841824.9	Heterogeneous Self-Organizing Network for Access and Backhaul
2/6/2019	3/20/2019	EP13842755.4	Dynamic Multi-Access Wireless Network Virtualization
11/7/2018	9/25/2013	EP13840788.7	Heterogenous Mesh Network and A Multi-Rat Node Used Therein
7/15/2020	8/13/2020	EP13841824.9	Heterogeneous Self-Organizing Network for Access and Backhaul
12/9/2020	8/2/2018	EP18187135.1	Heterogeneous Self-Organizing Network for Access and Backhaul
12/9/2020	8/2/2018	EP18187135.1	Heterogeneous Self-Organizing Network for Access and Backhaul
12/9/2020	8/2/2018	EP18187135.1	Heterogeneous Self-Organizing Network for Access and Backhaul
12/9/2020	8/2/2018	EP18187135.1	Heterogeneous Self-Organizing Network for Access and Backhaul
12/9/2020	8/2/2018	EP18187135.1	Heterogeneous Self-Organizing Network for Access and Backhaul
2/6/2019	3/21/2019	EP13842755.4	Dynamic Multi-Access Wireless Network Virtualization
11/7/2018	9/25/2013	EP13840788.7	Heterogenous Mesh Network and A Multi-Rat Node Used Therein
7/15/2020	8/13/2020	EP13841824.9	Heterogeneous Self-Organizing Network for Access and Backhaul
2/6/2019	4/8/2019	EP13842755.4	Dynamic Multi-Access Wireless Network Virtualization
11/7/2018	9/25/2013	EP13840788.7	Heterogenous Mesh Network and A Multi-Rat Node Used Therein
7/15/2020	8/13/2020	EP13841824.9	Heterogeneous Self-Organizing Network for Access and Backhaul
2/6/2019	4/3/2019	EP13842755.4	Dynamic Multi-Access Wireless Network Virtualization
2/6/2019	4/2/2019	EP13842755.4	Dynamic Multi-Access Wireless Network Virtualization
7/6/2017	2/18/2014	EP2014751640	Methods of Incorporating an Ad Hoc Cellular Network into a Fixed Cellular Ne
1/10/2018	4/24/2015	EP15165083.5	Methods of Incorporating an Ad Hoc Cellular Network into a Fixed Cellular Ne
7/7/2017	2/18/2014	60 2014 011 291.9	Methods of Incorporating an Ad Hoc Cellular Network into a Fixed Cellular Ne
1/11/2018	4/24/2015	EP15165083.5	Methods of Incorporating an Ad Hoc Cellular Network into a Fixed Cellular Ne
7/14/2017	2/18/2014	EP2014751640	Methods of Incorporating an Ad Hoc Cellular Network into a Fixed Cellular Ne
1/3/2018	4/24/2015	EP15165083.5	Methods of Incorporating an Ad Hoc Cellular Network into a Fixed Cellular Ne
6/28/2017	2/18/2014	EP14751640.5	Methods of Incorporating an Ad Hoc Cellular Network into a Fixed Cellular Ne
1/23/2018	4/24/2015	EP15165083.5	Methods of Incorporating an Ad Hoc Cellular Network into a Fixed Cellular Ne
7/4/2017	2/18/2014	EP14751640.5	Methods of Incorporating an Ad Hoc Cellular Network into a Fixed Cellular Ne
1/10/2018	4/24/2015	EP15165083.5	Methods of Incorporating an Ad Hoc Cellular Network into a Fixed Cellular Ne
7/8/2017	2/18/2014	EP14751640.5	Methods of Incorporating an Ad Hoc Cellular Network into a Fixed Cellular Ne
	4/24/2015	EP15165083.5	Methods of Incorporating an Ad Hoc Cellular Network into a Fixed Cellular Ne
6/29/2017	2/18/2014	EP2014751640	Methods of Incorporating an Ad Hoc Cellular Network into a Fixed Cellular Ne
1/12/2018	4/24/2015	EP15165083.5	Methods of Incorporating an Ad Hoc Cellular Network into a Fixed Cellular Ne
7/8/2017	2/18/2014	EP2014751640	Methods of Incorporating an Ad Hoc Cellular Network into a Fixed Cellular Ne
1/10/2018	4/24/2015	EP15165083.5	Methods of Incorporating an Ad Hoc Cellular Network into a Fixed Cellular Ne

6/9/2017	2/18/2014	EP2014751640	Methods of Incorporating an Ad Hoc Cellular Network into a Fixed Cellular Ne
8/14/2017	2/18/2014	EP2014751640	Methods of Incorporating an Ad Hoc Cellular Network into a Fixed Cellular Ne
1/19/2018	4/24/2015	EP15165083.5	Methods of Incorporating an Ad Hoc Cellular Network into a Fixed Cellular Ne
8/17/2017	2/18/2014	EP2014751640	Methods of Incorporating an Ad Hoc Cellular Network into a Fixed Cellular Ne
1/23/2018	4/24/2015	EP15165083.5	Methods of Incorporating an Ad Hoc Cellular Network into a Fixed Cellular Ne
9/23/2020	3/14/2014	EP14763509.8	Methods of Enabling Base Station Functionality in a User Equipment
9/23/2020	3/14/2014	EP14763509.8	Methods of Enabling Base Station Functionality in a User Equipment
9/23/2020	3/14/2014	EP14763509.8	Methods of Enabling Base Station Functionality in a User Equipment
12/26/2019	3/25/2019	EP15726449.0	Multi-Egress Backhaul
12/26/2019	3/25/2019	EP15726449.0	Multi-Egress Backhaul
12/26/2019	3/25/2019	EP15726449.0	Multi-Egress Backhaul
12/26/2019	3/25/2019	EP15726449.0	Multi-Egress Backhaul
12/26/2019	3/25/2019	EP15726449.0	Multi-Egress Backhaul
11/25/2020	3/7/2018	EP16837883.4	Cell Id Disambiguation
11/25/2020	3/7/2018	EP16837883.4	Cell Id Disambiguation
11/25/2020	3/7/2018	EP16837883.4	Cell Id Disambiguation
11/25/2020	3/7/2018	EP16837883.4	Cell Id Disambiguation
11/25/2020	3/7/2018	EP16837883.4	Cell Id Disambiguation
10/30/2019	1/28/2020	EP16825016.5	Enhanced X2 Protocol
10/30/2019	2/18/2020	EP16825016.5	Enhanced X2 Protocol
10/30/2019	1/30/2020	EP16825016.5	Enhanced X2 Protocol
10/30/2019	1/27/2020	EP16825016.5	Enhanced X2 Protocol
10/30/2019	1/27/2020	EP16825016.5	Enhanced X2 Protocol
2/17/2021	9/25/2018	EP17767711.9	luGW Architecture
2/17/2021	9/25/2018	EP17767711.9	luGW Architecture
2/17/2021	9/25/2018	EP17767711.9	luGW Architecture
2/17/2021	9/25/2018	EP17767711.9	luGW Architecture
6/23/2021	11/9/2015	EP15797751.3	Self-Calibrating and Self-Adjusting Network
6/23/2021	11/9/2015	EP15797751.3	Self-Calibrating and Self-Adjusting Network
6/23/2021	11/9/2015	EP15797751.3	Self-Calibrating and Self-Adjusting Network
6/23/2021	11/9/2015	EP15797751.3	Self-Calibrating and Self-Adjusting Network
6/23/2021	11/9/2015	EP15797751.3	Self-Calibrating and Self-Adjusting Network
9/30/2015	9/23/2020	EP14763509.8	Methods of Enabling Base Station Functionality in a User Equipment
11/11/2019	7/11/2016	EP16825016.5	Enhanced X2 Protocol
2/17/2021	9/25/2018	EP17767711.9	luGW Architecture
9/8/2021	5/15/2018	EP16858255.9	X2 Protocol Programmability
9/22/2021	11/1/2017	EP16783889.5	SIM Whitelisting and Multi-Operator Core Networks
12/15/2021	9/29/2016	15713067.5	Federated X2 Gateway

EXHIBIT C

Trademarks

Docket Numbers	Filing Date	App. No.	Reg. No.	Mark
PWS-80024USTM	August 14, 2019	88578830	-	Reimagine Your Network (image)
PWS-80024USTM	July 26, 2019	88539835	-	PARALLEL WIRELESS (new image)
PWS-80024USTM	May 1, 2019	88411438	-	5G Starts Here
PWS-80024USTM	March 13, 2019	88337537	-	ALL G
PWS-80028USTM	October 11, 2017	87640948	-	BHM
PWS-80027CNTM	August 10, 2016	1323793	-	PARALLEL WIRELESS (old image)
PWS-80027INTM	August 10, 2016	1323793	-	PARALLEL WIRELESS (old image)
PWS-80027KRTM	August 10, 2016	1323793	-	PARALLEL WIRELESS (old image)
PWS-80027UKTM	August 10, 2016	1323793	-	PARALLEL WIRELESS (old image)
PWS-80027WOTM	August 10, 2016	1323793	1323793	PARALLEL WIRELESS (old image)
PWS-80024AUTM	April 20, 2016	1783239	-	CWS
PWS-80024CNTM	April 20, 2016	1046816	-	CWS
PWS-80024EUTM	April 20, 2016	1302609	1302609	CWS
PWS-80024INTM	April 20, 2016	1046816	-	CWS
PWS-80024JPTM	April 20, 2016	1046816	-	CWS
PWS-80024KRTM	April 20, 2016	1046816	-	CWS
PWS-80024MXTM	April 20, 2016	1046816	-	CWS
PWS-80024NZTM	April 20, 2016	1046816	1302609	CWS
PWS-80024PHTM	April 20, 2016	1302609	-	CWS
PWS-80024RUTM	April 20, 2016	1046816	-	CWS
PWS-80024SGTM	April 20, 2016	40201611600X	-	CWS
PWS-80024TRTM	April 20, 2016	1046816	-	CWS
PWS-80024WOTM	April 20, 2016	1302609	1302609	CWS
PWS-80027USTM	February 10, 2016	86903595	-	PARALLEL WIRELESS (old image)
PWS-80024USTM	October 20, 2015	86793102	5277022	CWS
PWS-80021USTM	April 15, 2015	86598249	5083877	HetNet Services Cloud
PWS-80022USTM	April 15, 2015	86598260	5056404	HetNet Gateway
PWS-80023USTM	April 15, 2015	86598266	N/A	HetNet Controller
PWS-80026USTM	February 25, 2015	86546158	N/A	Reimagine the RAN
PWS-80013CNTM	December 4, 2014	3047186	N/A	PARALLEL WIRELESS (old image)
PWS-80013INTM	December 4, 2014	3047186	TBD	PARALLEL WIRELESS (old image)
PWS-80013JPTM	December 4, 2014	1248887	1248887	PARALLEL WIRELESS (old image)
PWS-80013UKTM	December 4, 2014	1248887	1248887	PARALLEL WIRELESS (old image)
PWS-80013WOTM	December 4, 2014	1248887	1248887	PARALLEL WIRELESS (old image)
PWS-80018USTM	July 30, 2014	86352670	N/A	LTE ACCESS CONTROLLER
PWS-80018USTM	July 30, 2014	86352678	N/A	LAC
PWS-80016USTM	July 1, 2014	86325362	5106713	CONVERGED WIRELESS SYSTEM
PWS-80017USTM	July 1, 2014	86325637	4923518	UNI-MANAGE
PWS-80015USTM	June 23, 2014	86317019	-	BYOC (goods)
PWS-80014USTM	June 18, 2014	86312798	N/A	UMLTE
PWS-80013USTM	June 5, 2014	86301011	5015420	PARALLEL WIRELESS (old image)

PWS-80012USTM	May 13, 2014	86279422	N/A	VPLN
PWS-80011USTM	April 30, 2014	86267905	4914400	UNI-MANAGE EMS
PWS-80010USTM	April 29, 2014	86266038	5022996	PARALLEL WIRELESS HETNET S
PWS-80009USTM	January 15, 2014	86166404	4832579	P (stylized image)
PWS-80008USTM	December 20, 2013	86149853	N/A	CWAS
PWS-80006USTM	October 10, 2013	86088558	4744465	BYOC
PWS-80007USTM	October 10, 2013	86088593	N/A	BRING YOUR OWN COVERAGE
PWS-80003USTM	July 12, 2013	86008843	N/A	INSTANT-ON BASE STATION
PWS-80004USTM	July 12, 2013	86008880	4590063	LMLTE
PWS-80006USTM	July 12, 2013	86006902	N/A	INSTANT-ON
PWS-80002USTM	May 6, 2013	85924047	N/A	MESH RAN
PWS-80001USTM	April 11, 2013	85901292	4573333	PARALLEL WIRELESS