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UTILITY PATENT APPLICATION TRANSMITTAL

(Only for new nonprovisional applications under 37 CFR 1.53(b))

Attorney Docket No.	061240-8002.US05
First Named Inventor	Xiaodong Li
Title	METHODS AND APPARATUS FOR MULTI-CARRIER COMMUNICATION SYSTEMS
Express Mail Label No.	Via EFS-Web

APPLICATION ELEMENTS

See MPEP chapter 600 concerning utility patent application contents.

ADDRESS TO: **Commissioner for Patents**
P.O. Box 1450
Alexandria, VA 22313-1450

1. [ ] **Fee Transmittal Form** (PTO/SB/17 or equivalent)
2. [✓] **Applicant asserts small entity status.** See 37 CFR 1.27
3. [ ] **Applicant certifies micro entity status.** See 37 CFR 1.29. Applicant must attach form PTO/SB/15A or B or equivalent.
4. [✓] **Specification** [*Total Pages* 18] Both the claims and abstract must start on a new page. *(See MPEP § 608.01(a) for information on the preferred arrangement)*
5. [✓] **Drawing(s)** (35 U.S.C. 113) [*Total Sheets* 8]
6. **Inventor's Oath or Declaration** [*Total Pages* 4] *(including substitute statements under 37 CFR 1.64 and assignments serving as an oath or declaration under 37 CFR 1.63(e))*
   a. [ ] Newly executed (original or copy)
   b. [✓] A copy from a prior application (37 CFR 1.63(d))
7. [✓] **Application Data Sheet** ** See note below.* See 37 CFR 1.76 (PTO/AIA/14 or equivalent)
8. **CD-ROM or CD-R** in duplicate, large table, or Computer Program (*Appendix*)
   [ ] Landscape Table on CD
9. **Nucleotide and/or Amino Acid Sequence Submission** (*if applicable, items a. – c. are required*)
   a. [ ] Computer Readable Form (CRF)
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      ii. [ ] Paper
   c. [ ] Statements verifying identity of above copies

ACCOMPANYING APPLICATION PAPERS

10. [ ] **Assignment Papers** (cover sheet & document(s))
    Name of Assignee _____
11. [✓] **37 CFR 3.73(c) Statement** (*when there is an assignee*) [✓] **Power of Attorney**
12. [ ] **English Translation Document** (*if applicable*)
13. [ ] **Information Disclosure Statement** (PTO/SB/08 or PTO-1449)
    [ ] Copies of citations attached
14. [ ] **Preliminary Amendment**
15. [ ] **Return Receipt Postcard** (*MPEP § 503*) (*Should be specifically itemized*)
16. [ ] **Certified Copy of Priority Document(s)** (*if foreign priority is claimed*)
17. [ ] **Nonpublication Request** Under 35 U.S.C. 122(b)(2)(B)(i). Applicant must attach form PTO/SB/35 or equivalent.
18. [ ] **Other:** _____

***Note:** (1) Benefit claims under 37 CFR 1.78 and foreign priority claims under 1.55 **must** be included in an Application Data Sheet (ADS).
(2) For applications filed under 35 U.S.C. 111, the application must contain an ADS specifying the applicant if the applicant is an assignee, person to whom the inventor is under an obligation to assign, or person who otherwise shows sufficient proprietary interest in the matter. See 37 CFR 1.46(b).

19. CORRESPONDENCE ADDRESS

[✓] The address associated with Customer Number: 25096 **OR** [ ] Correspondence address below

Name					
Address					
City		State		Zip Code	
Country		Telephone		Email	

Signature	/Stephen Bishop/	Date	28 March 2016
Name (Print/Type)	Stephen Bishop	Registration No. (Attorney/Agent)	38,829

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POWER OF ATTORNEY TO PROSECUTE APPLICATIONS BEFORE THE USPTO

I hereby revoke all previous powers of attorney given in the application identified in the attached statement under 37 CFR 3.73(b).

I hereby appoint:

[X] Practitioners associated with the Customer Number: 25096

OR

[ ] Practitioner(s) named below (if more than ten patent practitioners are to be named, then a customer number must be used):

Name	Registration Number	Name	Registration Number

as attorney(s) or agent(s) to represent the undersigned before the United States Patent and Trademark Office (USPTO) in connection with any and all patent applications assigned only to the undersigned according to the USPTO assignment records or assignment documents attached to this form in accordance with 37 CFR 3.73(b).

Please change the correspondence address for the application identified in the attached statement under 37 CFR 3.73(b) to:

[X] The address associated with Customer Number: 25096

OR

[ ] Firm or Individual Name					
Address					
City		State		Zip	
Country		Telephone		Email	

Assignee Name and Address:

Neocific, Inc.
13312 SE 43rd Street
Bellevue, Washington 98006

A copy of this form, together with a statement under 37 CFR 3.73(b) (Form PTO/SB/96 or equivalent) is required to be filed in each application in which this form is used. The statement under 37 CFR 3.73(b) may be completed by one of the practitioners appointed in this form if the appointed practitioner is authorized to act on behalf of the assignee, and must identify the application in which this Power of Attorney is to be filed.

SIGNATURE of Assignee of Record

The individual whose signature and title is supplied below is authorized to act on behalf of the assignee

Signature	[signature]	Date	1/3/2007
Name	XIAODONG LI	Telephone	425-445-2270
Title	PRESIDENT		

61240-8000/LEGAL12936537.1

PTO/SB/96 (07-09)
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STATEMENT UNDER 37 CFR 3.73(b)

Applicant/Patent Owner: Neocific, Inc.

Application No./Patent No.: Not Yet Assigned Filed/Issue Date: Concurrently Herewith

Titled: METHODS AND APPARATUS FOR MULTI-CARRIER COMMUNICATION SYSTEMS WITH ADAPTIVE TRANSMISSION AND FEEDBACK

Neocific, Inc. (Name of Assignee), a corporation (Type of Assignee, e.g., corporation, partnership, university, government agency, etc.)

states that it is:

1. [X] the assignee of the entire right, title, and interest in;

2. [ ] an assignee of less than the entire right, title, and interest in
(The extent (by percentage) of its ownership interest is _____ %); or

3. [ ] an assignee of an undivided interest in the entirety of (a complete assignment from one of the joint inventors was made) the patent application/patent identified above by virtue of either:

A. [ ] An assignment from the inventor(s) of the patent application/patent identified above. The assignment was recorded in the United States Patent and Trademark Office at Reel _____ , Frame _____ , or for which a copy thereof is attached.

OR

B. [X] A chain of title from the inventor(s), of the patent application/patent identified above, to the current assignee as follows:

1. From: Inventors To: WALTICAL SOLUTION, INC.
The document was recorded in the United States Patent and Trademark Office at
Reel 023479 , Frame 0163 , or for which a copy thereof is attached.

2. From: WALTICAL SOLUTION, INC. To: NEOCIFIC, INC.
The document was recorded in the United States Patent and Trademark Office at
Reel 017363 , Frame 0370 , or for which a copy thereof is attached.

3. From: _____ To: _____
The document was recorded in the United States Patent and Trademark Office at
Reel _____ , Frame _____ , or for which a copy thereof is attached.

[ ] Additional documents in the chain of title are listed on a supplemental sheet(s).

[X] As required by 37 CFR 3.73(b)(1)(i), the documentary evidence of the chain of title from the original owner to the assignee was, or concurrently is being, submitted for recordation pursuant to 37 CFR 3.11.

[NOTE: A separate copy (*i.e.,* a true copy of the original assignment document(s)) must be submitted to Assignment Division in accordance with 37 CFR Part 3, to record the assignment in the records of the USPTO. See MPEP 302.08]

The undersigned (whose title is supplied below) is authorized to act on behalf of the assignee.

/Stephen Bishop/	28 March 2016
Signature	Date
Stephen Bishop – Reg. No. 38,829	Attorney for Assignee
Printed or Typed Name	Title

130351535.1

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DECLARATION (37 CFR 1.63) FOR UTILITY OR DESIGN APPLICATION USING AN APPLICATION DATA SHEET (37 CFR 1.76)

Title of Invention	METHODS AND APPARATUS FOR MULTI-CARRIER COMMUNICATION SYSTEMS WITH ADAPTIVE TRANSMISSION AND FEEDBACK

As the below named inventor, I hereby declare that:

This declaration is directed to:

☐ The attached application, or

☑ United States application or PCT international application number 14/539,917

filed on November 12, 2014.

The above-identified application was made or authorized to be made by me.

I believe that I am the original inventor or an original joint inventor of a claimed invention in the application.

I hereby acknowledge that any willful false statement made in this declaration is punishable under 18 U.S.C. 1001 by fine or imprisonment of not more than five (5) years, or both.

WARNING:

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LEGAL NAME OF INVENTOR

Inventor: Xiaodong Li Date (Optional): 2/12/2015

Signature:

Note: An application data sheet (PTO/SB/14 or equivalent), including naming the entire inventive entity, must accompany this form. Use an additional PTO/AIA/01 form for each additional inventor.

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LEGAL NAME OF INVENTOR

Inventor: Titus Lo Date (Optional) :

Signature:

Note: An application data sheet (PTO/SB/14 or equivalent), including naming the entire inventive entity, must accompany this form. Use an additional PTO/AIA/01 form for each additional inventor.

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LEGAL NAME OF INVENTOR

Inventor: Kemin Li Date (Optional): _____

Signature: _____

Note: An application data sheet (PTO/SB/14 or equivalent), including naming the entire inventive entity, must accompany this form. Use an additional PTO/AIA/01 form for each additional inventor.

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LEGAL NAME OF INVENTOR

Inventor: Haiming Huang Date (Optional): 02/09/2015

Signature: [illegible]

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METHODS AND APPARATUS FOR MULTI-CARRIER COMMUNICATION SYSTEMS WITH ADAPTIVE TRANSMISSION AND FEEDBACK

CROSS-REFERENCE TO RELATED APPLICATION(S)

[0001] This application is a continuation application of, and incorporates by reference in its entirety, U.S. Patent Application No. 14/539,917, filed November 12, 2014, which is a continuation application of U.S. Patent Application No. 13/246,677, filed September 27, 2011, which is a continuation application of U.S. Patent Application No. 12/755,313, now granted U.S. Patent No. 8,027,367, filed April 6, 2010, which is a continuation application of U.S. Patent Application No. 10/583,529, now granted U.S. Patent No. 7,693,032, having a 371 date of May 10, 2007, which is a national stage application of International Application No. PCT/US2005/004601, filed February 14, 2005, which claims the benefit of U.S. Provisional Patent Application No. 60/544,521, filed February 13, 2004. This application also relates to PCT Application No. PCT/US05/03518 titled "Methods and Apparatus for Overlaying Multi-Carrier and Direct Sequence Spread Spectrum Signals in a Broadband Wireless Communication System," filed January 27, 2005, which claims the benefit of U.S. Provisional Application No. 60/540,032 filed January 29, 2004 and U.S. Provisional Application No. 60/540,586 filed January 30, 2004.

BACKGROUND

[0002] Adaptive modulation and coding (AMC) has been used in wireless systems to improve spectral efficiency in a fading environment where signal quality varies significantly. By adjusting the modulation and coding scheme (MCS) in accordance with the varying signal-to-interference-plus-noise ratio (SINR), reliable communication link can be maintained between communicating devices. For example, in CDMA2000 1xEV-DO system, twelve different modulation/coding schemes are provided. AMC is also used in CDMA2000 1xEV-DV and 3GPP HSDPA systems.

[0003] To improve performance, in addition to the MCS, other system functions such as channel estimation, transmission power control (TPC), and subchannel

configuration can be adjusted in accordance with the state of the communication channel. For example, channel estimation typically utilizes training symbols or pilot data, which are known to both the transmitter and the receiver. For coherent modulation, the channel information can be extracted at the receiver by comparing the pilots and their corresponding received versions. For non-coherent modulation, the received samples of the pilots are used as reference for the detection of the transmitted data.

[0004] Channel estimation is an important part of multi-carrier (MC) communication systems such as Orthogonal Frequency Division Multiplexing (OFDM) systems. In conventional OFDM systems, such as IEEE802.11a, 802.11g, 802.16, or DVB-T system, pilots are transmitted for channel estimation. The pilots are fixed and form part of other functions such as MCS, TPC, and subchannel configuration in some wireless systems.

[0005] Fast TPC can compensate for fast fading. In a multi-cell multiple-access system, TPC is also used to reduce intra-cell and inter-cell interference and to conserve battery life for the mobile station by transmitting with only necessary power. TPC is one of many functions in some wireless systems, along with MCS, pilot attributes, subchannel configuration, etc.

[0006] The subchannel configuration is normally defined and fixed in an operation, and it is usually not considered an adjustable function of the system to be adapted to the user profile and/or operational environment.

BRIEF DESCRIPTION OF THE DRAWINGS

[0007] Figure 1 is a representative cellular communication system.

[0008] Figure 2 is a basic structure of a multi-carrier signal in the frequency domain, made up of subcarriers.

[0009] Figure 3 depicts a radio resource divided into small units in both frequency and time domains: subchannels and time slots.

[0010] Figure 4 is an illustration of a control process between Device A and Device B, each of which can be a part of a base station and a mobile station depicted in Figure 1.

[0011] Figure 5 illustrates a joint adaptation process at a transmitter of an OFDM system which controls coding, modulation, training pilot pattern, and transmission power for a subchannel.

[0012] Figure 6 is an illustration of a control messaging associated with data transmission between communication devices.

[0013] Figure 7 illustrates two different training pilot patterns plotted for a multi-carrier system.

[0014] Figure 8 illustrates a power control in AMCTP scheme for an OFDM system.

DETAILED DESCRIPTION

[0015] Methods and apparatus for adaptive transmission of wireless communication signals are described, where MCS (modulation and coding scheme), coding rates, training pilot patterns, TPC (transmission power control) levels, and subchannel configurations are jointly adjusted to adapt to the channel conditions. This adaptation maximizes the overall system capacity and spectral efficiency without wasting radio resources or compromising error probability performance.

[0016] Furthermore, the subchannel composition is designed to be configurable so that it can be adjusted statically or dynamically according to the user profiles or environmental conditions. The methods for obtaining the channel information and for transmitting the control information in the joint adaptation scheme are also described below, such as feedback of channel condition and indexing of the joint scheme, along with methods for reducing the overhead of messaging.

[0017] The mentioned multi-carrier system can be of any special format such as OFDM, or Multi-Carrier Code Division Multiple Access (MC-CDMA) and can be applied to downlink, uplink, or both, where the duplexing technique is either Time Division Duplexing (TDD) or Frequency Division Duplexing (FDD).

[0018] The apparatus and methods are described with respect to various embodiments and provide specific details for a thorough understanding and enablement. One skilled in the art will understand that the invention may be practiced without such details. In some instances well-known structures and

functions are not shown or described in detail to avoid unnecessarily obscuring the description of the embodiments.

[0019] Unless the context clearly requires otherwise, throughout the description and the claims, the words “comprise,” “comprising,” and the like are to be construed in an inclusive sense as opposed to an exclusive or exhaustive sense; that is to say, in the sense of “including, but not limited to.” Words using the singular or plural number also include the plural or singular number respectively. Additionally, the words “herein,” “above,” "below" and words of similar import, when used in this application, shall refer to this application as a whole and not to any particular portions of this application. When the claims use the word "or" in reference to a list of two or more items, that word covers all of the following interpretations of the word: any of the items in the list, all of the items in the list and any combination of the items in the list.

[0020] The content of this description is applicable to a communication system with multiple transmitters and multiple receivers. For example, in a wireless network, there are a number of base stations, each of which provides coverage to its designated area, typically called a cell. Within each cell, there are mobile stations. Figure 1 illustrates a communication system that is representative of such a system, where Base Station 110 is communicating with Mobile Stations 101 and 102 in Sector A of its cell site while Base Station 120 is communicating with Mobile Stations 103, 104, and 105 in Sector B of its cell site.

[0021] A multi-carrier multiple-access system is a special case of general communication systems and hereinafter is employed as a representative communication system to describe the embodiments of the invention.

MULTI-CARRIER COMMUNICATION SYSTEM

[0022] The physical media resource (e.g., radio or cable) in a multi-carrier communication system can be divided in both the frequency and the time domains. This canonical division provides a high flexibility and fine granularity for resource sharing.

[0023] The basic structure of a multi-carrier signal in the frequency domain is made up of subcarriers. Within a particular spectral band or channel, there are a fixed number of subcarriers, and there are three types of subcarriers:

1. Data subcarriers, which carry information data;
2. Pilot subcarriers, whose phases and amplitudes are predetermined and made known to all receivers and which are used for assisting system functions such as estimation of system parameters; and
3. Silent subcarriers, which have no energy and are used for guard bands and DC carrier.

[0024] The data subcarriers can be arranged into groups called subchannels to support scalability and multiple-access. The carriers forming one subchannel are not necessarily adjacent to each other. Each user may use part or all of the subchannels. The concept is illustrated in Figure 2, which is the basic structure of a multi-carrier signal in the frequency domain, made up of subcarriers. Data subcarriers can be grouped into subchannels in a specified manner. The pilot subcarriers are also distributed over the entire channel in a specified manner.

[0025] The basic structure of a multi-carrier signal in the time domain is made up of time slots to support multiple-access. The resource division in both the frequency and time domains is depicted in Figure 3, which is the radio resource divided into small units in both the frequency and time domains (subchannels and time slots). The basic structure of a multi-carrier signal in the time domain is made up of time slots.

ADAPTIVE TRANSMISSION AND FEEDBACK

[0026] The underlying principles of adaptive transmission and feedback are both to increase the degree of freedom of a transmission process and to supply information for the adaptation process of a communication system. The adaptation process adjusts the allocated modulation schemes, coding rates, pilot patterns, power levels, spatial processing schemes, subchannel configurations, etc. in accordance with the transmission channel state and condition, for improving system performance and/or capacity.

[0027] Below, AMCTP (adaptive modulation, coding, training and power control) is used as a general term, where its variations can be applied to appropriate applications. There are different adaptive transmission schemes that are subsets of the AMCTP scheme, such as AMCT (adaptive modulation, coding and training), AMTP (adaptive modulation, training, and power control), AMT (adaptive modulation and training), and so forth.

[0028] Figure 4 is an illustration of the control process between Device A and Device B, each of which can be a part of a base station and a mobile station depicted in Figure 1, during adaptive transmission. The transmitter 401 of Device A transmits data 402 and associated control information 404 to Device B, based on an output of the adaptation process 406. After a receiver 408 of Device B receives the transmitted data 402 and control information 404, a measurement process 410 of Device B measures a channel conditions and feeds a channel quality information (CQI) 412 back to Device A.

[0029] The granularity of AMCTP schemes in a multi-carrier system can be user-based, where one or multiple subchannels may be used, or the granularity can be subchannel-based, where a subchannel may contain one or more subcarriers. Likewise, the granularity of CQI can be user- or subchannel-based. Both AMCTP and CQI may change over time and may differ from one time slot to another.

[0030] Figure 5 illustrates a joint adaptation process at a transmitter of an OFDM system which employs separate processing block to control the coding 502, modulation 504, training pilot pattern 506, and transmission power for a subchannel 508. Each block may be implemented combined or separately in circuitry, in dedicated processors, in a digital signal processor, as a microprocessor implemented subroutine, etc.

[0031] Figure 6 is an illustration of control messaging associated with the data transmission between communication devices, such as Device A and B in Figure 4. In Figure 6 the AMCTP indicator 602 is associated with data transmission 604 on a forward link from the transmitter to the receiver, and CQI 606 is associated with the information feedback from the receiver to the transmitter on a return channel.

[0032] In a system where AMCTP is used, the transmitter relies on the CQI to select an appropriate AMCTP scheme for transmitting the next packet, or

retransmitting a previously failed packet, required in an automatic repeat request (ARQ) process. The CQI is a function of one or more of the following: received signal strength; average SINR; variance in time; frequency or space; measured bit error rate (BER); frame error rate (FER); or mean square error (MSE). Channel conditions hereinafter are referred to as one or more of the following, for a user or a subchannel: signal level, noise level, interference level, SINR, fading channel characteristics (Doppler frequency, delay spread, etc.), or channel profile in time or frequency domain. The detection of the channel condition can be at the transmitter, the receiver, or both.

[0033] An MCS in AMCTP is referred to as a modulation and error correction coding scheme used in the system. By matching an MCS to a specific channel condition (e.g., SINR level), a better throughput is achieved. Varying only the MCS is a sub-optimal approach since other factors such as training pilot patterns or subchannel compositions also impact system performance.

[0034] A pilot pattern includes the number of (training) pilot symbols, the location of the symbols in time/frequency/space, the amplitude and phase, and other attributes of these symbols. The system may use distinctive pilot patterns to suit different MCS and channel conditions. The pilot pattern requirements for a robust channel estimation vary with the SINR of the channel and the channel profile.

[0035] In a multi-carrier system, pilots are transmitted on certain positions in the time-frequency grid. Figure 7 illustrates two of many different training pilot patterns that may be used, each plotted for a multi-carrier system, where the dark shaded time-frequency grids 702 are allocated as training pilot symbols. One criterion for choosing a pilot pattern is that the pilot assisted channel estimation should not be a bottleneck for the link performance, and that the pilot overhead should be kept to a minimum. The joined adaptation of training pilot pattern together with MCS is a more effective way of matching the channel conditions, and results in a better performance compared with a mere adaptation of MCS.

[0036] The power control information may include an absolute power level and/or a relative amount to increase or decrease the current power setting. In a multi-carrier system, the power levels of different subchannels are set differently

such that minimum power is allocated to a subchannel to satisfy its performance requirements while minimizing interference to other users.

[0037] The power control can be user- or subchannel-based. Figure 8 is an illustration of a power control in an OFDM system where digital variable gains 802 G1, G2… GN are applied to subchannels 804 that may have different MCSs with different transmission power levels. Analog domain gain 806 Ga is used to control the total transmission power signal processes to meet the requirements of the transmission power of the device. In Figure 8, after variable gains are applied to subchannels 804, they are inputted to the inverse discrete Fourier transform (IDFT) module. The outputs from the IDFT are the time domain signals, which are converted from parallel to sequential signals after a cyclic prefix is added to them.

[0038] Table 1 is an example of a general AMCTP table (or CQI table). It should be noted that some pilot patterns in the table can be the same. The total number of indexes used to represent different combinations of the joint adaptation process can be different for AMCTP index and CQI index. For instance, it is not necessary to send absolute transmission power information to the receiver(s). Some AMCTP information, such as relative power control or code rate, can be embedded in the data transmission instead of being conveyed in the AMCTP index.

Table 1: An example of general AMCTP.

Index	Modulation	Code Rate	Training Pilot	Transmit Power
1	QPSK	1/16	Pattern 1	+
2	QPSK	1/8	Pattern 2	+
3	QPSK	¼	Pattern 3	+
4	QPSK	½	Pattern 4	+
5	QPSK	½	Pattern 5	+
6	16QAM	½	Pattern 6	+
7	16QAM	½	Pattern 7	+
8	16QAM	¾	Pattern 8	+
9	16QAM	¾	Pattern 9	+
10	64QAM	2/3	Pattern 10	+
11	64QAM	5/6	Pattern 11	+

12	64QAM	5/6	Pattern 12	Max-1x
13	64QAM	5/6	Pattern 13	Max-2x
14	64QAM	5/6	Pattern 14	Max-3x

[0039] In a general AMCTP or CQI table, different training pilot patterns may be used for different modulations and code rates. However, even for the same modulation and coding, different patterns can be used to match different channel conditions. In order to make the table more efficient, more indexes can be allocated to the more frequently used scenarios. For example, several training pilot patterns can be allocated to the same MCS that is used more frequently, to achieve finer granularity and thus have a better match with different channel conditions.

[0040] Table 2 is a simple realization of the AMCTP index or the CQI index. In one embodiment, as shown in Table 2, the AMCTP and CQI index is Gray coded so that one bit error in the index makes the index shift to the adjacent index.

[0041] In some cases, a different number of pilot symbols is used for the same MCS. In one embodiment, to keep the packet size the same when the same MCS is used with a different number of pilot symbols, rate matching schemes such as repetition or puncturing is employed. For instance in Table 2, for Index 010 and Index 011, Pattern 3 has more pilot symbols compared to Pattern 2. The code rate of Index 010 is ½, which is punctured to 7/16 for Index 011 to accommodate the extra pilot symbols. In one embodiment, more significant bits in the CQI index are protected with stronger error protection code on the return channel.

Table 2: Another example of AMCTP or CQI table.

Index (Gray coded)	Modulation	Code Rate	Training Pilot	Transmit Power
000	QPSK	¼	Pattern 1	Max
010	QPSK	½	Pattern 2	Max
011	QPSK	7/16	Pattern 3	Max
001	16QAM	½	Pattern 2	Max
101	16QAM	7/16	Pattern 3	Max
111	64QAM	2/3	Pattern 2	Max
110	64QAM	5/6	Pattern 3	Max

100	64QAM	5/6	Pattern 3	Max-X

[0042] Other factors that can be used in the adaptation process include modulation constellation arrangements, transmitter antenna techniques, and subchannel configuration in a multi-carrier system.

[0043] For some modulation schemes such as 16QAM and 64QAM, how information bits are mapped to a symbol determines the modulation schemes' reliability. In one embodiment, constellation arrangement is adjusted in the adaptation process to achieve a better system performance, especially during retransmission in a hybrid ARQ process.

[0044] Some multiple antenna techniques, such as transmission diversity, are used to improve the transmission robustness against fading channel effects, whereas other multiple antenna techniques such as multiple-input multiple-output (MIMO) schemes are used to improve transmission throughput in favorable channel conditions. In one embodiment of the adaptive transmissions the antenna technique used for a transmission is determined by the adaptation process.

[0045] In a multi-carrier multi-cell communication system, when all subcarriers in one subchannel are adjacent or close to each other, they are more likely to fall in the coherent bandwidth of a fading channel; thus they can be allocated to users that are either fixed in location or are move slowly. On the other hand, when subcarriers and/or subchannels that belong to one user are scattered in the frequency domain, it results in higher diversity gains for the fast moving users, and a better interference averaging effect.

[0046] Given the fact that different configurations of subchannel compositions are suitable for different scenarios or user profiles, subchannel configuration is included in the transmission adaptation process. In one embodiment, the subchannel configuration information is broadcast on the common forward control channel to all users such that each user is informed of its subchannel configuration.

[0047] In another embodiment, the subchannel configuration is adjusted according to deployment scenarios. For instance, when a base station is newly deployed with less interference, one form of subchannel configuration is used, and when more users join the network or more adjacent base stations are deployed,

which results in stronger interference to the users in the system, a different subchannel configuration with better interference averaging effect is used.

[0048] The following paragraphs describe a method of transmitting the control message between the transmitter and receiver, when the AMCTP scheme is implemented. A forward control link is defined here as the transmission of the AMCTP indicator from the transmitter to the receiver, and a return control channel is defined as the transmission of CQI, as the feedback information, from the receiver to the transmitter, as shown in Figure 4.

[0049] The AMCTP indicator on the forward link can be sent either separately or jointly. For instance, the power control information, training pilot pattern indicator, or antenna diversity scheme can be embedded in the data transmission. In another embodiment, AMCTP is transmitted on a separate control channel with stronger error protection.

[0050] One way for the transmitter to obtain CQI is to have it explicitly sent from the receiver to the transmitter based on channel condition measurements at the receiver during previous transmission(s). The CQI is then used by the transmitter to determine what AMCTP scheme to use for the next transmission. In one embodiment, CQI for one user is periodically updated on the return channel, even when there is no forward transmission targeted for that user. In this case the receiver measures the channel conditions from the common broadcast transmission or the data transmission targeted to other users.

[0051] In one embodiment, the transmitter or the receiver uses any of several known predictive algorithms to predict current or future channel conditions based on previous channel measurements. This is more effective for a fast fading environment where the past measurements may not match the current transmission closely, due to the fast channel variations. The output of the predictive algorithm is then used by the adaptation process to select the best possible scheme for the current transmission.

[0052] Another method to obtain CQI is through the transmission of a probing sequence from the receiver to the transmitter on the return channel. In one embodiment, in a multi-carrier communication system, a probing sequence is transmitted from the receiver to the transmitter using an overlay scheme where the

probing sequence is overlaid to the data traffic without having negative impact on the data transmission performance. In this case the transmitter estimates the channel profile in the time and/or frequency domains based on the received probing sequence. This is especially effective for TDD systems due to the reciprocity of the channel conditions on forward and reverse channels.

[0053] The AMCTP indicator or CQI can be sent per user or per subchannel. In one embodiment if per subchannel feedback is employed, since the AMCTP and CQI information for the same users are highly correlated, first the source coding is employed to compress the CQI, and then the error correction coding is applied to the compressed CQI to provide sufficient error protection.

[0054] In another embodiment, in hybrid ARQ retransmission, the transmitter may not use the requested CQI for the retransmission, while it may use the requested CQI for a new packet transmission. Instead, in this embodiment, it selects an AMCTP scheme that is appropriate for the retransmission at the same power level as in the previous transmission(s), in order to reduce interference with other users.

[0055] It should be pointed out that the AMCTP index used for the transmission from the transmitter to the receiver may be different from the CQI that the receiver requested, because the transmitter may have other considerations such as quality of service (QoS) for different users, network traffic load, and power allocation limit.

[0056] The above detailed description of the embodiments of the invention is not intended to be exhaustive or to limit the invention to the precise form disclosed above or to the particular field of usage mentioned in this disclosure. While specific embodiments of, and examples for, the invention are described above for illustrative purposes, various equivalent modifications are possible within the scope of the invention, as those skilled in the relevant art will recognize. Also, the teachings of the invention provided herein can be applied to other systems, not necessarily the system described above. The elements and acts of the various embodiments described above can be combined to provide further embodiments.

[0057] All of the above patents and applications and other references, including any that may be listed in accompanying filing papers, are incorporated herein by reference. Aspects of the invention can be modified, if necessary, to employ the

systems, functions, and concepts of the various references described above to provide yet further embodiments of the invention.

[0058] Changes can be made to the invention in light of the above "Detailed Description." While the above description details certain embodiments of the invention and describes the best mode contemplated, no matter how detailed the above appears in text, the invention can be practiced in many ways. Therefore, implementation details may vary considerably while still being encompassed by the invention disclosed herein. As noted above, particular terminology used when describing certain features or aspects of the invention should not be taken to imply that the terminology is being redefined herein to be restricted to any specific characteristics, features, or aspects of the invention with which that terminology is associated.

[0059] In general, the terms used in the following claims should not be construed to limit the invention to the specific embodiments disclosed in the specification, unless the above Detailed Description section explicitly defines such terms. Accordingly, the actual scope of the invention encompasses not only the disclosed embodiments, but also all equivalent ways of practicing or implementing the invention under the claims.

[0060] While certain aspects of the invention are presented below in certain claim forms, the inventors contemplate the various aspects of the invention in any number of claim forms. Accordingly, the inventors reserve the right to add additional claims after filing the application to pursue such additional claim forms for other aspects of the invention.

CLAIMS

I/We claim:

1. A transmission control method by a base station serving a plurality of mobile stations in a multi-carrier communication system, the communication system utilizing a transmission structure with time slots in the time domain and frequency subchannels in the frequency domain, the method comprising:

determining a set of mobile station-based transmission parameters to be used for a subsequent transmission, the set of transmission parameters indicating a pilot pattern for one or more frequency subchannels utilized by the system, wherein the pilot pattern differs from one time slot to another and wherein the pilot pattern is based on channel conditions or other factors; and

sending a control message to a mobile station, the control message providing information regarding the set of transmission parameters.

2. The method of claim 1, wherein the set of mobile station-based transmission parameters further comprises a modulation and coding scheme.

3. The method of claim 1, wherein the set of mobile station-based transmission parameters further comprises a multiple-input multiple-output (MIMO) scheme.

4. The method of claim 3, wherein the pilot pattern and the MIMO scheme are jointly adapted.

5. The method of claim 1, wherein the pilot pattern includes a number of pilot symbols.

6. The method of claim 1, wherein the pilot pattern includes locations of pilot symbols in time or frequency or space.

7. The method of claim 1, wherein the pilot pattern includes amplitudes and phases of pilot symbols.

8. The method of claim 1, wherein the other factors include a transmission antenna technique.

9. The method of claim 1, wherein the other factors include a subchannel configuration.

10. A transmission control method by a mobile station served by a base station in a multi-carrier communication system, the communication system utilizing a transmission structure with time slots in the time domain and frequency subchannels in the frequency domain, the method comprising:

receiving, at the mobile station, a control message from the serving base station, the control message providing information regarding a set of mobile station-based transmission parameters to be used for a subsequent transmission; and

determining a pilot pattern for one or more frequency subchannels based on a pilot pattern indicator contained in the set of received transmission parameters, wherein the pilot pattern differs from one time slot to another and wherein the pilot pattern is based on channel conditions or other factors.

11. The method of claim 10, wherein the pilot pattern includes a number of pilot symbols.

12. The method of claim 10, wherein the pilot pattern includes locations of pilot symbols in time or frequency or space.

13. The method of claim 10, wherein the pilot pattern includes amplitudes and phases of pilot symbols.

14. A base station serving a plurality of mobile stations in a multi-carrier communication system, the communication system utilizing a transmission structure with time slots in the time domain and frequency subchannels in the frequency domain, the base station comprising:

a processor configured to determine a set of mobile station-based transmission parameters to be used for a subsequent transmission, the set of transmission parameters indicating a pilot pattern for one or more frequency subchannels utilized by the system, wherein the pilot pattern differs from one time slot to another and wherein the pilot pattern is based on channel conditions or other factors; and

a transmitter configured to transmit a control message to a mobile station, the control message providing information regarding the set of transmission parameters.

15. The base station of claim 14, wherein the set of mobile station-based transmission parameters further comprises a multiple-input multiple-output (MIMO) scheme.

16. The base station of claim 15, wherein the pilot pattern and the MIMO scheme are jointly adapted.

17. The base station of claim 14, wherein the pilot pattern includes a number of pilot symbols.

18. The base station in claim 14, wherein the pilot pattern includes locations of pilot symbols in time or frequency or space.

19. The base station of claim 14, wherein the pilot pattern includes amplitudes and phases of pilot symbols.

20. The base station of claim 14, wherein the other factors include a transmission antenna technique.

21. The base station of claim 14, wherein the other factors include a subchannel configuration.

22. A mobile station served by a base station in a multi-carrier communication system, the communication system utilizing a transmission structure with time slots in the time domain and frequency subchannels in the frequency domain, the mobile station comprising:

a receiver configured to receive a control message from the serving base station, the control message providing information regarding a set of mobile station-based transmission parameters to be used for a subsequent transmission; and

a processor configured to determine a pilot pattern for one or more frequency subchannels based on a pilot pattern indicator contained in the set of received transmission parameters, wherein the pilot pattern differs from one time slot to another and wherein the pilot pattern is based on channel conditions or other factors.

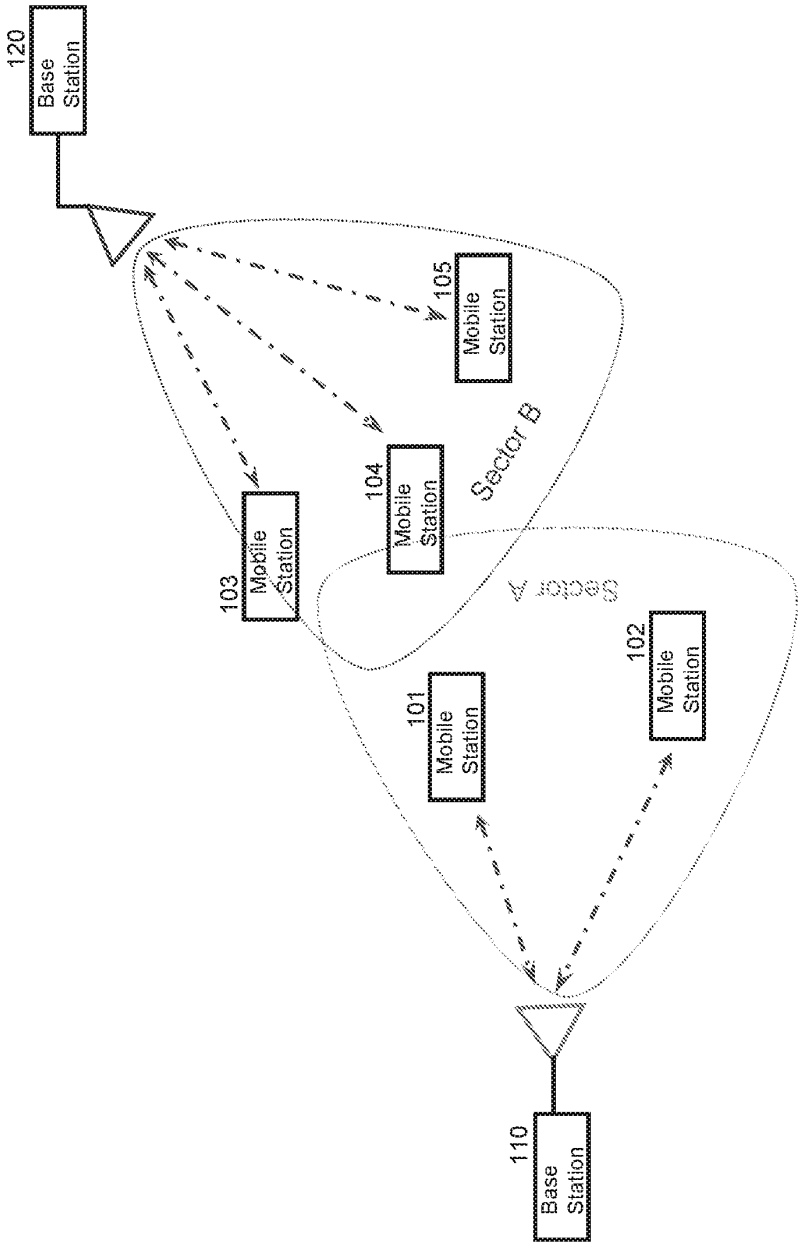
23. The mobile station of claim 22, wherein the pilot pattern includes a number of pilot symbols.

24. The mobile station of claim 22, wherein the pilot pattern includes locations of pilot symbols in time or frequency or space.

25. The mobile station of claim 22, wherein the pilot pattern includes amplitudes and phases of pilot symbols.

ABSTRACT

An arrangement is disclosed where in a multi-carrier communication system, the modulation scheme, coding attributes, training pilots, and signal power may be adjusted to adapt to channel conditions in order to maximize the overall system capacity and spectral efficiency without wasting radio resources or compromising error probability performance, etc.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Base Station
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Sector B
104
Mobile Station
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Mobile Station
Sector A
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Mobile Station
101
Mobile Station
110
Base Station

FIG. 1

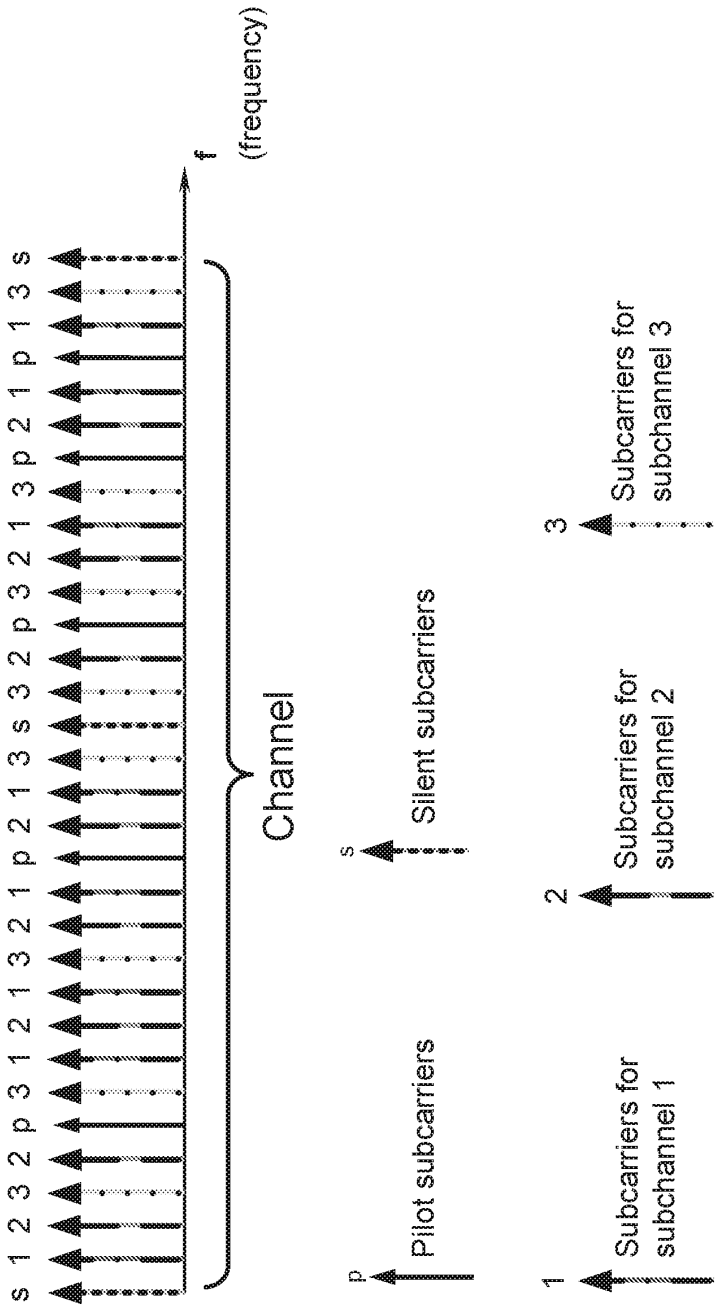

s 1 2 3 2 p 3 1 2 1 3 2 1 p 2 1 3 s 3 2 p 3 2 1 3 p 2 1 p 1 3 s
f
(frequency)
Channel
p
Pilot subcarriers
s
Silent subcarriers
1
Subcarriers for subchannel 1
2
Subcarriers for subchannel 2
3
Subcarriers for subchannel 3

FIG. 2

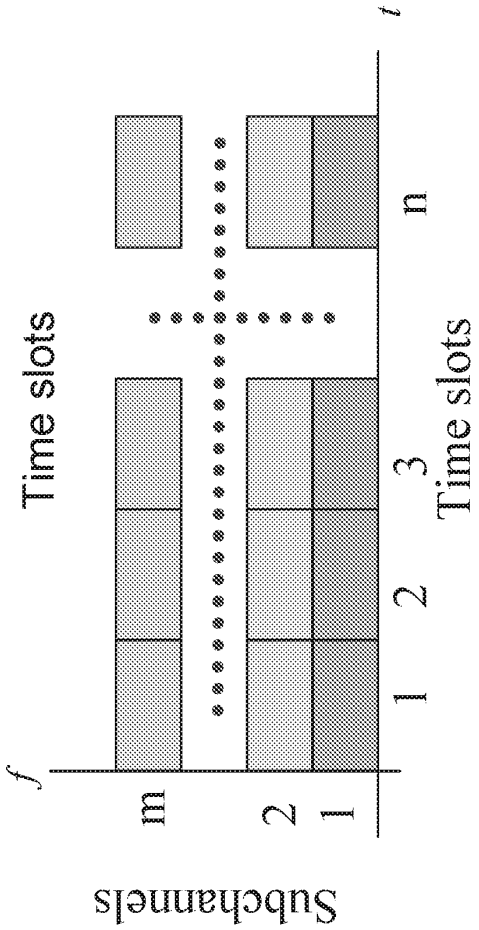


FIG. 3

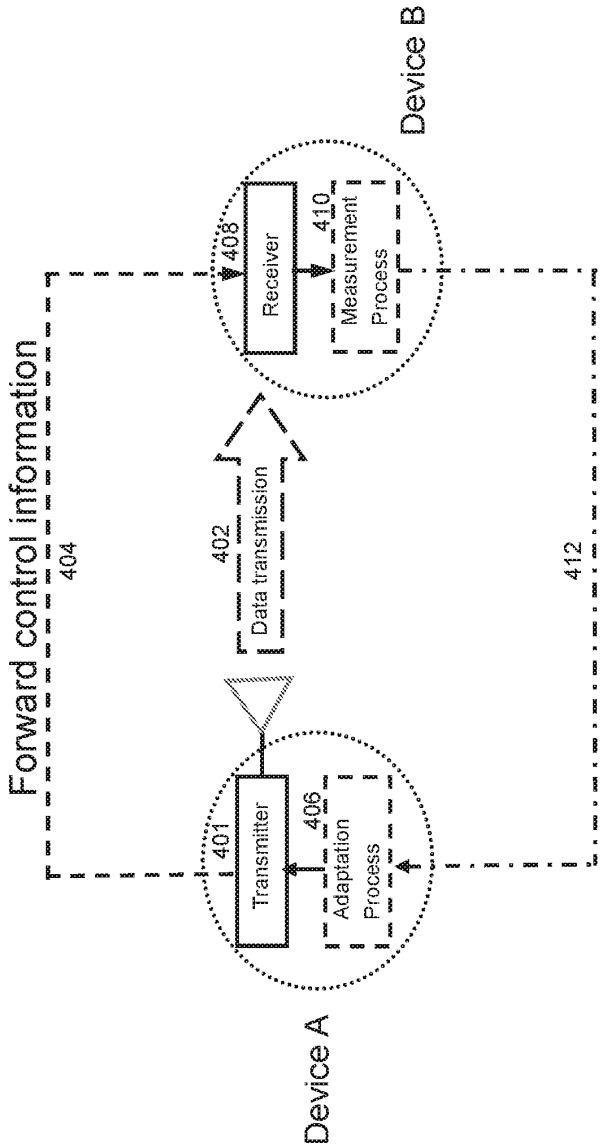

Forward control information
404
Device A
401
Transmitter
406
Adaptation
Process
402
Data transmission
Device B
408
Receiver
410
Measurement
Process
412
CQI

FIG. 4

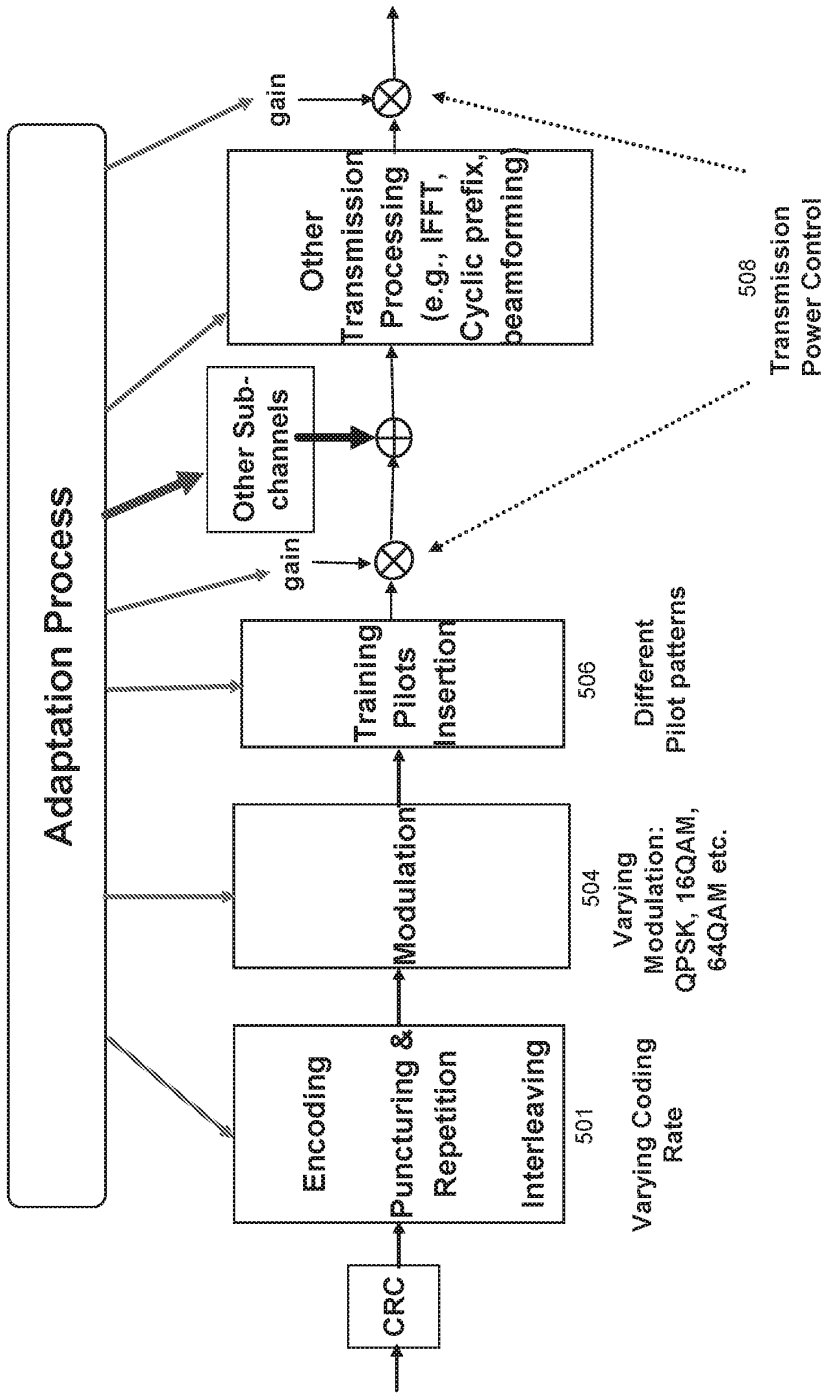

Adaptation Process
CRC
Encoding
Puncturing & Repetition
Interleaving
501
Varying Coding Rate
Modulation
504
Varying Modulation: QPSK, 16QAM, 64QAM etc.
Training Pilots Insertion
506
Different Pilot patterns
gain
Other Sub-channels
gain
Other Transmission Processing (e.g., IFFT, Cyclic prefix, beamforming)
508
Transmission Power Control

FIG. 5

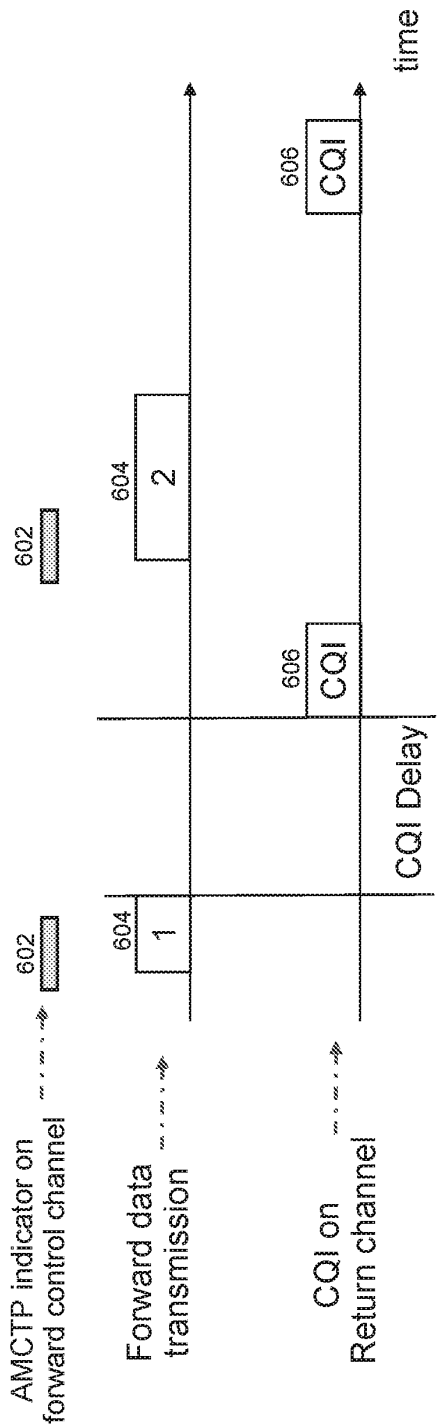
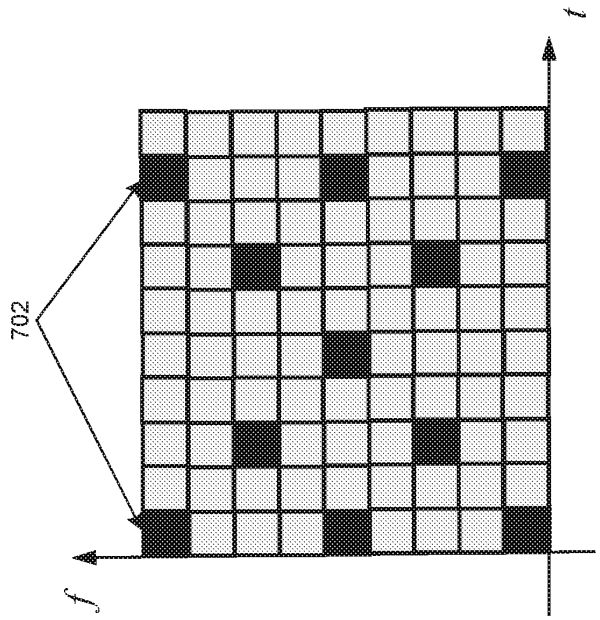
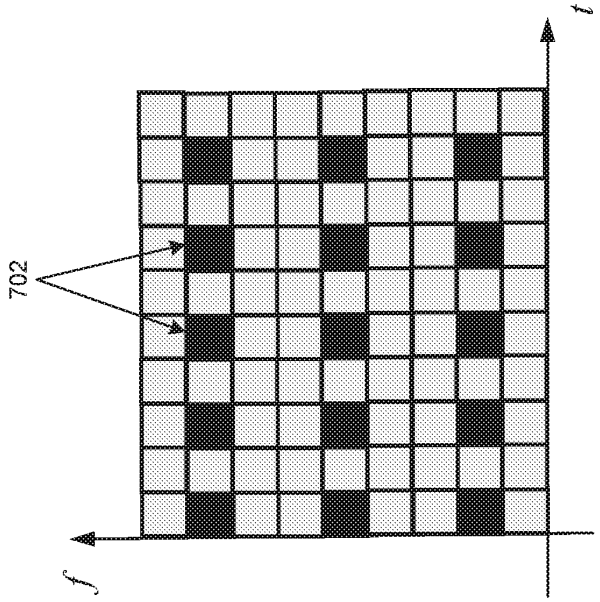

AMCTP indicator on forward control channel
Forward data transmission
CQI on Return channel
602
602
604
1
604
2
606
CQI
606
CQI
CQI Delay
time

FIG. 6



4.b



4.a

FIG. 7

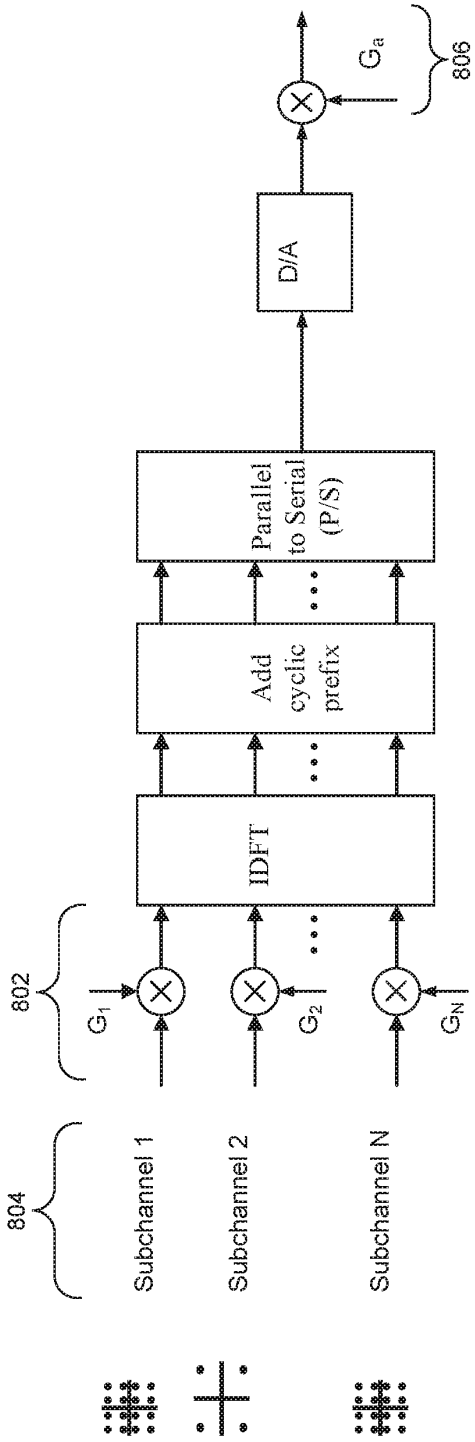

804
Subchannel 1
Subchannel 2
Subchannel N
802
G_1
G_2
G_N
IDFT
Add cyclic prefix
Parallel to Serial (P/S)
D/A
G_a
806

FIG. 8

Electronic Acknowledgement Receipt

EFS ID:	25323307
Application Number:	15082878
International Application Number:	
Confirmation Number:	1059
Title of Invention:	METHODS AND APPARATUS FOR MULTI-CARRIER COMMUNICATION SYSTEMS WITH ADAPTIVE TRANSMISSION AND FEEDBACK
First Named Inventor/Applicant Name:	Xiaodong Li
Customer Number:	25096
Filer:	Stephen C Bishop/Todd Nielsen
Filer Authorized By:	Stephen C Bishop
Attorney Docket Number:	061240-8002.US05
Receipt Date:	28-MAR-2016
Filing Date:	
Time Stamp:	17:36:17
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	no

File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1	Application Data Sheet	0612408002US05_ADS_03_28_16.PDF	1823602 185f4954b5c688cf3d0456073b6427e7647170c8	no	10

Warnings:

Information:

2		0612408002US05_Application_03_28_16.pdf	3804827 4b043968de0a8ac57c186bc25a4de1f22993d752	yes	33

Multipart Description/PDF files in .zip description

Document Description	Start	End
Transmittal of New Application	1	1
Power of Attorney	2	2
Assignee showing of ownership per 37 CFR 3.73	3	3
Oath or Declaration filed	4	7
Specification	8	20
Claims	21	24
Abstract	25	25
Drawings-only black and white line drawings	26	33

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Application Data Sheet 37 CFR 1.76	Attorney Docket Number	061240-8002.US05
	Application Number	
Title of Invention	METHODS AND APPARATUS FOR MULTI-CARRIER COMMUNICATION SYSTEMS WITH ADAPTIVE TRANSMISSION AND FEEDBACK	

The application data sheet is part of the provisional or nonprovisional application for which it is being submitted. The following form contains the bibliographic data arranged in a format specified by the United States Patent and Trademark Office as outlined in 37 CFR 1.76.
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Secrecy Order 37 CFR 5.2:

☐ Portions or all of the application associated with this Application Data Sheet may fall under a Secrecy Order pursuant to 37 CFR 5.2 (Paper filers only. Applications that fall under Secrecy Order may not be filed electronically.)

Inventor Information:

Inventor 1 Remove

Legal Name

Prefix	Given Name	Middle Name	Family Name	Suffix
	Xiaodong		Li	

Residence Information (Select One) ● US Residency Non US Residency Active US Military Service

City	Kirkland	State/Province	WA	Country of Residence i	US

Mailing Address of Inventor:

Address 1	1750 112th Ave NE
Address 2	Suite D159
City	Bellevue
State/Province	WA
Postal Code	98004
Country i	US

Inventor 2 Remove

Legal Name

Prefix	Given Name	Middle Name	Family Name	Suffix
	Titus		Lo	

Residence Information (Select One) ◉ US Residency Non US Residency Active US Military Service

City	Bellevue	State/Province	WA	Country of Residence i	US

Mailing Address of Inventor:

Address 1	1750 112th Ave NE
Address 2	Suite D159
City	Bellevue
State/Province	WA
Postal Code	98004
Country i	US

Inventor 3 Remove

Legal Name

Prefix	Given Name	Middle Name	Family Name	Suffix
	Kemin		Li	

Residence Information (Select One) ◉ US Residency Non US Residency Active US Military Service

Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it contains a valid OMB control number.

Application Data Sheet 37 CFR 1.76	Attorney Docket Number	061240-8002.US05
	Application Number	
Title of Invention	METHODS AND APPARATUS FOR MULTI-CARRIER COMMUNICATION SYSTEMS WITH ADAPTIVE TRANSMISSION AND FEEDBACK	

City	Bellevue	**State/Province**	WA	**Country of Residence** i	US

Mailing Address of Inventor:

Address 1	1750 112th Ave NE		
Address 2	Suite D159		
City	Bellevue	**State/Province**	WA
Postal Code	98004	**Country** i	US

Inventor 4 Remove

Legal Name

Prefix	Given Name	Middle Name	Family Name	Suffix
	Haiming		Huang	

Residence Information (Select One) ◉ US Residency Non US Residency Active US Military Service

City	Bellevue	**State/Province**	WA	**Country of Residence** i	US

Mailing Address of Inventor:

Address 1	1750 112th Ave NE		
Address 2	Suite D159		
City	Bellevue	**State/Province**	WA
Postal Code	98004	**Country** i	US

All Inventors Must Be Listed - Additional Inventor Information blocks may be generated within this form by selecting the **Add** button. Add

Correspondence Information:

Enter either Customer Number or complete the Correspondence Information section below.
For further information see 37 CFR 1.33(a).

☐ **An Address is being provided for the correspondence Information of this application.**

Customer Number	25096		
Email Address	patentprocurement@perkinscoie.com	Add Email	Remove Email

Application Information:

Title of the Invention	METHODS AND APPARATUS FOR MULTI-CARRIER COMMUNICATION SYSTEMS WITH ADAPTIVE TRANSMISSION AND FEEDBACK		
Attorney Docket Number	061240-8002.US05	**Small Entity Status Claimed**	☒
Application Type	Nonprovisional		
Subject Matter	Utility		
Total Number of Drawing Sheets (if any)	8	**Suggested Figure for Publication (if any)**	

Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it contains a valid OMB control number.

Application Data Sheet 37 CFR 1.76	Attorney Docket Number	061240-8002.US05
	Application Number	
Title of Invention	METHODS AND APPARATUS FOR MULTI-CARRIER COMMUNICATION SYSTEMS WITH ADAPTIVE TRANSMISSION AND FEEDBACK	

Filing By Reference:

Only complete this section when filing an application by reference under 35 U.S.C. 111(c) and 37 CFR 1.57(a). Do not complete this section if application papers including a specification and any drawings are being filed. Any domestic benefit or foreign priority information must be provided in the appropriate section(s) below (i.e., "Domestic Benefit/National Stage Information" and "Foreign Priority Information").

For the purposes of a filing date under 37 CFR 1.53(b), the description and any drawings of the present application are replaced by this reference to the previously filed application, subject to conditions and requirements of 37 CFR 1.57(a).

Application number of the previously filed application	Filing date (YYYY-MM-DD)	Intellectual Property Authority or Country

Publication Information:

☐ Request Early Publication (Fee required at time of Request 37 CFR 1.219)

☐ **Request Not to Publish.** I hereby request that the attached application not be published under 35 U.S.C. 122(b) and certify that the invention disclosed in the attached application **has not and will not** be the subject of an application filed in another country, or under a multilateral international agreement, that requires publication at eighteen months after filing.

Representative Information:

Representative information should be provided for all practitioners having a power of attorney in the application. Providing this information in the Application Data Sheet does not constitute a power of attorney in the application (see 37 CFR 1.32).
Either enter Customer Number or complete the Representative Name section below. If both sections are completed the customer Number will be used for the Representative Information during processing.

Please Select One:	● Customer Number	US Patent Practitioner	○ Limited Recognition (37 CFR 11.9)
Customer Number	25096		

Domestic Benefit/National Stage Information:

This section allows for the applicant to either claim benefit under 35 U.S.C. 119(e), 120, 121, 365(c), or 386(c) or indicate National Stage entry from a PCT application. Providing benefit claim information in the Application Data Sheet constitutes the specific reference required by 35 U.S.C. 119(e) or 120, and 37 CFR 1.78.
When referring to the current application, please leave the "Application Number" field blank.

Prior Application Status	Pending		Remove
Application Number	Continuity Type	Prior Application Number	Filing or 371(c) Date (YYYY-MM-DD)
	Continuation of	14539917	2014-11-12

Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it contains a valid OMB control number.

Application Data Sheet 37 CFR 1.76	Attorney Docket Number	061240-8002.US05
	Application Number	
Title of Invention	METHODS AND APPARATUS FOR MULTI-CARRIER COMMUNICATION SYSTEMS WITH ADAPTIVE TRANSMISSION AND FEEDBACK	

Prior Application Status	Abandoned			Remove
Application Number	Continuity Type	Prior Application Number	Filing or 371(c) Date (YYYY-MM-DD)	
14539917	Continuation of	13246677	2011-09-27	

Prior Application Status	Patented				Remove
Application Number	Continuity Type	Prior Application Number	Filing Date (YYYY-MM-DD)	Patent Number	Issue Date (YYYY-MM-DD)
13246677	Continuation of	12755313	2010-04-06	8027367	2011-09-27

Prior Application Status	Patented				Remove
Application Number	Continuity Type	Prior Application Number	Filing Date (YYYY-MM-DD)	Patent Number	Issue Date (YYYY-MM-DD)
12755313	Continuation of	10583529	2007-05-10	7693032	2010-04-06

Prior Application Status	Expired			Remove
Application Number	Continuity Type	Prior Application Number	Filing or 371(c) Date (YYYY-MM-DD)	
10583529	a 371 of international	PCTUS0504601	2005-02-14	

Prior Application Status	Expired			Remove
Application Number	Continuity Type	Prior Application Number	Filing or 371(c) Date (YYYY-MM-DD)	
PCTUS0504601	Claims benefit of provisional	60544521	2004-02-13	

Additional Domestic Benefit/National Stage Data may be generated within this form by selecting the **Add** button. Add

Foreign Priority Information:

This section allows for the applicant to claim priority to a foreign application. Providing this information in the application data sheet constitutes the claim for priority as required by 35 U.S.C. 119(b) and 37 CFR 1.55. When priority is claimed to a foreign application that is eligible for retrieval under the priority document exchange program (PDX)[i] the information will be used by the Office to automatically attempt retrieval pursuant to 37 CFR 1.55(i)(1) and (2). Under the PDX program, applicant bears the ultimate responsibility for ensuring that a copy of the foreign application is received by the Office from the participating foreign intellectual property office, or a certified copy of the foreign priority application is filed, within the time period specified in 37 CFR 1.55(g)(1).

Remove

Application Number	Country[i]	Filing Date (YYYY-MM-DD)	Access Code[i] (if applicable)

Additional Foreign Priority Data may be generated within this form by selecting the **Add** button. Add

Application Data Sheet 37 CFR 1.76	Attorney Docket Number	061240-8002.US05
	Application Number	
Title of Invention	METHODS AND APPARATUS FOR MULTI-CARRIER COMMUNICATION SYSTEMS WITH ADAPTIVE TRANSMISSION AND FEEDBACK	

Statement under 37 CFR 1.55 or 1.78 for AIA (First Inventor to File) Transition Applications

☐ This application (1) claims priority to or the benefit of an application filed before March 16, 2013 and (2) also contains, or contained at any time, a claim to a claimed invention that has an effective filing date on or after March 16, 2013.
NOTE: By providing this statement under 37 CFR 1.55 or 1.78, this application, with a filing date on or after March 16, 2013, will be examined under the first inventor to file provisions of the AIA.

Application Data Sheet 37 CFR 1.76	Attorney Docket Number	061240-8002.US05
	Application Number	
Title of Invention	METHODS AND APPARATUS FOR MULTI-CARRIER COMMUNICATION SYSTEMS WITH ADAPTIVE TRANSMISSION AND FEEDBACK	

Authorization or Opt-Out of Authorization to Permit Access:

When this Application Data Sheet is properly signed and filed with the application, applicant has provided written authority to permit a participating foreign intellectual property (IP) office access to the instant application-as-filed (see paragraph A in subsection 1 below) and the European Patent Office (EPO) access to any search results from the instant application (see paragraph B in subsection 1 below).

Should applicant choose not to provide an authorization identified in subsection 1 below, applicant **must opt-out** of the authorization by checking the corresponding box A or B or both in subsection 2 below.

NOTE: This section of the Application Data Sheet is **ONLY** reviewed and processed with the **INITIAL** filing of an application. After the initial filing of an application, an Application Data Sheet cannot be used to provide or rescind authorization for access by a foreign IP office(s). Instead, Form PTO/SB/39 or PTO/SB/69 must be used as appropriate.

1. Authorization to Permit Access by a Foreign Intellectual Property Office(s)

A. Priority Document Exchange (PDX) - Unless box A in subsection 2 (opt-out of authorization) is checked, the undersigned hereby **grants the USPTO authority** to provide the European Patent Office (EPO), the Japan Patent Office (JPO), the Korean Intellectual Property Office (KIPO), the State Intellectual Property Office of the People's Republic of China (SIPO), the World Intellectual Property Organization (WIPO), and any other foreign intellectual property office participating with the USPTO in a bilateral or multilateral priority document exchange agreement in which a foreign application claiming priority to the instant patent application is filed, access to: (1) the instant patent application-as-filed and its related bibliographic data, (2) any foreign or domestic application to which priority or benefit is claimed by the instant application and its related bibliographic data, and (3) the date of filing of this Authorization. See 37 CFR 1.14(h)(1).

B. Search Results from U.S. Application to EPO - Unless box B in subsection 2 (opt-out of authorization) is checked, the undersigned hereby **grants the USPTO authority** to provide the EPO access to the bibliographic data and search results from the instant patent application when a European patent application claiming priority to the instant patent application is filed. See 37 CFR 1.14(h)(2).

The applicant is reminded that the EPO's Rule 141(1) EPC (European Patent Convention) requires applicants to submit a copy of search results from the instant application without delay in a European patent application that claims priority to the instant application.

2. Opt-Out of Authorizations to Permit Access by a Foreign Intellectual Property Office(s)

☐ A. Applicant **DOES NOT** authorize the USPTO to permit a participating foreign IP office access to the instant application-as-filed. If this box is checked, the USPTO will not be providing a participating foreign IP office with any documents and information identified in subsection 1A above.

☐ B. Applicant **DOES NOT** authorize the USPTO to transmit to the EPO any search results from the instant patent application. If this box is checked, the USPTO will not be providing the EPO with search results from the instant application.

NOTE: Once the application has published or is otherwise publicly available, the USPTO may provide access to the application in accordance with 37 CFR 1.14.

PTO/AIA/14 (11-15)
Approved for use through 04/30/2017. OMB 0651-0032
U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE
Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it contains a valid OMB control number.

Application Data Sheet 37 CFR 1.76	Attorney Docket Number	061240-8002.US05
	Application Number	
Title of Invention	METHODS AND APPARATUS FOR MULTI-CARRIER COMMUNICATION SYSTEMS WITH ADAPTIVE TRANSMISSION AND FEEDBACK	

Applicant Information:

Providing assignment information in this section does not substitute for compliance with any requirement of part 3 of Title 37 of CFR to have an assignment recorded by the Office.

Applicant 1 Remove

If the applicant is the inventor (or the remaining joint inventor or inventors under 37 CFR 1.45), this section should not be completed. The information to be provided in this section is the name and address of the legal representative who is the applicant under 37 CFR 1.43; or the name and address of the assignee, person to whom the inventor is under an obligation to assign the invention, or person who otherwise shows sufficient proprietary interest in the matter who is the applicant under 37 CFR 1.46. If the applicant is an applicant under 37 CFR 1.46 (assignee, person to whom the inventor is obligated to assign, or person who otherwise shows sufficient proprietary interest) together with one or more joint inventors, then the joint inventor or inventors who are also the applicant should be identified in this section. Clear

● Assignee	Legal Representative under 35 U.S.C. 117	Joint Inventor
Person to whom the inventor is obligated to assign.	Person who shows sufficient proprietary interest	

If applicant is the legal representative, indicate the authority to file the patent application, the inventor is:

Name of the Deceased or Legally Incapacitated Inventor:

If the Applicant is an Organization check here. ☒

Organization Name	Neocific, Inc.		
Mailing Address Information For Applicant:			
Address 1	1750 112th Ave NE		
Address 2	Suite D159		
City	Bellevue	**State/Province**	WA
Country	US	Postal Code	98004
Phone Number		Fax Number	
Email Address			

Additional Applicant Data may be generated within this form by selecting the Add button. Add

Assignee Information including Non-Applicant Assignee Information:

Providing assignment information in this section does not substitute for compliance with any requirement of part 3 of Title 37 of CFR to have an assignment recorded by the Office.

Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it contains a valid OMB control number.

Application Data Sheet 37 CFR 1.76	Attorney Docket Number	061240-8002.US05
	Application Number	
Title of Invention	METHODS AND APPARATUS FOR MULTI-CARRIER COMMUNICATION SYSTEMS WITH ADAPTIVE TRANSMISSION AND FEEDBACK	

Assignee 1

Complete this section if assignee information, including non-applicant assignee information, is desired to be included on the patent application publication. An assignee-applicant identified in the "Applicant Information" section will appear on the patent application publication as an applicant. For an assignee-applicant, complete this section only if identification as an assignee is also desired on the patent application publication.

Remove

If the Assignee or Non-Applicant Assignee is an Organization check here. ☐

Prefix	**Given Name**	Middle Name	**Family Name**	Suffix

Mailing Address Information For Assignee including Non-Applicant Assignee:

Address 1			
Address 2			
City		**State/Province**	
Country i		Postal Code	
Phone Number		Fax Number	
Email Address			

Additional Assignee or Non-Applicant Assignee Data may be generated within this form by selecting the Add button. Add

Signature:

Remove

NOTE: This Application Data Sheet must be signed in accordance with 37 CFR 1.33(b). **However, if this Application Data Sheet is submitted with the INITIAL filing of the application and either box A or B is not checked in subsection 2 of the "Authorization or Opt-Out of Authorization to Permit Access" section, then this form must also be signed in accordance with 37 CFR 1.14(c).**

This Application Data Sheet **must** be signed by a patent practitioner if one or more of the applicants is a **juristic entity** (e.g., corporation or association). If the applicant is two or more joint inventors, this form must be signed by a patent practitioner, **all** joint inventors who are the applicant, or one or more joint inventor-applicants who have been given power of attorney (e.g., see USPTO Form PTO/AIA/81) on behalf of **all** joint inventor-applicants.

See 37 CFR 1.4(d) for the manner of making signatures and certifications.

Signature	/Stephen Bishop/			Date (YYYY-MM-DD)	2016-03-28
First Name	Stephen	Last Name	Bishop	Registration Number	38829

Additional Signature may be generated within this form by selecting the Add button. Add

Application Data Sheet 37 CFR 1.76	Attorney Docket Number	061240-8002.US05
	Application Number	
Title of Invention	METHODS AND APPARATUS FOR MULTI-CARRIER COMMUNICATION SYSTEMS WITH ADAPTIVE TRANSMISSION AND FEEDBACK	

This collection of information is required by 37 CFR 1.76. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 23 minutes to complete, including gathering, preparing, and submitting the completed application data sheet form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

Privacy Act Statement

The Privacy Act of 1974 (P.L. 93-579) requires that you be given certain information in connection with your submission of the attached form related to a patent application or patent. Accordingly, pursuant to the requirements of the Act, please be advised that: (1) the general authority for the collection of this information is 35 U.S.C. 2(b)(2); (2) furnishing of the information solicited is voluntary; and (3) the principal purpose for which the information is used by the U.S. Patent and Trademark Office is to process and/or examine your submission related to a patent application or patent. If you do not furnish the requested information, the U.S. Patent and Trademark Office may not be able to process and/or examine your submission, which may result in termination of proceedings or abandonment of the application or expiration of the patent.

The information provided by you in this form will be subject to the following routine uses:

1 The information on this form will be treated confidentially to the extent allowed under the Freedom of Information Act (5 U.S.C. 552) and the Privacy Act (5 U.S.C. 552a). Records from this system of records may be disclosed to the Department of Justice to determine whether the Freedom of Information Act requires disclosure of these records.

2. A record from this system of records may be disclosed, as a routine use, in the course of presenting evidence to a court, magistrate, or administrative tribunal, including disclosures to opposing counsel in the course of settlement negotiations.

3 A record in this system of records may be disclosed, as a routine use, to a Member of Congress submitting a request involving an individual, to whom the record pertains, when the individual has requested assistance from the Member with respect to the subject matter of the record.

4. A record in this system of records may be disclosed, as a routine use, to a contractor of the Agency having need for the information in order to perform a contract. Recipients of information shall be required to comply with the requirements of the Privacy Act of 1974, as amended, pursuant to 5 U.S.C. 552a(m).

5. A record related to an International Application filed under the Patent Cooperation Treaty in this system of records may be disclosed, as a routine use, to the International Bureau of the World Intellectual Property Organization, pursuant to the Patent CooperationTreaty.

6. A record in this system of records may be disclosed, as a routine use, to another federal agency for purposes of National Security review (35 U.S.C. 181) and for review pursuant to the Atomic Energy Act (42 U.S.C. 218(c)).

7. A record from this system of records may be disclosed, as a routine use, to the Administrator, General Services, or his/her designee, during an inspection of records conducted by GSA as part of that agency's responsibility to recommend improvements in records management practices and programs, under authority of 44 U.S.C. 2904 and 2906. Such disclosure shall be made in accordance with the GSA regulations governing inspection of records for this purpose, and any other relevant (i.e., GSA or Commerce) directive. Such disclosure shall not be used to make determinations about individuals.

8. A record from this system of records may be disclosed, as a routine use, to the public after either publication of the application pursuant to 35 U.S.C. 122(b) or issuance of a patent pursuant to 35 U.S.C. 151. Further, a record may be disclosed, subject to the limitations of 37 CFR 1.14, as a routine use, to the public if the record was filed in an application which became abandoned or in which the proceedings were terminated and which application is referenced by either a published application, an application open to public inspections or an issued patent.

9. A record from this system of records may be disclosed, as a routine use, to a Federal, State, or local law enforcement agency, if the USPTO becomes aware of a violation or potential violation of law or regulation.

SCORE Placeholder Sheet for IFW Content

Application Number: 15082878 Document Date: 03/28/2016

The presence of this form in the IFW record indicates that the following document type was received in electronic format on the date identified above. This content is stored in the SCORE database.

- Drawings – Other than Black and White Line Drawings

Since this was an electronic submission, there is no physical artifact folder, no artifact folder is recorded in PALM, and no paper documents or physical media exist. The TIFF images in the IFW record were created from the original documents that are stored in SCORE.

To access the documents in the SCORE database, refer to instructions below.

At the time of document entry (noted above):

- Examiners may access SCORE content via the eDAN interface.
- Other USPTO employees can bookmark the current SCORE URL (http://Score.uspto.gov/ScoreAccessWeb/).
- External customers may access SCORE content via the Public and Private PAIR interfaces.

Form Revision Date: September 30, 2013

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UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NUMBER	FILING or 371(c) DATE	GRP ART UNIT	FIL FEE REC'D	ATTY.DOCKET.NO	TOT CLAIMS	IND CLAIMS
15/082,878	03/28/2016		0.00	061240-8002.US05	25	4

CONFIRMATION NO. 1059

FILING RECEIPT

OC000000082117305

25096
PERKINS COIE LLP - SEA General
PATENT-SEA
P.O. BOX 1247
SEATTLE, WA 98111-1247

Date Mailed: 04/13/2016

Receipt is acknowledged of this non-provisional patent application. The application will be taken up for examination in due course. Applicant will be notified as to the results of the examination. Any correspondence concerning the application must include the following identification information: the U.S. APPLICATION NUMBER, FILING DATE, NAME OF APPLICANT, and TITLE OF INVENTION. Fees transmitted by check or draft are subject to collection. Please verify the accuracy of the data presented on this receipt. **If an error is noted on this Filing Receipt, please submit a written request for a Filing Receipt Correction. Please provide a copy of this Filing Receipt with the changes noted thereon. If you received a "Notice to File Missing Parts" for this application, please submit any corrections to this Filing Receipt with your reply to the Notice. When the USPTO processes the reply to the Notice, the USPTO will generate another Filing Receipt incorporating the requested corrections**

Inventor(s)

Xiaodong Li, Kirkland, WA;
Titus Lo, Bellevue, WA;
Kemin Li, Bellevue, WA;
Haiming Huang, Bellevue, WA;

Applicant(s)

Neocific, Inc., Bellevue, WA;

Power of Attorney: The patent practitioners associated with Customer Number 25096

Domestic Priority data as claimed by applicant

This application is a CON of 14/539,917 11/12/2014 PAT 9301296
which is a CON of 13/246,677 09/27/2011 ABN
which is a CON of 12/755,313 04/06/2010 PAT 8027367
which is a CON of 10/583,529 05/10/2007 PAT 7693032
which is a 371 of PCT/US2005/004601 02/14/2005
which claims benefit of 60/544,521 02/13/2004

Foreign Applications for which priority is claimed (You may be eligible to benefit from the **Patent Prosecution Highway** program at the USPTO. Please see http://www.uspto.gov for more information.) - None.
Foreign application information must be provided in an Application Data Sheet in order to constitute a claim to foreign priority. See 37 CFR 1.55 and 1.76.

Permission to Access Application via Priority Document Exchange: Yes

Permission to Access Search Results: Yes

Applicant may provide or rescind an authorization for access using Form PTO/SB/39 or Form PTO/SB/69 as appropriate.

If Required, Foreign Filing License Granted: 04/11/2016

The country code and number of your priority application, to be used for filing abroad under the Paris Convention, is **US 15/082,878**

Projected Publication Date: To Be Determined - pending completion of Missing Parts

Non-Publication Request: No

Early Publication Request: No
**** SMALL ENTITY ****
Title

METHODS AND APPARATUS FOR MULTI-CARRIER COMMUNICATION SYSTEMS WITH ADAPTIVE TRANSMISSION AND FEEDBACK

Preliminary Class

Statement under 37 CFR 1.55 or 1.78 for AIA (First Inventor to File) Transition Applications: No

PROTECTING YOUR INVENTION OUTSIDE THE UNITED STATES

Since the rights granted by a U.S. patent extend only throughout the territory of the United States and have no effect in a foreign country, an inventor who wishes patent protection in another country must apply for a patent in a specific country or in regional patent offices. Applicants may wish to consider the filing of an international application under the Patent Cooperation Treaty (PCT). An international (PCT) application generally has the same effect as a regular national patent application in each PCT-member country. The PCT process **simplifies** the filing of patent applications on the same invention in member countries, but **does not result** in a grant of "an international patent" and does not eliminate the need of applicants to file additional documents and fees in countries where patent protection is desired.

Almost every country has its own patent law, and a person desiring a patent in a particular country must make an application for patent in that country in accordance with its particular laws. Since the laws of many countries differ in various respects from the patent law of the United States, applicants are advised to seek guidance from specific foreign countries to ensure that patent rights are not lost prematurely.

Applicants also are advised that in the case of inventions made in the United States, the Director of the USPTO must issue a license before applicants can apply for a patent in a foreign country. The filing of a U.S. patent application serves as a request for a foreign filing license. The application's filing receipt contains further information and guidance as to the status of applicant's license for foreign filing.

Applicants may wish to consult the USPTO booklet, "General Information Concerning Patents" (specifically, the section entitled "Treaties and Foreign Patents") for more information on timeframes and deadlines for filing foreign patent applications. The guide is available either by contacting the USPTO Contact Center at 800-786-9199, or it can be viewed on the USPTO website at http://www.uspto.gov/web/offices/pac/doc/general/index.html.

For information on preventing theft of your intellectual property (patents, trademarks and copyrights), you may wish to consult the U.S. Government website, http://www.stopfakes.gov. Part of a Department of Commerce initiative, this website includes self-help "toolkits" giving innovators guidance on how to protect intellectual property in specific

countries such as China, Korea and Mexico. For questions regarding patent enforcement issues, applicants may call the U.S. Government hotline at 1-866-999-HALT (1-866-999-4258).

LICENSE FOR FOREIGN FILING UNDER

Title 35, United States Code, Section 184

Title 37, Code of Federal Regulations, 5.11 & 5.15

GRANTED

The applicant has been granted a license under 35 U.S.C. 184, if the phrase "IF REQUIRED, FOREIGN FILING LICENSE GRANTED" followed by a date appears on this form. Such licenses are issued in all applications where the conditions for issuance of a license have been met, regardless of whether or not a license may be required as set forth in 37 CFR 5.15. The scope and limitations of this license are set forth in 37 CFR 5.15(a) unless an earlier license has been issued under 37 CFR 5.15(b). The license is subject to revocation upon written notification. The date indicated is the effective date of the license, unless an earlier license of similar scope has been granted under 37 CFR 5.13 or 5.14.

This license is to be retained by the licensee and may be used at any time on or after the effective date thereof unless it is revoked. This license is automatically transferred to any related applications(s) filed under 37 CFR 1.53(d). This license is not retroactive.

The grant of a license does not in any way lessen the responsibility of a licensee for the security of the subject matter as imposed by any Government contract or the provisions of existing laws relating to espionage and the national security or the export of technical data. Licensees should apprise themselves of current regulations especially with respect to certain countries, of other agencies, particularly the Office of Defense Trade Controls, Department of State (with respect to Arms, Munitions and Implements of War (22 CFR 121-128)); the Bureau of Industry and Security, Department of Commerce (15 CFR parts 730-774); the Office of Foreign AssetsControl, Department of Treasury (31 CFR Parts 500+) and the Department of Energy.

NOT GRANTED

No license under 35 U.S.C. 184 has been granted at this time, if the phrase "IF REQUIRED, FOREIGN FILING LICENSE GRANTED" DOES NOT appear on this form. Applicant may still petition for a license under 37 CFR 5.12, if a license is desired before the expiration of 6 months from the filing date of the application. If 6 months has lapsed from the filing date of this application and the licensee has not received any indication of a secrecy order under 35 U.S.C. 181, the licensee may foreign file the application pursuant to 37 CFR 5.15(b).

SelectUSA

The United States represents the largest, most dynamic marketplace in the world and is an unparalleled location for business investment, innovation, and commercialization of new technologies. The U.S. offers tremendous resources and advantages for those who invest and manufacture goods here. Through SelectUSA, our nation works to promote and facilitate business investment. SelectUSA provides information assistance to the international investor community; serves as an ombudsman for existing and potential investors; advocates on behalf of U.S. cities, states, and regions competing for global investment; and counsels U.S. economic development organizations on investment attraction best practices. To learn more about why the United States is the best country in the world to develop

technology, manufacture products, deliver services, and grow your business, visit http://www.SelectUSA.gov or call +1-202-482-6800.

PATENT APPLICATION FEE DETERMINATION RECORD Substitute for Form PTO-875	Application or Docket Number 15/082,878

APPLICATION AS FILED - PART I

FOR	(Column 1) NUMBER FILED	(Column 2) NUMBER EXTRA	SMALL ENTITY RATE($)	SMALL ENTITY FEE($)	OR	OTHER THAN SMALL ENTITY RATE($)	OTHER THAN SMALL ENTITY FEE($)
BASIC FEE (37 CFR 1.16(a), (b), or (c))	N/A	N/A	N/A	70		N/A	
SEARCH FEE (37 CFR 1.16(k), (i), or (m))	N/A	N/A	N/A	300		N/A	
EXAMINATION FEE (37 CFR 1.16(o), (p), or (q))	N/A	N/A	N/A	360		N/A	
TOTAL CLAIMS (37 CFR 1.16(i))	25 minus 20 =	* 5	x 40 =	200	OR		
INDEPENDENT CLAIMS (37 CFR 1.16(h))	4 minus 3 =	* 1	x 210 =	210			
APPLICATION SIZE FEE (37 CFR 1.16(s))	If the specification and drawings exceed 100 sheets of paper, the application size fee due is $310 ($155 for small entity) for each additional 50 sheets or fraction thereof. See 35 U.S.C. 41(a)(1)(G) and 37 CFR 1.16(s).			0.00			
MULTIPLE DEPENDENT CLAIM PRESENT (37 CFR 1.16(j))				0.00			
* If the difference in column 1 is less than zero, enter "0" in column 2.			TOTAL	1140		TOTAL	

APPLICATION AS AMENDED - PART II

		(Column 1) CLAIMS REMAINING AFTER AMENDMENT		(Column 2) HIGHEST NUMBER PREVIOUSLY PAID FOR	(Column 3) PRESENT EXTRA	SMALL ENTITY RATE($)	SMALL ENTITY ADDITIONAL FEE($)	OR	OTHER THAN SMALL ENTITY RATE($)	OTHER THAN SMALL ENTITY ADDITIONAL FEE($)
AMENDMENT A	Total (37 CFR 1.16(i))	*	Minus	**	=	x =		OR	x =	
AMENDMENT A	Independent (37 CFR 1.16(h))	*	Minus	***	=	x =		OR	x =	
AMENDMENT A	Application Size Fee (37 CFR 1.16(s))									
AMENDMENT A	FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))							OR		
						TOTAL ADD'L FEE		OR	TOTAL ADD'L FEE	

		(Column 1) CLAIMS REMAINING AFTER AMENDMENT		(Column 2) HIGHEST NUMBER PREVIOUSLY PAID FOR	(Column 3) PRESENT EXTRA	RATE($)	ADDITIONAL FEE($)	OR	RATE($)	ADDITIONAL FEE($)
AMENDMENT B	Total (37 CFR 1.16(i))	*	Minus	**	=	x =		OR	x =	
AMENDMENT B	Independent (37 CFR 1.16(h))	*	Minus	***	=	x =		OR	x =	
AMENDMENT B	Application Size Fee (37 CFR 1.16(s))									
AMENDMENT B	FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))							OR		
						TOTAL ADD'L FEE		OR	TOTAL ADD'L FEE	

* If the entry in column 1 is less than the entry in column 2, write "0" in column 3.
** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 20, enter "20".
*** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 3, enter "3".
The "Highest Number Previously Paid For" (Total or Independent) is the highest found in the appropriate box in column 1.

UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
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www.uspto.gov

APPLICATION NUMBER	FILING OR 371(C) DATE	FIRST NAMED APPLICANT	ATTY. DOCKET NO./TITLE
15/082,878	03/28/2016	Xiaodong Li	061240-8002.US05

CONFIRMATION NO. 1059

FORMALITIES LETTER

OC000000082117306

25096
PERKINS COIE LLP - SEA General
PATENT-SEA
P.O. BOX 1247
SEATTLE, WA 98111-1247

Date Mailed: 04/13/2016

NOTICE TO FILE MISSING PARTS OF NONPROVISIONAL APPLICATION

FILED UNDER 37 CFR 1.53(b)

Filing Date Granted

Items Required To Avoid Abandonment:

An application number and filing date have been accorded to this application. The item(s) indicated below, however, are missing. Applicant is given **TWO MONTHS** from the date of this Notice within which to file all required items below to avoid abandonment. Extensions of time may be obtained by filing a petition accompanied by the extension fee under the provisions of 37 CFR 1.136(a).

- The statutory basic filing fee is missing.
- The application search fee must be submitted.
- The application examination fee must be submitted.
- Additional claim fees of $ **410** as a small entity, including any required multiple dependent claim fee, are required. Applicant must submit the additional claim fees or cancel the additional claims for which fees are due.
- Surcharge as set forth in 37 CFR 1.16(f) must be submitted.
  The surcharge is due for any one of:
  - late submission of the basic filing fee, search fee, or examination fee,
  - late submission of inventor's oath or declaration,
  - filing an application that does not contain at least one claim on filing, or
  - submission of an application filed by reference to a previously filed application.

SUMMARY OF FEES DUE:

The fee(s) required within **TWO MONTHS** from the date of this Notice to avoid abandonment is/are itemized below. Small entity discount is in effect. If applicant is qualified for micro entity status, an acceptable Certification of Micro Entity Status must be submitted to establish micro entity status. (See 37 CFR 1.29 and forms PTO/SB/15A and 15B.)

- $ **70** basic filing fee.
- $ **70** surcharge.
- $ **300** search fee.
- $ **360** examination fee.
- $ **210** for **1** independent claims over 3.
- $ **200** for **5** total claims over 20.

- $(**0**) previous unapplied payment amount.
- $ **1210** TOTAL FEE BALANCE DUE.

Replies must be received in the USPTO within the set time period or must include a proper Certificate of Mailing or Transmission under 37 CFR 1.8 with a mailing or transmission date within the set time period. For more information and a suggested format, see Form PTO/SB/92 and MPEP 512.

Replies should be mailed to:

Mail Stop Missing Parts
Commissioner for Patents
P.O. Box 1450
Alexandria VA 22313-1450

Registered users of EFS-Web may alternatively submit their reply to this notice via EFS-Web, including a copy of this Notice and selecting the document description "Applicant response to Pre-Exam Formalities Notice". https://sportal.uspto.gov/authenticate/AuthenticateUserLocalEPF.html

For more information about EFS-Web please call the USPTO Electronic Business Center at 1-866-217-9197 or visit our website at http://www.uspto.gov/ebc.

If you are not using EFS-Web to submit your reply, you must include a copy of this notice.

Questions about the contents of this notice and the requirements it sets forth should be directed to the Office of Data Management, Application Assistance Unit, at **(571) 272-4000** or **(571) 272-4200** or **1-888-786-0101**.

/tnguyen/

Docket No.: 061240-8002.US05
(PATENT)

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Patent Application of:
Li et al.

Application No.: 15/082,878

Confirmation No.: 1059

Filed: March 28, 2016

Art Unit: Not Yet Known

For: METHODS AND APPARATUS FOR MULTI-CARRIER COMMUNICATION SYSTEMS WITH ADAPTIVE TRANSMISSION AND FEEDBACK

Examiner: Not Yet Known

PRELIMINARY AMENDMENT UNDER 37 CFR 1.115

MS Amendment
Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Madam,:

Prior to examination on the merits, please amend the above-identified U.S. patent application as follows:

INTRODUCTORY COMMENTS

Amendments to the Specification begin on page 2 of this paper.

Amendments to the Claims are reflected in the listing of claims which begins on page 3 of this paper.

Remarks/Arguments begin on page 7 of this paper.

AMENDMENTS TO THE SPECIFICATION

Please amend the specification as follows:

CROSS-REFERENCE TO RELATED APPLICATION(S)

[0001] This application is a continuation application of, and incorporates by reference in its entirety, U.S. Patent Application No. 14/539,917, now granted U.S. Patent No. 9,301,296, filed November 12, 2014, which is a continuation application of U.S. Patent Application No. 13/246,677, filed September 27, 2011, which is a continuation application of U.S. Patent Application No. 12/755,313, now granted U.S. Patent No. 8,027,367, filed April 6, 2010, which is a continuation application of U.S. Patent Application No. 10/583,529, now granted U.S. Patent No. 7,693,032, having a 371 date of May 10, 2007, which is a national stage application of International Application No. PCT/US2005/004601, filed February 14, 2005, which claims the benefit of U.S. Provisional Patent Application No. 60/544,521, filed February 13, 2004. This application also relates to PCT Application No. PCT/US05/03518 titled "Methods and Apparatus for Overlaying Multi-Carrier and Direct Sequence Spread Spectrum Signals in a Broadband Wireless Communication System," filed January 27, 2005, which claims the benefit of U.S. Provisional Application No. 60/540,032 filed January 29, 2004 and U.S. Provisional Application No. 60/540,586 filed January 30, 2004.

AMENDMENTS TO THE CLAIMS

Please amend the claims as follows:

1-25. (Canceled)

26. (New) A link adaptation method by a base station serving a plurality of mobile stations in an Orthogonal Frequency Division Multiplexing (OFDM) communication system, the communication system utilizing a transmission structure with time slots in the time domain and frequency subchannels in the frequency domain, the method comprising:

transmitting a control message to a mobile station over a control channel, wherein:

the control message contains transmission parameters specific to the mobile station for a subsequent transmission of data by the base station over a frequency subchannel to the mobile station in a time slot; and

the mobile station-specific transmission parameters indicate a multiple-input multiple-output (MIMO) scheme and a corresponding subchannel configuration; and

transmitting a data packet to the mobile station over the frequency subchannel in accordance with the mobile station-specific transmission parameters.

27. (New) The method in claim 26, wherein the mobile station-specific transmission parameters further indicate a training pilot pattern.

28. (New) The method in claim 26, wherein the mobile station-specific transmission parameters further indicate power control information.

29. (New) The method in claim 26, wherein the MIMO scheme is for improving transmission throughput based on a channel condition.

30. (New) The method in claim 26, wherein the corresponding subchannel configuration is selected based on a channel condition.

31. (New) The method in claim 30, wherein the subchannel configuration is characterized by localized subcarriers of a subchannel in the frequency domain.

32. (New) The method in claim 30, wherein the subchannel configuration is characterized by distributed subcarriers of a subchannel in the frequency domain.

33. (New) A base station serving a plurality of mobile stations in an Orthogonal Frequency Division Multiplexing (OFDM) communication system, the communication system utilizing a transmission structure with time slots in the time domain and frequency subchannels in the frequency domain, the base station comprising a transmitter configured to:

transmit a control message to a mobile station over a control channel, wherein:

the control message contains transmission parameters specific to the mobile station for a subsequent transmission of data by the base station over a frequency subchannel to the mobile station in a time slot; and

the mobile station-specific transmission parameters indicate a multiple-input multiple-output (MIMO) scheme and a corresponding subchannel configuration; and

transmit a data packet to the mobile station over the frequency subchannel in accordance with the mobile station-specific transmission parameters.

34. (New) The base station in claim 33, further comprising a receiver configured to receive channel state information from the mobile station.

35. (New) A link adaptation method by a mobile station served by a serving base station in an Orthogonal Frequency Division Multiplexing (OFDM) communication system, the communication system utilizing a transmission structure with time slots in the time domain and frequency subchannels in the frequency domain, the method comprising:

receiving a control message from the serving base station over a control channel, wherein:

the control message contains transmission parameters specific to the mobile station for a subsequent transmission by the serving base station over a frequency subchannel to the mobile station in a time slot; and

the mobile station-specific transmission parameters indicate a multiple-input multiple-output (MIMO) scheme and a corresponding subchannel configuration; and

receiving a data packet transmitted by the serving base station using the mobile station-specific transmission parameters over the frequency subchannel.

36. (New) The method in claim 35, wherein the mobile station-specific transmission parameters further indicate a training pilot pattern.

37. (New) The method in claim 35, wherein the mobile station-specific transmission parameters further indicate power control information.

38. (New) The method in claim 35, wherein the MIMO scheme is for improving transmission throughput based on a channel condition.

39. (New) The method in claim 35, wherein the corresponding subchannel configuration is selected based on a channel condition.

40. (New) The method in claim 39, wherein the subchannel configuration is characterized by localized subcarriers of a subchannel in the frequency domain.

41. (New) The method in claim 39, wherein the subchannel configuration is characterized by distributed subcarriers of a subchannel in the frequency domain.

42. (New) A mobile station served by a serving base station in an Orthogonal Frequency Division Multiplexing (OFDM) communication system, the communication system utilizing a transmission structure with time slots in the time domain and frequency subchannels in the frequency domain, the mobile station comprising a receiver configured to:

receive a control message from the serving base station over a control channel, wherein:

the control message contains transmission parameters specific to the mobile station for a subsequent transmission by the serving base station over a frequency subchannel to the mobile station in a time slot; and

the mobile station-specific transmission parameters indicate a multiple-input multiple-output (MIMO) scheme and a corresponding subchannel configuration; and

receive a data packet transmitted by the serving base station using the mobile station-specific transmission parameters over the frequency subchannel.

43. (New) The mobile station in claim 42, further comprising a transmitter configured to transmit channel state information to the serving base station.

REMARKS

Claims 1-25 were pending prior to the present filing. Claims 1-25 have been canceled and new claims 26-43 have been added. Support for the new claims may be found, for example, in at least paragraph(s) [0015], [0026], [0031], [0042], and [0044]-[0049], and accompanying figures. Applicant respectfully requests examination of the newly-added claims.

Applicant has also amended the first paragraph of the specification to update the application priority information. No new matter has been added to the application.

Please charge any underpayment or credit any overpayment to our Deposit Account No. 50-0665 under Order No. 061240-8002.US05, from which the undersigned is authorized to draw.

Dated: 11 November 2016

Respectfully submitted,

By /Stephen Bishop/
Stephen Bishop
Registration No.: 38,829

Perkins Coie LLP
P.O. Box 1247
Seattle, WA 98111-1247
Phone: (206) 359-8000
Fax: (206) 359-7198

Attorneys for Applicant

Electronic Patent Application Fee Transmittal

Application Number:	15082878
Filing Date:	28-Mar-2016
Title of Invention:	METHODS AND APPARATUS FOR MULTI-CARRIER COMMUNICATION SYSTEMS WITH ADAPTIVE TRANSMISSION AND FEEDBACK
First Named Inventor/Applicant Name:	Xiaodong Li
Filer:	Stephen C Bishop/Todd Nielsen
Attorney Docket Number:	061240-8002.US05

Filed as Small Entity

Filing Fees for Utility under 35 USC 111(a)

Description	Fee Code	Quantity	Amount	Sub-Total in USD($)
Basic Filing:				
UTILITY FILING FEE (ELECTRONIC FILING)	4011	1	70	70
UTILITY SEARCH FEE	2111	1	300	300
UTILITY EXAMINATION FEE	2311	1	360	360
Pages:				
Claims:				
INDEPENDENT CLAIMS IN EXCESS OF 3	2201	1	210	210
Miscellaneous-Filing:				
LATE FILING FEE FOR OATH OR DECLARATION	2051	1	70	70

Description	Fee Code	Quantity	Amount	Sub-Total in USD($)
Petition:				
Patent-Appeals-and-Interference:				
Post-Allowance-and-Post-Issuance:				
Extension-of-Time:				
Extension - 5 months with $0 paid	2255	1	1500	1500
Miscellaneous:				
		Total in USD ($)		**2510**

Electronic Acknowledgement Receipt	
EFS ID:	27490545
Application Number:	15082878
International Application Number:	
Confirmation Number:	1059
Title of Invention:	METHODS AND APPARATUS FOR MULTI-CARRIER COMMUNICATION SYSTEMS WITH ADAPTIVE TRANSMISSION AND FEEDBACK
First Named Inventor/Applicant Name:	Xiaodong Li
Customer Number:	25096
Filer:	Stephen C Bishop/Todd Nielsen
Filer Authorized By:	Stephen C Bishop
Attorney Docket Number:	061240-8002.US05
Receipt Date:	11-NOV-2016
Filing Date:	28-MAR-2016
Time Stamp:	17:41:49
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	yes
Payment Type	CARD
Payment was successfully received in RAM	$2510
RAM confirmation Number	111416INTEFSW17431701
Deposit Account	
Authorized User	
The Director of the USPTO is hereby authorized to charge indicated fees and credit any overpayment as follows:	

File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1		0612408002US05_MP_Response_11_11_16.pdf	288264 f0a7c92f50f9031bc09e60fd7a359113a035c6ef	yes	11

Multipart Description/PDF files in .zip description

Document Description	Start	End
Applicant Response to Pre-Exam Formalities Notice	1	2
Transmittal Letter	3	3
Authorization for Extension of Time all replies	4	4
Preliminary Amendment	5	5
Specification	6	6
Claims	7	10
Applicant Arguments/Remarks Made in an Amendment	11	11

Warnings:

Information:

2	Fee Worksheet (SB06)	fee-info.pdf	40502 2889e7bb27ea8d99c3b3978e072313dc0008c384	no	2

Warnings:

Information:

Total Files Size (in bytes):	328766

This Acknowledgement Receipt evidences receipt on the noted date by the USPTO of the indicated documents, characterized by the applicant, and including page counts, where applicable. It serves as evidence of receipt similar to a Post Card, as described in MPEP 503.

New Applications Under 35 U.S.C. 111
If a new application is being filed and the application includes the necessary components for a filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application.

National Stage of an International Application under 35 U.S.C. 371
If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course.

New International Application Filed with the USPTO as a Receiving Office
If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.

Docket No.: 061240-8002.US05
(PATENT)

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Patent Application of:
Li et al.

Application No.: 15/082,878

Confirmation No.: 1059

Filed: March 28, 2016

Art Unit: Not Yet Assigned

For: METHODS AND APPARATUS FOR MULTI-CARRIER COMMUNICATION SYSTEMS WITH ADAPTIVE TRANSMISSION AND FEEDBACK

Examiner: Not Yet Assigned

RESPONSE TO NOTICE TO FILE MISSING PARTS OF APPLICATION

MS Missing Parts
Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Madam:

In response to the Notice to File Missing Parts of Application – Filing Date Granted mailed April 13, 2016, Applicant respectfully submits the Filing Fee for the Application (as shown on accompanying Fee Transmittal), a Preliminary Amendment, a Petition for Extension of Time, and a General Authorization for Extensions of Time under 37 C.F.R. § 1.136(A)(3) and Fees under 37 C.F.R. § 1.17.

Payment by Credit Card is submitted herewith in the amount of $2,510.00 covering the fees set forth in 37 C.F.R. § 1.16(f), 1.16(a), 1.16(k), 1.16(o), 1.16(h), and 1.17(a)(5). The Director is hereby authorized to charge any deficiency in the fees filed, asserted to be filed or which should have been filed herewith (or with any paper hereafter filed in this application by this firm) to our Deposit Account No. 50-0665, under Order No. 061240-8002.US05.

Dated: 11 November 2016

Respectfully submitted,

By /Stephen Bishop/

Stephen Bishop
Registration No.: 38,829
PERKINS COIE LLP
P.O. Box 1247
Seattle, Washington 98111-1247
(206) 359-8000
(206) 359-7198 (Fax)
Attorney for Applicant

PTO/SB/17 (03-13)
Approved for use through 01/31/2014. OMB 0651-0032
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Under the Paperwork Reduction Act of 1995 no persons are required to respond to a collection of information unless it displays a valid OMB control number

FEE TRANSMITTAL

Complete if known	
Application Number	15/082,878
Filing Date	March 28, 2016
First Named Inventor	Xiaodong Li
Examiner Name	Not Yet Assigned
Art Unit	Not Yet Assigned
Practitioner Docket No.	061240-8002.US05

✓ Applicant asserts small entity status. See 37 CFR 1.27.

☐ Applicant certifies micro entity status. See 37 CFR 1.29. Form PTO/SB/15A or B or equivalent must either be enclosed or have been submitted previously.

TOTAL AMOUNT OF PAYMENT ($) 2,510.00

METHOD OF PAYMENT (check all that apply)

☐ Check ✓ Credit Card ☐ Money Order ☐ None ☐ Other (please identify): _____

✓ Deposit Account Deposit Account Number: 50-0665 Deposit Account Name: Perkins Coie LLP

For the above-identified deposit account, the Director is hereby authorized to (check all that apply):

☐ Charge fee(s) indicated below ☐ Charge fee(s) indicated below, **except for the filing fee**

✓ Charge any additional fee(s) or underpayment of fee(s) under 37 CFR 1.16 and 1.17 ✓ Credit any overpayment of fee(s)

WARNING: Information on this form may become public. Credit card information should not be included on this form. Provide credit card information and authorization on PTO-2038.

FEE CALCULATION

1. BASIC FILING, SEARCH, AND EXAMINATION FEES (U = undiscounted fee; S = small entity fee; M = micro entity fee)

	FILING FEES			SEARCH FEES			EXAMINATION FEES			
Application Type	U ($)	S ($)	M ($)	U ($)	S ($)	M ($)	U ($)	S ($)	M ($)	Fees Paid ($)
Utility	280	140*	70	600	300	150	720	360	180	730.00
Design	180	90	45	120	60	30	460	230	115	
Plant	180	90	45	380	190	95	580	290	145	
Reissue	280	140	70	600	300	150	2,160	1,080	540	
Provisional	260	130	65	0	0	0	0	0	0	

* The $140 small entity status filing fee for a utility application is further reduced to $70 for a small entity status applicant who files the application via EFS-Web.

2. EXCESS CLAIM FEES

Fee Description	Undiscounted Fee ($)	Small Entity Fee ($)	Micro Entity Fee ($)
Each claim over 20 (including Reissues)	80	40	20
Each independent claim over 3 (including Reissues)	420	210	105
Multiple dependent claims	780	390	195

Total Claims		Extra Claims		Fee ($)		Fee Paid ($)
18	-20 or HP =	_____	x	_____	=	_____

HP = highest number of total claims paid for, if greater than 20.

Indep. Claims		Extra Claims		Fee ($)		Fee Paid ($)
4	-3 or HP =	1	x	210.00	=	210.00

HP = highest number of independent claims paid for, if greater than 3.

Multiple Dependent Claims	
Fee ($)	Fee Paid ($)
_____	_____

3. APPLICATION SIZE FEE

If the specification and drawings exceed 100 sheets of paper (excluding electronically filed sequence or computer listings under 37 CFR 1.52(e)), the application size fee due is $400 ($200 for small entity) ($100 for micro entity) for each additional 50 sheets or fraction thereof. See 35 U.S.C. 41(a)(1)(G) and 37 CFR 1.16(s).

Total Sheets		Extra Sheets		Number of each additional 50 or fraction thereof		Fee ($)		Fee Paid ($)
26	- 100 =	_____	/ 50 =	_____ (round up to a whole number)	x	_____	=	_____

4. OTHER FEE(S) — Fees Paid ($)

Non-English specification, $130 fee (no small or micro entity discount) _____

Non-electronic filing fee under 37 CFR 1.16(t) for a utility application, $400 fee ($200 small or micro entity) _____

Other (e.g., late filing surcharge): Extension for response within fifth month ($1,500.00) and Late Filing Surcharge ($70.00) 1,570.00

SUBMITTED BY

Signature	/Stephen Bishop/	Registration No. (Attorney/Agent) 38,829	Telephone (206) 359-8000
Name (Print/Type)	Stephen Bishop		Date 11 November 2016

This collection of information is required by 37 CFR 1.136. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 30 minutes to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

If you need assistance in completing the form, call 1-800-PTO-9199 and select option 2.

Docket No.: 061240-8002.US05
(PATENT)

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Patent Application of:
Li et al.

Application No.: 15/082,878

Confirmation No.: 1059

Filed: March 28, 2016

Art Unit: Not Yet Assigned

For: METHODS AND APPARATUS FOR MULTI-CARRIER COMMUNICATION SYSTEMS WITH ADAPTIVE TRANSMISSION AND FEEDBACK

Examiner: Not Yet Assigned

AUTHORIZATION FOR: EXTENSIONS OF TIME UNDER 37 C.F.R. § 1.136(a)(3) AND PAYMENT OF FEES UNDER 37 C.F.R. § 1.17

Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Madam:

With respect to the above-identified application, the Commissioner is authorized to treat any concurrent or future reply requiring a petition for an extension of time under 37 C.F.R. § 1.136(a)(3) for its timely submission as incorporating a petition therefor for the appropriate length of time. The Commissioner is also authorized to charge any extension of time fees or other fees that may be required under 37 C.F.R. § 1.17 for any paper filed concurrently herewith or in the future, or credit any overpayment, to Deposit Account No. 50-0665.

Dated: 11 November 2016

Respectfully submitted,

By /Stephen Bishop/
Stephen Bishop
Registration No.: 38,829

Perkins Coie LLP
P.O. Box 1247
Seattle, WA 98111-1247
Phone: (206) 359-8000
Attorneys for Applicant

PTO/SB/06 (09-11)
Approved for use through 1/31/2014. OMB 0651-0032
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PATENT APPLICATION FEE DETERMINATION RECORD Substitute for Form PTO-875	Application or Docket Number 15/082,878	Filing Date 03/28/2016	☐ To be Mailed

ENTITY: ☐ LARGE ☒ SMALL ☐ MICRO

APPLICATION AS FILED – PART I

FOR	(Column 1) NUMBER FILED	(Column 2) NUMBER EXTRA	RATE ($)	FEE ($)
☐ BASIC FEE (37 CFR 1.16(a), (b), or (c))	N/A	N/A	N/A	
☐ SEARCH FEE (37 CFR 1.16(k), (i), or (m))	N/A	N/A	N/A	
☐ EXAMINATION FEE (37 CFR 1.16(o), (p), or (q))	N/A	N/A	N/A	
TOTAL CLAIMS (37 CFR 1.16(i))	minus 20 =	*	X $ =	
INDEPENDENT CLAIMS (37 CFR 1.16(h))	minus 3 =	*	X $ =	
☐ APPLICATION SIZE FEE (37 CFR 1.16(s))	If the specification and drawings exceed 100 sheets of paper, the application size fee due is $310 ($155 for small entity) for each additional 50 sheets or fraction thereof. See 35 U.S.C. 41(a)(1)(G) and 37 CFR 1.16(s).			
☐ MULTIPLE DEPENDENT CLAIM PRESENT (37 CFR 1.16(j))				
* If the difference in column 1 is less than zero, enter "0" in column 2.			TOTAL	

APPLICATION AS AMENDED – PART II

AMENDMENT

11/11/2016	(Column 1) CLAIMS REMAINING AFTER AMENDMENT		(Column 2) HIGHEST NUMBER PREVIOUSLY PAID FOR	(Column 3) PRESENT EXTRA	RATE ($)	ADDITIONAL FEE ($)
Total (37 CFR 1.16(i))	* 18	Minus	** 20	= 0	X $40 =	0
Independent (37 CFR 1.16(h))	* 4	Minus	***4	= 0	X $210 =	0
☐ Application Size Fee (37 CFR 1.16(s))						
☐ FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))						
					TOTAL ADD'L FEE	**0**

AMENDMENT

	(Column 1) CLAIMS REMAINING AFTER AMENDMENT		(Column 2) HIGHEST NUMBER PREVIOUSLY PAID FOR	(Column 3) PRESENT EXTRA	RATE ($)	ADDITIONAL FEE ($)
Total (37 CFR 1.16(i))	*	Minus	**	=	X $ =	
Independent (37 CFR 1.16(h))	*	Minus	***	=	X $ =	
☐ Application Size Fee (37 CFR 1.16(s))						
☐ FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))						
					TOTAL ADD'L FEE	

* If the entry in column 1 is less than the entry in column 2, write "0" in column 3.
** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 20, enter "20".
*** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 3, enter "3".
The "Highest Number Previously Paid For" (Total or Independent) is the highest number found in the appropriate box in column 1.

LIE
TRINA STEPTOE

This collection of information is required by 37 CFR 1.16. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 12 minutes to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**
If you need assistance in completing the form, call 1-800-PTO-9199 and select option 2.

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UNITED STATES DEPARTMENT OF COMMERCE
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www.uspto.gov

APPLICATION NUMBER	FILING or 371(c) DATE	GRP ART UNIT	FIL FEE REC'D	ATTY.DOCKET.NO	TOT CLAIMS	IND CLAIMS
15/082,878	03/28/2016		1010	061240-8002.US05	18	4

CONFIRMATION NO. 1059

UPDATED FILING RECEIPT

25096
PERKINS COIE LLP - SEA General
PATENT-SEA
P.O. BOX 1247
SEATTLE, WA 98111-1247

Date Mailed: 11/17/2016

Receipt is acknowledged of this non-provisional patent application. The application will be taken up for examination in due course. Applicant will be notified as to the results of the examination. Any correspondence concerning the application must include the following identification information: the U.S. APPLICATION NUMBER, FILING DATE, NAME OF APPLICANT, and TITLE OF INVENTION. Fees transmitted by check or draft are subject to collection. Please verify the accuracy of the data presented on this receipt. **If an error is noted on this Filing Receipt, please submit a written request for a Filing Receipt Correction. Please provide a copy of this Filing Receipt with the changes noted thereon. If you received a "Notice to File Missing Parts" for this application, please submit any corrections to this Filing Receipt with your reply to the Notice. When the USPTO processes the reply to the Notice, the USPTO will generate another Filing Receipt incorporating the requested corrections**

Inventor(s)

Xiaodong Li, Kirkland, WA;
Titus Lo, Bellevue, WA;
Kemin Li, Bellevue, WA;
Haiming Huang, Bellevue, WA;

Applicant(s)

Neocific, Inc., Bellevue, WA;

Power of Attorney: The patent practitioners associated with Customer Number 25096

Domestic Priority data as claimed by applicant

This application is a CON of 14/539,917 11/12/2014 PAT 9301296
which is a CON of 13/246,677 09/27/2011 ABN
which is a CON of 12/755,313 04/06/2010 PAT 8027367
which is a CON of 10/583,529 05/10/2007 PAT 7693032
which is a 371 of PCT/US2005/004601 02/14/2005
which claims benefit of 60/544,521 02/13/2004

Foreign Applications for which priority is claimed (You may be eligible to benefit from the **Patent Prosecution Highway** program at the USPTO. Please see http://www.uspto.gov for more information.) - None.
Foreign application information must be provided in an Application Data Sheet in order to constitute a claim to foreign priority. See 37 CFR 1.55 and 1.76.

Permission to Access Application via Priority Document Exchange: Yes

Permission to Access Search Results: Yes

Applicant may provide or rescind an authorization for access using Form PTO/SB/39 or Form PTO/SB/69 as appropriate.

If Required, Foreign Filing License Granted: 04/11/2016

The country code and number of your priority application, to be used for filing abroad under the Paris Convention, is **US 15/082,878**

Projected Publication Date: 02/23/2017

Non-Publication Request: No

Early Publication Request: No
**** SMALL ENTITY ****
Title

METHODS AND APPARATUS FOR MULTI-CARRIER COMMUNICATION SYSTEMS WITH ADAPTIVE TRANSMISSION AND FEEDBACK

Preliminary Class

Statement under 37 CFR 1.55 or 1.78 for AIA (First Inventor to File) Transition Applications: No

PROTECTING YOUR INVENTION OUTSIDE THE UNITED STATES

Since the rights granted by a U.S. patent extend only throughout the territory of the United States and have no effect in a foreign country, an inventor who wishes patent protection in another country must apply for a patent in a specific country or in regional patent offices. Applicants may wish to consider the filing of an international application under the Patent Cooperation Treaty (PCT). An international (PCT) application generally has the same effect as a regular national patent application in each PCT-member country. The PCT process **simplifies** the filing of patent applications on the same invention in member countries, but **does not result** in a grant of "an international patent" and does not eliminate the need of applicants to file additional documents and fees in countries where patent protection is desired.

Almost every country has its own patent law, and a person desiring a patent in a particular country must make an application for patent in that country in accordance with its particular laws. Since the laws of many countries differ in various respects from the patent law of the United States, applicants are advised to seek guidance from specific foreign countries to ensure that patent rights are not lost prematurely.

Applicants also are advised that in the case of inventions made in the United States, the Director of the USPTO must issue a license before applicants can apply for a patent in a foreign country. The filing of a U.S. patent application serves as a request for a foreign filing license. The application's filing receipt contains further information and guidance as to the status of applicant's license for foreign filing.

Applicants may wish to consult the USPTO booklet, "General Information Concerning Patents" (specifically, the section entitled "Treaties and Foreign Patents") for more information on timeframes and deadlines for filing foreign patent applications. The guide is available either by contacting the USPTO Contact Center at 800-786-9199, or it can be viewed on the USPTO website at http://www.uspto.gov/web/offices/pac/doc/general/index.html.

For information on preventing theft of your intellectual property (patents, trademarks and copyrights), you may wish to consult the U.S. Government website, http://www.stopfakes.gov. Part of a Department of Commerce initiative, this website includes self-help "toolkits" giving innovators guidance on how to protect intellectual property in specific

countries such as China, Korea and Mexico. For questions regarding patent enforcement issues, applicants may call the U.S. Government hotline at 1-866-999-HALT (1-866-999-4258).

LICENSE FOR FOREIGN FILING UNDER

Title 35, United States Code, Section 184

Title 37, Code of Federal Regulations, 5.11 & 5.15

GRANTED

The applicant has been granted a license under 35 U.S.C. 184, if the phrase "IF REQUIRED, FOREIGN FILING LICENSE GRANTED" followed by a date appears on this form. Such licenses are issued in all applications where the conditions for issuance of a license have been met, regardless of whether or not a license may be required as set forth in 37 CFR 5.15. The scope and limitations of this license are set forth in 37 CFR 5.15(a) unless an earlier license has been issued under 37 CFR 5.15(b). The license is subject to revocation upon written notification. The date indicated is the effective date of the license, unless an earlier license of similar scope has been granted under 37 CFR 5.13 or 5.14.

This license is to be retained by the licensee and may be used at any time on or after the effective date thereof unless it is revoked. This license is automatically transferred to any related applications(s) filed under 37 CFR 1.53(d). This license is not retroactive.

The grant of a license does not in any way lessen the responsibility of a licensee for the security of the subject matter as imposed by any Government contract or the provisions of existing laws relating to espionage and the national security or the export of technical data. Licensees should apprise themselves of current regulations especially with respect to certain countries, of other agencies, particularly the Office of Defense Trade Controls, Department of State (with respect to Arms, Munitions and Implements of War (22 CFR 121-128)); the Bureau of Industry and Security, Department of Commerce (15 CFR parts 730-774); the Office of Foreign AssetsControl, Department of Treasury (31 CFR Parts 500+) and the Department of Energy.

NOT GRANTED

No license under 35 U.S.C. 184 has been granted at this time, if the phrase "IF REQUIRED, FOREIGN FILING LICENSE GRANTED" DOES NOT appear on this form. Applicant may still petition for a license under 37 CFR 5.12, if a license is desired before the expiration of 6 months from the filing date of the application. If 6 months has lapsed from the filing date of this application and the licensee has not received any indication of a secrecy order under 35 U.S.C. 181, the licensee may foreign file the application pursuant to 37 CFR 5.15(b).

SelectUSA

The United States represents the largest, most dynamic marketplace in the world and is an unparalleled location for business investment, innovation, and commercialization of new technologies. The U.S. offers tremendous resources and advantages for those who invest and manufacture goods here. Through SelectUSA, our nation works to promote and facilitate business investment. SelectUSA provides information assistance to the international investor community; serves as an ombudsman for existing and potential investors; advocates on behalf of U.S. cities, states, and regions competing for global investment; and counsels U.S. economic development organizations on investment attraction best practices. To learn more about why the United States is the best country in the world to develop

technology, manufacture products, deliver services, and grow your business, visit http://www.SelectUSA.gov or call +1-202-482-6800.

PATENT APPLICATION FEE DETERMINATION RECORD

Substitute for Form PTO-875

Application or Docket Number
15/082,878

APPLICATION AS FILED - PART I

FOR	(Column 1) NUMBER FILED	(Column 2) NUMBER EXTRA	SMALL ENTITY RATE($)	SMALL ENTITY FEE($)	OR	OTHER THAN SMALL ENTITY RATE($)	OTHER THAN SMALL ENTITY FEE($)
BASIC FEE (37 CFR 1.16(a), (b), or (c))	N/A	N/A	N/A	70		N/A	
SEARCH FEE (37 CFR 1.16(k), (i), or (m))	N/A	N/A	N/A	300		N/A	
EXAMINATION FEE (37 CFR 1.16(o), (p), or (q))	N/A	N/A	N/A	360		N/A	
TOTAL CLAIMS (37 CFR 1.16(i))	18 minus 20 =	*	x 40 =	0.00	OR		
INDEPENDENT CLAIMS (37 CFR 1.16(h))	4 minus 3 =	* 1	x 210 =	210			
APPLICATION SIZE FEE (37 CFR 1.16(s))	If the specification and drawings exceed 100 sheets of paper, the application size fee due is $310 ($155 for small entity) for each additional 50 sheets or fraction thereof. See 35 U.S.C. 41(a)(1)(G) and 37 CFR 1.16(s).			0.00			
MULTIPLE DEPENDENT CLAIM PRESENT (37 CFR 1.16(j))				0.00			
* If the difference in column 1 is less than zero, enter "0" in column 2.			TOTAL	940		TOTAL	

APPLICATION AS AMENDED - PART II

		(Column 1) CLAIMS REMAINING AFTER AMENDMENT		(Column 2) HIGHEST NUMBER PREVIOUSLY PAID FOR	(Column 3) PRESENT EXTRA	SMALL ENTITY RATE($)	SMALL ENTITY ADDITIONAL FEE($)	OR	OTHER THAN SMALL ENTITY RATE($)	OTHER THAN SMALL ENTITY ADDITIONAL FEE($)
AMENDMENT A	Total (37 CFR 1.16(i))	*	Minus	**	=	x =		OR	x =	
AMENDMENT A	Independent (37 CFR 1.16(h))	*	Minus	***	=	x =		OR	x =	
AMENDMENT A	Application Size Fee (37 CFR 1.16(s))									
AMENDMENT A	FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))							OR		
						TOTAL ADD'L FEE		OR	TOTAL ADD'L FEE	

		(Column 1) CLAIMS REMAINING AFTER AMENDMENT		(Column 2) HIGHEST NUMBER PREVIOUSLY PAID FOR	(Column 3) PRESENT EXTRA	RATE($)	ADDITIONAL FEE($)		RATE($)	ADDITIONAL FEE($)
AMENDMENT B	Total (37 CFR 1.16(i))	*	Minus	**	=	x =		OR	x =	
AMENDMENT B	Independent (37 CFR 1.16(h))	*	Minus	***	=	x =		OR	x =	
AMENDMENT B	Application Size Fee (37 CFR 1.16(s))									
AMENDMENT B	FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))							OR		
						TOTAL ADD'L FEE		OR	TOTAL ADD'L FEE	

* If the entry in column 1 is less than the entry in column 2, write "0" in column 3.
** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 20, enter "20".
*** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 3, enter "3".
The "Highest Number Previously Paid For" (Total or Independent) is the highest found in the appropriate box in column 1.

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APPLICATION NUMBER	FILING OR 371(C) DATE	FIRST NAMED APPLICANT	ATTY. DOCKET NO./TITLE
15/082,878	03/28/2016	Xiaodong Li	061240-8002.US05

CONFIRMATION NO. 1059

PUBLICATION NOTICE

OC000000089424841

25096
PERKINS COIE LLP - SEA General
PATENT-SEA
P.O. BOX 1247
SEATTLE, WA 98111-1247

Title:METHODS AND APPARATUS FOR MULTI-CARRIER COMMUNICATION SYSTEMS WITH ADAPTIVE TRANSMISSION AND FEEDBACK

Publication No.US-2017-0055245-A1
Publication Date:02/23/2017

NOTICE OF PUBLICATION OF APPLICATION

The above-identified application will be electronically published as a patent application publication pursuant to 37 CFR 1.211, et seq. The patent application publication number and publication date are set forth above.

The publication may be accessed through the USPTO's publically available Searchable Databases via the Internet at www.uspto.gov. The direct link to access the publication is currently http://www.uspto.gov/patft/.

The publication process established by the Office does not provide for mailing a copy of the publication to applicant. A copy of the publication may be obtained from the Office upon payment of the appropriate fee set forth in 37 CFR 1.19(a)(1). Orders for copies of patent application publications are handled by the USPTO's Office of Public Records. The Office of Public Records can be reached by telephone at (571) 272-3150 or (800) 972-6382, by facsimile at (571) 273-3250, by mail addressed to the United States Patent and Trademark Office, Office of Public Records, Alexandria, VA 22313-1450 or via the Internet.

In addition, information on the status of the application, including the mailing date of Office actions and the dates of receipt of correspondence filed in the Office, may also be accessed via the Internet through the Patent Electronic Business Center at www.uspto.gov using the public side of the Patent Application Information and Retrieval (PAIR) system. The direct link to access this status information is currently http://pair.uspto.gov/. Prior to publication, such status information is confidential and may only be obtained by applicant using the private side of PAIR.

Further assistance in electronically accessing the publication, or about PAIR, is available by calling the Patent Electronic Business Center at 1-866-217-9197.

Office of Data Managment, Application Assistance Unit (571) 272-4000, or (571) 272-4200, or 1-888-786-0101

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UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
15/082,878	03/28/2016	Xiaodong Li	061240-8002.US05	1059

25096 7590 10/12/2017
PERKINS COIE LLP - SEA General
PATENT-SEA
P.O. BOX 1247
SEATTLE, WA 98111-1247

EXAMINER
LEVITAN, DMITRY

ART UNIT	PAPER NUMBER
2461	

NOTIFICATION DATE	DELIVERY MODE
10/12/2017	ELECTRONIC

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Notice of the Office communication was sent electronically on above-indicated "Notification Date" to the following e-mail address(es):

patentprocurement@perkinscoie.com

PTOL-90A (Rev. 04/07)

Office Action Summary	Application No. 15/082,878	Applicant(s) LI ET AL.	
	Examiner Dmitry H. Levitan	Art Unit 2461	AIA (First Inventor to File) Status No

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTHS FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *11/11/16*.

☐ A declaration(s)/affidavit(s) under **37 CFR 1.130(b)** was/were filed on _____.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ An election was made by the applicant in response to a restriction requirement set forth during the interview on _____; the restriction requirement and election have been incorporated into this action.

4)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims*

5)☒ Claim(s) *26-43* is/are pending in the application.

5a) Of the above claim(s) _____ is/are withdrawn from consideration.

6)☐ Claim(s) _____ is/are allowed.

7)☒ Claim(s) *26-43* is/are rejected.

8)☐ Claim(s) _____ is/are objected to.

9)☐ Claim(s) _____ are subject to restriction and/or election requirement.

* If any claims have been determined allowable, you may be eligible to benefit from the **Patent Prosecution Highway** program at a participating intellectual property office for the corresponding application. For more information, please see http://www.uspto.gov/patents/init_events/pph/index.jsp or send an inquiry to PPHfeedback@uspto.gov.

Application Papers

10)☐ The specification is objected to by the Examiner.

11)☒ The drawing(s) filed on *3/28/16* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

Certified copies:

a)☐ All b)☐ Some** c)☐ None of the:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

** See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)

2) ☐ Information Disclosure Statement(s) (PTO/SB/08a and/or PTO/SB/08b) Paper No(s)/Mail Date _____.

3) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .

4) ☐ Other: _____.

1. The present application is being examined under the pre-AIA first to invent provisions.

2. Preliminary amendment, filed 11/11/16, has been entered. Claims 26-43 remain pending.

Specification

3. The amendment to the Specification, submitted on 11/11/16, has been entered.

Double Patenting

4. The nonstatutory double patenting rejection is based on a judicially created doctrine grounded in public policy (a policy reflected in the statute) so as to prevent the unjustified or improper timewise extension of the "right to exclude" granted by a patent and to prevent possible harassment by multiple assignees. A nonstatutory double patenting rejection is appropriate where the conflicting claims are not identical, but at least one examined application claim is not patentably distinct from the reference claim(s) because the examined application claim is either anticipated by, or would have been obvious over, the reference claim(s). See, e.g., *In re Berg*, 140 F.3d 1428, 46 USPQ2d 1226 (Fed. Cir. 1998); *In re Goodman*, 11 F.3d 1046, 29 USPQ2d 2010 (Fed. Cir. 1993); *In re Longi*, 759 F.2d 887, 225 USPQ 645 (Fed. Cir. 1985); *In re Van Ornum*, 686 F.2d 937, 214 USPQ 761 (CCPA 1982); *In re Vogel*, 422 F.2d 438, 164 USPQ 619 (CCPA 1970); *In re Thorington*, 418 F.2d 528, 163 USPQ 644 (CCPA 1969).

A timely filed terminal disclaimer in compliance with 37 CFR 1.321(c) or 1.321(d) may be used to overcome an actual or provisional rejection based on nonstatutory double patenting provided the reference application or patent either is shown to be commonly owned with the examined application, or claims an invention made as a result of activities undertaken within the

scope of a joint research agreement. See MPEP § 717.02 for applications subject to examination under the first inventor to file provisions of the AIA as explained in MPEP § 2159. See MPEP §§ 706.02(l)(1) - 706.02(l)(3) for applications not subject to examination under the first inventor to file provisions of the AIA. A terminal disclaimer must be signed in compliance with 37 CFR 1.321(b).

The USPTO Internet website contains terminal disclaimer forms which may be used. Please visit www.uspto.gov/patent/patents-forms. The filing date of the application in which the form is filed determines what form (e.g., PTO/SB/25, PTO/SB/26, PTO/AIA/25, or PTO/AIA/26) should be used. A web-based eTerminal Disclaimer may be filled out completely online using web-screens. An eTerminal Disclaimer that meets all requirements is auto-processed and approved immediately upon submission. For more information about eTerminal Disclaimers, refer to www.uspto.gov/patents/process/file/efs/guidance/eTD-info-I.jsp.

5. Claim 27 is rejected on the ground of nonstatutory double patenting as being unpatentable over claim 4 of U.S. Patent No. 9,301,296. Although the claims at issue are not identical, they are not patentably distinct from each other because they are directed to similar base stations, operating on time slots and frequency subchannels, transmitting a control message to the corresponding mobile stations, comprising a set of parameters, which include a pilot pattern and information on MIMO scheme for the subsequent transmission to the mobile station, with minor modifications, which are obvious, like transmitting a control message over a control channel, or are a design choice, as transmitting data over time slots or frequency subchannels can be used in the system.

Claim Rejections - 35 USC § 112

6. Claims 29-32 and 38-41 are rejected under 35 U.S.C. 112(b) or 35 U.S.C. 112 (pre-AIA), second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which the inventor or a joint inventor, or for pre-AIA the applicant regards as the invention.

Claims 29, 30, 38 and 39 limitations, directed to "a channel condition" are unclear, because it is not understood which channel conditions are claimed, as the corresponding parent claims comprise a control channel, a frequency subchannel or multiple MIMO subchannels. Other claims are rejected as the claims depending on the claims rejected above.

Claim Rejections - 35 USC § 102

7. Claims 26-43 are rejected under pre-AIA 35 U.S.C. 102(e) as being anticipated by Wilson (US 7,436,757).

8. Regarding claims 26, 33, 35 and 42, Wilson teaches a link adaptation system by a base station serving a plurality of mobile stations in an Orthogonal Frequency Division Multiplexing (OFDM) communication system (MIMO-OFDM system comprising a base station 10 serving multiple mobile units 20, as shown on Fig. 2 and described on 6:4-16), the communication system utilizing a transmission structure with time slots in the time domain and frequency subchannels in the frequency domain (the transmission structure comprises time and frequency portions, as shown on Fig. 3 and described on 6:17-46), the method comprising:

transmitting a control message to a mobile station over a control channel (the base station selects the transmission strategy for the pilots allocation, which is a control message, and transmits it to the UE on a forward control channel, as described on 9:4-12), wherein:

the control message contains transmission parameters specific to the mobile station for a subsequent transmission of data by the base station over a frequency subchannel to the mobile station in a time slot (the pilot allocation in the frequency-time structure of Fig. 3 provides essential information for the UEs on receiving the following/subsequent data transmissions from the base station, as shown on Fig. 3 and described on 6:16-51) ; and

the mobile station-specific transmission parameters indicate a multiple-input multiple-output (MIMO) scheme and a corresponding subchannel configuration (the MIMO portion of the system operates on MxN channels, which are adapted for the pilot patterns, as described on 3:33-62); and transmitting a data packet to the mobile station over the frequency subchannel in accordance with the mobile station-specific transmission parameters (the base station transmits data packets on the subcarriers/frequency subchannels,, which are not occupied by the pilots, as shown on Fig. 3 and described on 6:29-46).

In addition, regarding claims 35 and 42, Wilson teaches a wireless system, comprising the base station and the UE, as shown on Fig. 2 and described on 6:4-16, wherein each UE performs the corresponding steps to the steps of the base station, particularly receiving the information transmitted by the base station, which are described above.

9. Regarding claims 27 and 36, Wilson teaches transmitting the pilot patterns for the estimation/training of the UEs, as shown on Fig. 2 and described on 6:58-7:62.

10. Regarding claims 28 and 37, Wilson teaches indicating power information on each of the MxN channels, as described on 3:42-67.

11. Regarding claims 29 and 38, Wilson teaches using the MIMO method for improving the system transmission through the wireless channel, as described on 3:42-67.

12. Regarding claims 30-32 and 39-41, Wilson teaches using the pilot patterns to overcome the wireless conditions localizing or distributing the pilot symbols in the time-frequency structure/lattice depending on the requirements for the transmitted signal overhead, as described on 2:53-3:40.

13. Regarding claims 34 and 43, Wilson teaches the wireless system, wherein the UE provides feedback to the serving base station, which inherently requires for the UE to comprise a transmitter and the base station a receiver, as described on 8:57-64.

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Dmitry H. Levitan whose telephone number is (571)272-3093. The examiner can normally be reached on 8:30 to 4:30.

Examiner interviews are available via telephone, in-person, and video conferencing using a USPTO supplied web-based collaboration tool. To schedule an interview, applicant is encouraged to use the USPTO Automated Interview Request (AIR) at http://www.uspto.gov/interviewpractice.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Huy Vu can be reached on (571) 272-3155. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

Dmitry H Levitan
Primary Examiner
Art Unit 2461

/Dmitry H Levitan/
Primary Examiner, Art Unit 2461

Notice of References Cited	Application/Control No. 15/082,878	Applicant(s)/Patent Under Reexamination LI ET AL.	
	Examiner Dmitry H. Levitan	Art Unit 2461	Page 1 of 1

U.S. PATENT DOCUMENTS

*		Document Number Country Code-Number-Kind Code	Date MM-YYYY	Name	CPC Classification	US Classification
*	A	US-7,436,757 B1	10-2008	Wilson; Keith S	H04L5/0058	370/203
	B	US-				
	C	US-				
	D	US-				
	E	US-				
	F	US-				
	G	US-				
	H	US-				
	I	US-				
	J	US-				
	K	US-				
	L	US-				
	M	US-				

FOREIGN PATENT DOCUMENTS

*		Document Number Country Code-Number-Kind Code	Date MM-YYYY	Country	Name	CPC Classification
	N					
	O					
	P					
	Q					
	R					
	S					
	T					

NON-PATENT DOCUMENTS

*		Include as applicable: Author, Title Date, Publisher, Edition or Volume, Pertinent Pages)
	U	
	V	
	W	
	X	

*A copy of this reference is not being furnished with this Office action. (See MPEP § 707.05(a).)
Dates in MM-YYYY format are publication dates. Classifications may be US or foreign.

EAST Search History

EAST Search History (Prior Art)

Ref #	Hits	Search Query	DBs	Default Operator	Plurals	Time Stamp
S68	11	(base$station or node$B or enodeB or BTS or BS and access$point or AP) and ((slot or interval or period or TDD or (time adj domain)) with (frequency or carriers or subcarriers)) and ((control$3 adj2 channel)) and MIMO and ((packet or data) near4 (frequency near3 (band or sub$channel or channel or FDD))) and @ay<"2005"	US-PGPUB; USPAT	OR	ON	2017/09/22 10:10
S71	93	(base$station or node$B or enodeB or BTS or BS and access$point or AP) and ((slot or interval or period or TDD or (time adj domain)) with (frequency or carriers or subcarriers)) and ((control$3 adj2 channel)) and ((packet or data) near2 (frequency near2 (band or sub$channel or channel))) and @ay<"2005"	US-PGPUB; USPAT	OR	ON	2017/09/22 10:23
S73	55	(base$station or node$B or enodeB or BTS or BS and access$point or AP) and ((slot) with (frequency or carriers or subcarriers)) and ((control$3 adj2 channel) with (mobile or UE or WTRU or terminals or stations)) and ((packet or data) near2 (frequency near2 (band or sub$channel or channel))) and @ay<"2005"	US-PGPUB; USPAT	OR	ON	2017/09/22 10:26
S74	9	(base$station or node$B or enodeB or BTS or BS and access$point or AP) and ((slot) with (frequency or carriers or subcarriers)) and ((control$3 adj2 channel) with (mobile or UE or WTRU or terminals or stations)) and ((packet or data) near2 (frequency adj3 (band or sub$channel))) and @ay<"2005"	US-PGPUB; USPAT	OR	ON	2017/09/22 13:08

9/22/2017 3:15:29 PM
C:\Users\dlevitan\Documents\EAST\Workspaces\15082878.wsp

Search Notes	Application/Control No.	Applicant(s)/Patent Under Reexamination
	15082878	LI ET AL.
	Examiner	**Art Unit**
	DMITRY H LEVITAN	2461

CPC- SEARCHED		
Symbol	**Date**	**Examiner**
H04W 72/044, H04B 7/0413,H04L 1/0026, 1/0029, 1/0068, 5/006, 5/0046	9/22/17	DL

CPC COMBINATION SETS - SEARCHED		
Symbol	**Date**	**Examiner**

US CLASSIFICATION SEARCHED			
Class	**Subclass**	**Date**	**Examiner**
370	310, 328, 349,350, 431, 436, 458	9/22/17	DL

* See search history printout included with this form or the SEARCH NOTES box below to determine the scope of the search.

SEARCH NOTES		
Search Notes	**Date**	**Examiner**
IEEE, EAST	9/22/17	DL

INTERFERENCE SEARCH			
US Class/ CPC Symbol	**US Subclass / CPC Group**	**Date**	**Examiner**

Index of Claims	Application/Control No.	Applicant(s)/Patent Under Reexamination
	15082878	LI ET AL.
	Examiner	**Art Unit**
	DMITRY H LEVITAN	2461

✓	Rejected	-	Cancelled	N	Non-Elected	A	Appeal
=	Allowed	÷	Restricted	I	Interference	O	Objected

☐ Claims renumbered in the same order as presented by applicant ☐ CPA ☐ T.D. ☐ R.1.47

CLAIM		DATE								
Final	Original	09/22/2017								
	1	-								
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	36	✓								

Index of Claims	Application/Control No.	Applicant(s)/Patent Under Reexamination
	15082878	LI ET AL.
	Examiner	**Art Unit**
	DMITRY H LEVITAN	2461

✓	Rejected	-	Cancelled	N	Non-Elected	A	Appeal
=	Allowed	÷	Restricted	I	Interference	O	Objected

☐ Claims renumbered in the same order as presented by applicant ☐ CPA ☐ T.D. ☐ R.1.47

CLAIM		DATE								
Final	Original	09/22/2017								
	37	✓								
	38	✓								
	39	✓								
	40	✓								
	41	✓								
	42	✓								
	43	✓								

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BIB DATA SHEET

CONFIRMATION NO. 1059

SERIAL NUMBER	FILING or 371(c) DATE	CLASS	GROUP ART UNIT	ATTORNEY DOCKET NO.
15/082,878	03/28/2016 **RULE**	370	2461	061240-8002.US05

APPLICANTS
Neocific, Inc., Bellevue, WA;

INVENTORS
Xiaodong Li, Kirkland, WA;
Titus Lo, Bellevue, WA;
Kemin Li, Bellevue, WA;
Haiming Huang, Bellevue, WA;

**** CONTINUING DATA ***************************
This application is a CON of 14/539,917 11/12/2014 PAT 9301296
which is a CON of 13/246,677 09/27/2011 ABN
which is a CON of 12/755,313 04/06/2010 PAT 8027367
which is a CON of 10/583,529 05/10/2007 PAT 7693032
which is a 371 of PCT/US2005/004601 02/14/2005
which claims benefit of 60/544,521 02/13/2004

**** FOREIGN APPLICATIONS ***************************

**** IF REQUIRED, FOREIGN FILING LICENSE GRANTED** ** ** SMALL ENTITY **
04/11/2016

Foreign Priority claimed	☐ Yes ☑ No		STATE OR COUNTRY	SHEETS DRAWINGS	TOTAL CLAIMS	INDEPENDENT CLAIMS
35 USC 119(a-d) conditions met	☐ Yes ☑ No	☐ Met after Allowance	WA	8	18	4
Verified and Acknowledged	/DMITRY LEVITAN/ Examiner's Signature	Initials				

ADDRESS
PERKINS COIE LLP - SEA General
PATENT-SEA
P.O. BOX 1247
SEATTLE, WA 98111-1247
UNITED STATES

TITLE
METHODS AND APPARATUS FOR MULTI-CARRIER COMMUNICATION SYSTEMS WITH ADAPTIVE TRANSMISSION AND FEEDBACK

FILING FEE RECEIVED		
1010	FEES: Authority has been given in Paper No._____ to charge/credit DEPOSIT ACCOUNT No._____ for following:	☐ All Fees ☐ 1.16 Fees (Filing) ☐ 1.17 Fees (Processing Ext. of time) ☐ 1.18 Fees (Issue) ☐ Other _____ ☐ Credit

BIB (Rev. 05/07).

PTO/SB/06 (09-11)
Approved for use through 1/31/2014. OMB 0651-0032
U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE
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PATENT APPLICATION FEE DETERMINATION RECORD Substitute for Form PTO-875	Application or Docket Number 15/082,878	Filing Date 03/28/2016	☐ To be Mailed

ENTITY: ☐ LARGE ☒ SMALL ☐ MICRO

APPLICATION AS FILED – PART I

FOR	(Column 1) NUMBER FILED	(Column 2) NUMBER EXTRA	RATE ($)	FEE ($)
☐ BASIC FEE (37 CFR 1.16(a), (b), or (c))	N/A	N/A	N/A	
☐ SEARCH FEE (37 CFR 1.16(k), (i), or (m))	N/A	N/A	N/A	
☐ EXAMINATION FEE (37 CFR 1.16(o), (p), or (q))	N/A	N/A	N/A	
TOTAL CLAIMS (37 CFR 1.16(i))	minus 20 =	*	X $ =	
INDEPENDENT CLAIMS (37 CFR 1.16(h))	minus 3 =	*	X $ =	
☐ APPLICATION SIZE FEE (37 CFR 1.16(s))	If the specification and drawings exceed 100 sheets of paper, the application size fee due is $310 ($155 for small entity) for each additional 50 sheets or fraction thereof. See 35 U.S.C. 41(a)(1)(G) and 37 CFR 1.16(s).			
☐ MULTIPLE DEPENDENT CLAIM PRESENT (37 CFR 1.16(j))				
* If the difference in column 1 is less than zero, enter "0" in column 2.			TOTAL	

APPLICATION AS AMENDED – PART II

AMENDMENT

04/12/2018	(Column 1) CLAIMS REMAINING AFTER AMENDMENT		(Column 2) HIGHEST NUMBER PREVIOUSLY PAID FOR	(Column 3) PRESENT EXTRA	RATE ($)	ADDITIONAL FEE ($)
Total (37 CFR 1.16(i))	* 14	Minus	** 20	=	X $ =	
Independent (37 CFR 1.16(h))	* 4	Minus	***4	=	X $ =	
☐ Application Size Fee (37 CFR 1.16(s))						
☐ FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))						
					TOTAL ADD'L FEE	

AMENDMENT

	(Column 1) CLAIMS REMAINING AFTER AMENDMENT		(Column 2) HIGHEST NUMBER PREVIOUSLY PAID FOR	(Column 3) PRESENT EXTRA	RATE ($)	ADDITIONAL FEE ($)
Total (37 CFR 1.16(i))	*	Minus	**	=	X $ =	
Independent (37 CFR 1.16(h))	*	Minus	***	=	X $ =	
☐ Application Size Fee (37 CFR 1.16(s))						
☐ FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))						
					TOTAL ADD'L FEE	

* If the entry in column 1 is less than the entry in column 2, write "0" in column 3.
** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 20, enter "20".
*** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 3, enter "3".
The "Highest Number Previously Paid For" (Total or Independent) is the highest number found in the appropriate box in column 1.

LIE
ELMIRA Y. HALL

This collection of information is required by 37 CFR 1.16. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 12 minutes to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**
If you need assistance in completing the form, call 1-800-PTO-9199 and select option 2.

Docket No.: 061240-8002.US05
(PATENT)

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Patent Application of:
Li et al.

Application No.: 15/082,878

Confirmation No.: 1059

Filed: March 28, 2016

Art Unit: 2461

For: METHODS AND APPARATUS FOR MULTI-CARRIER COMMUNICATION SYSTEMS WITH ADAPTIVE TRANSMISSION AND FEEDBACK

Examiner: Dmitry Levitan

AMENDMENT AND RESPONSE TO NON-FINAL OFFICE ACTION UNDER 37 CFR 1.111

MS Amendment
Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Sir:

In response to the Non-Final Office Action mailed on October 12, 2017, please amend the above-identified U.S. patent application as follows:

INTRODUCTORY COMMENTS

Amendments to the Claims are reflected in the listing of claims which begins on page 2 of this paper.

Remarks/Arguments begin on page 7 of this paper.

AMENDMENTS TO THE CLAIMS

Please amend the claims as follows:

1-25. (Canceled)

26. (Currently Amended) A link adaptation method by a base station serving a plurality of mobile stations in an Orthogonal Frequency Division Multiplexing (OFDM) communication system, the communication system utilizing a transmission structure with time slots in the time domain and frequency subchannels in the frequency domain, the method comprising:

transmitting a control message to a mobile station over a control channel, wherein:

the control message contains transmission parameters ~~specific~~ allocated to the mobile station for a subsequent transmission of data by the base station over a frequency subchannel to the mobile station in a time slot; and

the mobile station-specific transmission parameters indicate an ~~multiple-input multiple-output (MIMO)~~antenna transmission scheme and a corresponding subchannel configuration, the antenna transmission scheme comprising a transmission diversity scheme or a multiple-input multiple-output (MIMO) scheme and the corresponding subchannel configuration characterized by distributed subcarriers or localized subcarriers in the frequency domain; and

transmitting a data packet to the mobile station over the frequency subchannel in accordance with the mobile station-specific transmission parameters.

27. (Previously Presented) The method in claim 26, wherein the mobile station-specific transmission parameters further indicate a training pilot pattern.

28. (Previously Presented) The method in claim 26, wherein the mobile station-specific transmission parameters further indicate power control information.

29. (Currently Amended) The method in claim 26, wherein the ~~MIMO~~ antenna transmission scheme is ~~for improving transmission throughput~~ selected based on a channel condition.

30. (Previously Presented) The method in claim 26, wherein the corresponding subchannel configuration is selected based on a channel condition.

31. (Canceled)

32. (Canceled)

33. (Currently Amended) A base station serving a plurality of mobile stations in an Orthogonal Frequency Division Multiplexing (OFDM) communication system, the communication system utilizing a transmission structure with time slots in the time domain and frequency subchannels in the frequency domain, the base station comprising a transmitter configured to:

transmit a control message to a mobile station over a control channel, wherein:

the control message contains transmission parameters ~~specific~~ allocated to the mobile station for a subsequent transmission of data by the base station over a frequency subchannel to the mobile station in a time slot; and

the mobile station-specific transmission parameters indicate an ~~multiple-input multiple-output (MIMO)~~antenna transmission scheme and a corresponding subchannel configuration, the antenna transmission scheme comprising a transmission diversity scheme or a multiple-input multiple-output (MIMO) scheme and the corresponding subchannel configuration characterized by distributed subcarriers or localized subcarriers in the frequency domain; and

transmit a data packet to the mobile station over the frequency subchannel in accordance with the mobile station-specific transmission parameters.

34. (Previously Presented) The base station in claim 33, further comprising a receiver configured to receive channel state information from the mobile station.

35. (Currently Amended) A link adaptation method by a mobile station served by a serving base station in an Orthogonal Frequency Division Multiplexing (OFDM) communication system, the communication system utilizing a transmission structure with time slots in the time domain and frequency subchannels in the frequency domain, the method comprising:

receiving a control message from the serving base station over a control channel, wherein:

the control message contains transmission parameters specific to the mobile station for a subsequent transmission by the serving base station over a frequency subchannel to the mobile station in a time slot; and

the mobile station-specific transmission parameters indicate an ~~multiple-input multiple-output (MIMO)~~antenna transmission scheme and a corresponding subchannel configuration, the antenna transmission scheme comprising a transmission diversity scheme or a multiple-

input multiple-output (MIMO) scheme and the corresponding subchannel configuration characterized by distributed subcarriers or localized subcarriers in the frequency domain; and

receiving a data packet transmitted by the serving base station using the mobile station-specific transmission parameters over the frequency subchannel.

36. (Previously Presented) The method in claim 35, wherein the mobile station-specific transmission parameters further indicate a training pilot pattern.

37. (Previously Presented) The method in claim 35, wherein the mobile station-specific transmission parameters further indicate power control information.

38. (Previously Presented) The method in claim 35, wherein the MIMO scheme is for improving transmission throughput based on a channel condition.

39. (Previously Presented) The method in claim 35, wherein the corresponding subchannel configuration is selected based on a channel condition.

40. (Canceled)

41. (Canceled)

42. (Currently Amended) A mobile station served by a serving base station in an Orthogonal Frequency Division Multiplexing (OFDM) communication system, the communication system utilizing a transmission structure with time slots in the time domain and frequency subchannels in the frequency domain, the mobile station comprising a receiver configured to:

receive a control message from the serving base station over a control channel, wherein:

the control message contains transmission parameters specific to the mobile station for a subsequent transmission by the serving base station over a frequency subchannel to the mobile station in a time slot; and

the mobile station-specific transmission parameters indicate an ~~multiple-input multiple-output (MIMO)~~ antenna transmission scheme and a corresponding subchannel configuration, the antenna transmission scheme comprising a transmission diversity scheme or a multiple-input multiple-output (MIMO) scheme and the corresponding subchannel configuration characterized by distributed subcarriers or localized subcarriers in the frequency domain; and

receive a data packet transmitted by the serving base station using the mobile station-specific transmission parameters over the frequency subchannel.

43. (Previously Presented) The mobile station in claim 42, further comprising a transmitter configured to transmit channel state information to the serving base station.

REMARKS

Based on the following remarks, the applicant respectfully requests that the rejections set forth in the Office Action mailed October 12, 2017 (the "Office Action") be withdrawn.

The applicant has reviewed the Office Action and submits that all objections and rejections raised in the Office Action have been appropriately resolved herein. Each objection and rejection is addressed below, preceded by a heading similar to that found in the Office Action.[1]

Claims 26-43 were pending when the present Office Action was mailed. In this response, claims 26, 29, 33, 35, and 42 have been amended to clarify certain features of these claims and to expedite prosecution of this application; the foregoing amendments are made without prejudice to pursuing these claims in unamended or other forms in a continuation or other application. Support for the amendments may be found, for example in paragraphs [0024], [0044]-[0047], and [0049], as well as corresponding figures, of the application as filed. Claims 31-32 and 40-41 have been canceled in this response, and no claims have been added. Accordingly, claims 26-30, 33-39, and 42-43 are currently pending.

I. Response to the Section 112 Rejection of Claims 29-32 and 38-41

Claims 29-32 and 38-41 were rejected under 35 U.S.C. §112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter regarded as the invention. Specifically, the Office has objected to the use of the phrase "a channel condition" as being indefinite. Applicant respectfully disagrees.

[1] Silence regarding a position taken, or argument made, by the Office does not indicate any acquiescence to that position or argument. Furthermore, arguments made by the applicant with respect to a particular claim or claims apply only to those claim or claims, and not to other claims or patents/applications, unless specifically noted herein.

Contrary to the Office's position, the phrase "channel condition" is well defined within the specification. Notably, paragraph [0022] of the specification clearly defines the phrase as follows: "Channel conditions hereinafter are referred to as one or more of the following, for a user or a subchannel: signal level, noise level, interference level, SINR[2], fading channel characteristics (Doppler frequency, delay spread, etc.), or channel profile in time or frequency domain." In other words, channel conditions refer to any of various characteristics about a telecommunications channel that can be measured or estimated. As used in applicant's claims, those characteristics are used to inform subsequent transmission schemes or subchannel configurations. In the context of the provided definition and use, applicant respectfully submits that the use of the phrase "channel condition" is not indefinite and therefore requests that the section 112 rejection be withdrawn.

II. Response to the Section 102(e) Rejection of Claims 26-43

Claims 26-43 were rejected under 35 U.S.C. §102(e) as being anticipated over U.S. Patent No. 7,436,757 to Wilson et al. ("Wilson"). For at least the following reasons, applicant submits that Wilson does not anticipate claims 26-43.

Wilson is directed to a technique to improve the use of pilot signals within a MIMO-OFDM (multiple input multiple output--orthogonal frequency division multiplexing) system. (Wilson, col. 1, lines 6-9.) In particular, the technique of Wilson obtains historical data about channel conditions from either a receiver or by observation of an uplink signal. (*Id.*, col. 4, lines 37-39.) Using the determined historical information, Wilson inserts pilot symbols in a scattered pattern in the signal transmission. (*Id.*, col. 4, lines 40-45.) By inserting pilot symbols in a matter than is dependent on historical channel information, the accuracy of the channel estimation is improved because the

[2] SINR is well known in the telecommunications industry to mean "signal-to-interference-plus-noise ratio."

insertion is based on prevalent channel conditions, rather than on preset or average channel conditions. (*Id.*, col. 4, lines 49-53.)

Applicant's system is different from Wilson in at least two respects. First, applicant has amended independent claims 26, 33, 35 and 42 to indicate that applicant's system transmits subchannel configuration information, including whether the subchannels are "distributed subcarriers or localized subcarriers in the frequency domain." As noted in one example provided in paragraph [0025] of applicant's specification, such configuration information might be useful when assigning subchannels to users moving at different speeds. In contrast, Wilson is silent as to the transmission of subchannel information as defined by the applicant. Instead, as noted previously, Wilson is solely directed to the transmission of pilot information.

Second, Wilson specifically limits its teaching to a MIMO system. In contrast, applicant has amended pending independent claims 26, 33, 35 and 42 to indicate that applicant's system further transmits an "antenna transmission scheme," wherein the antenna transmission scheme comprises "a transmission diversity scheme or a multiple-input multiple-output (MIMO) scheme." In other words, applicant's system allows for its use in systems that rely on transmission diversity schemes other than MIMO. By being exclusively directed to a MIMO system, Wilson has no need to transmit an antenna transmission scheme, and therefore fails to either disclose or suggest the use of the antenna transmission scheme as claimed by applicant.

For at least the noted reasons, applicant submits that the pending claims are patentable over the cited reference. Accordingly, applicant respectively requests withdrawal of the Section 102(e) rejection of claims 26-43.

III. Response to the Double-Patenting Rejection of Claim 27

Claim 27 was rejected on the grounds of non-statutory double patenting over claim 4 of U.S. Patent No. 9,301,296 (the "296 patent"). The applicant respectfully submits that pending claim 27 is not obvious in light of the claim of the foregoing patent, and accordingly does not concede the merit of this rejection. Nonetheless, in the interest of expediting prosecution of the present application, if the other outstanding rejections can be resolved, applicant agrees to file a terminal disclaimer regarding the '296 patent to overcome the double-patenting rejection.

IV. Conclusion

In view of the foregoing, the pending claims comply with 35 U.S.C. § 112 and §102 and are patentable over the applied art. The applicant accordingly requests reconsideration of the application and respectfully submit that the application is in condition for allowance. If the Examiner has any questions or believes a telephone conference would expedite prosecution of this application, the Examiner is encouraged to contact the undersigned at (206) 359-8000.

Although the present communication may include alterations to the application or claims, or characterizations of claim scope or referenced art, the applicant is not conceding that previously pending claims are not patentable over the cited references; instead, any alteration or characterizations are being made to facilitate expeditious prosecution of this application.

The applicant reserves the right to later pursue any previously pending or other broader or narrow claims that capture any subject matter supported by the present disclosure, including subject matter that might be found disclaimed herein or by any prior prosecution. Accordingly, reviewers of this or any parent, child or related

prosecution history shall not reasonably infer that the applicant has made any disclaimers or disavowals of any subject matter supported by the present application.

Please charge any underpayment or credit any overpayment to our Deposit Account No. 50-0665 under Order No. 061240-8002.US05, from which the undersigned is authorized to draw.

Dated: 12 April 2018

Respectfully submitted,

By /Stephen Bishop/
Stephen Bishop
Registration No.: 38,829

Perkins Coie LLP
P.O. Box 1247
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Attorneys for Applicant

Electronic Patent Application Fee Transmittal

Application Number:	15082878
Filing Date:	28-Mar-2016
Title of Invention:	METHODS AND APPARATUS FOR MULTI-CARRIER COMMUNICATION SYSTEMS WITH ADAPTIVE TRANSMISSION AND FEEDBACK
First Named Inventor/Applicant Name:	Xiaodong Li
Filer:	Stephen C Bishop/Todd Nielsen
Attorney Docket Number:	061240-8002.US05

Filed as Small Entity

Filing Fees for Utility under 35 USC 111(a)

Description	Fee Code	Quantity	Amount	Sub-Total in USD($)
Basic Filing:				
Pages:				
Claims:				
Miscellaneous-Filing:				
Petition:				
Patent-Appeals-and-Interference:				
Post-Allowance-and-Post-Issuance:				
Extension-of-Time:				

Description	Fee Code	Quantity	Amount	Sub-Total in USD($)
Extension - 3 months with $0 paid	2253	1	700	700
Miscellaneous:				
			Total in USD ($)	**700**

Electronic Acknowledgement Receipt	
EFS ID:	32324372
Application Number:	15082878
International Application Number:	
Confirmation Number:	1059
Title of Invention:	METHODS AND APPARATUS FOR MULTI-CARRIER COMMUNICATION SYSTEMS WITH ADAPTIVE TRANSMISSION AND FEEDBACK
First Named Inventor/Applicant Name:	Xiaodong Li
Customer Number:	25096
Filer:	Stephen C Bishop/Todd Nielsen
Filer Authorized By:	Stephen C Bishop
Attorney Docket Number:	061240-8002.US05
Receipt Date:	12-APR-2018
Filing Date:	28-MAR-2016
Time Stamp:	15:42:49
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	yes
Payment Type	CARD
Payment was successfully received in RAM	$700
RAM confirmation Number	041318INTEFSW15434300
Deposit Account	
Authorized User	
The Director of the USPTO is hereby authorized to charge indicated fees and credit any overpayment as follows:	

File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1		0612408002US05_OA_Response_04_12_18.pdf	273820 a5414077d36e678374b59635f112ffbe8c276cce	yes	12
	Multipart Description/PDF files in .zip description				
	Document Description		**Start**	**End**	
	Extension of Time		1	1	
	Amendment/Req. Reconsideration-After Non-Final Reject		2	2	
	Amendment Copy Claims/Response to Suggested Claims		3	7	
	Applicant Arguments/Remarks Made in an Amendment		8	12	
Warnings:					
Information:					
2	Fee Worksheet (SB06)	fee-info.pdf	30878 0de2099d05370b3ee9ac6407bc7707b465a3e474	no	2
Warnings:					
Information:					
		Total Files Size (in bytes):	304698		

This Acknowledgement Receipt evidences receipt on the noted date by the USPTO of the indicated documents, characterized by the applicant, and including page counts, where applicable. It serves as evidence of receipt similar to a Post Card, as described in MPEP 503.

New Applications Under 35 U.S.C. 111
If a new application is being filed and the application includes the necessary components for a filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application.
National Stage of an International Application under 35 U.S.C. 371
If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course.
New International Application Filed with the USPTO as a Receiving Office
If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.

PTO/AIA/22 (03-13)
Approved for use through 11/30/2020. OMB 0651-0031
U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE
Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it displays a valid OMB control number.

PETITION FOR EXTENSION OF TIME UNDER 37 CFR 1.136(a)

Docket Number (Optional): 061240-8002.US05

Application Number: 15/082,878

Filed: March 28, 2016

For: METHODS AND APPARATUS FOR MULTI-CARRIER COMMUNICATION SYSTEMS WITH ADAPTIVE TRANSMISSION AND FEEDBACK

Art Unit: 2461

Examiner: Dmitry Levitan

This is a request under the provisions of 37 CFR 1.136(a) to extend the period for filing a reply in the above-identified application.

The requested extension and fee are as follows (check time period desired and enter the appropriate fee below):

		Fee	Small Entity Fee	Micro Entity Fee	
☐	One month (37 CFR 1.17(a)(1))	$200	$100	$50	$
☐	Two months (37 CFR 1.17(a)(2))	$600	$300	$150	$
☑	Three months (37 CFR 1.17(a)(3))	$1,400	$700	$350	$ 700
☐	Four months (37 CFR 1.17(a)(4))	$2,200	$1,100	$550	$
☐	Five months (37 CFR 1.17(a)(5))	$3,000	$1,500	$750	$

☑ Applicant asserts small entity status. See 37 CFR 1.27.

☐ Applicant certifies micro entity status. See 37 CFR 1.29.
Form PTO/SB/15A or B or equivalent must either be enclosed or have been submitted previously.

☐ A check in the amount of the fee is enclosed.

☑ Payment by credit card. Form PTO-2038 is attached.

☐ The Director has already been authorized to charge fees in this application to a Deposit Account.

☑ The Director is hereby authorized to charge any fees which may be required, or credit any overpayment, to Deposit Account Number 50-0665.

☐ Payment made via EFS-Web.

WARNING: Information on this form may become public. Credit card information should not be included on this form. Provide credit card information and authorization on PTO-2038.

I am the

☐ applicant.

☑ attorney or agent of record. Registration number 38,829.

☐ attorney or agent acting under 37 CFR 1.34. Registration number _____.

/Stephen Bishop/ — Signature

12 April 2018 — Date

Stephen Bishop — Typed or printed name

(206) 359-8000 — Telephone Number

NOTE: This form must be signed in accordance with 37 CFR 1.33. See 37 CFR 1.4 for signature requirements and certifications. Submit multiple forms if more than one signature is required, see below*.

☐ * Total of _____ forms are submitted.

This collection of information is required by 37 CFR 1.136(a). The information is required to obtain or retain a benefit by the public, which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.11 and 1.14. This collection is estimated to take 6 minutes to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. SEND TO: Mail Stop PCT, Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.

UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

NOTICE OF ALLOWANCE AND FEE(S) DUE

25096 7590 05/16/2018
PERKINS COIE LLP - SEA General
PATENT-SEA
P.O. BOX 1247
SEATTLE, WA 98111-1247

EXAMINER
LEVITAN, DMITRY

ART UNIT	PAPER NUMBER
2461	

DATE MAILED: 05/16/2018

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
15/082,878	03/28/2016	Xiaodong Li	061240-8002.US05	1059

TITLE OF INVENTION: METHODS AND APPARATUS FOR MULTI-CARRIER COMMUNICATION SYSTEMS WITH ADAPTIVE TRANSMISSION AND FEEDBACK

APPLN. TYPE	ENTITY STATUS	ISSUE FEE DUE	PUBLICATION FEE DUE	PREV. PAID ISSUE FEE	TOTAL FEE(S) DUE	DATE DUE
nonprovisional	SMALL	$500	$0	$0	$500	08/16/2018

THE APPLICATION IDENTIFIED ABOVE HAS BEEN EXAMINED AND IS ALLOWED FOR ISSUANCE AS A PATENT. PROSECUTION ON THE MERITS IS CLOSED. THIS NOTICE OF ALLOWANCE IS NOT A GRANT OF PATENT RIGHTS. THIS APPLICATION IS SUBJECT TO WITHDRAWAL FROM ISSUE AT THE INITIATIVE OF THE OFFICE OR UPON PETITION BY THE APPLICANT. SEE 37 CFR 1.313 AND MPEP 1308.

THE ISSUE FEE AND PUBLICATION FEE (IF REQUIRED) MUST BE PAID WITHIN THREE MONTHS FROM THE MAILING DATE OF THIS NOTICE OR THIS APPLICATION SHALL BE REGARDED AS ABANDONED. THIS STATUTORY PERIOD CANNOT BE EXTENDED. SEE 35 U.S.C. 151. THE ISSUE FEE DUE INDICATED ABOVE DOES NOT REFLECT A CREDIT FOR ANY PREVIOUSLY PAID ISSUE FEE IN THIS APPLICATION. IF AN ISSUE FEE HAS PREVIOUSLY BEEN PAID IN THIS APPLICATION (AS SHOWN ABOVE), THE RETURN OF PART B OF THIS FORM WILL BE CONSIDERED A REQUEST TO REAPPLY THE PREVIOUSLY PAID ISSUE FEE TOWARD THE ISSUE FEE NOW DUE.

HOW TO REPLY TO THIS NOTICE:

I. Review the ENTITY STATUS shown above. If the ENTITY STATUS is shown as SMALL or MICRO, verify whether entitlement to that entity status still applies.

If the ENTITY STATUS is the same as shown above, pay the TOTAL FEE(S) DUE shown above.

If the ENTITY STATUS is changed from that shown above, on PART B - FEE(S) TRANSMITTAL, complete section number 5 titled "Change in Entity Status (from status indicated above)".

For purposes of this notice, small entity fees are 1/2 the amount of undiscounted fees, and micro entity fees are 1/2 the amount of small entity fees.

II. PART B - FEE(S) TRANSMITTAL, or its equivalent, must be completed and returned to the United States Patent and Trademark Office (USPTO) with your ISSUE FEE and PUBLICATION FEE (if required). If you are charging the fee(s) to your deposit account, section "4b" of Part B - Fee(s) Transmittal should be completed and an extra copy of the form should be submitted. If an equivalent of Part B is filed, a request to reapply a previously paid issue fee must be clearly made, and delays in processing may occur due to the difficulty in recognizing the paper as an equivalent of Part B.

III. All communications regarding this application must give the application number. Please direct all communications prior to issuance to Mail Stop ISSUE FEE unless advised to the contrary.

IMPORTANT REMINDER: Maintenance fees are due in utility patents issuing on applications filed on or after Dec. 12, 1980. It is patentee's responsibility to ensure timely payment of maintenance fees when due. More information is available at www.uspto.gov/PatentMaintenanceFees.

PART B - FEE(S) TRANSMITTAL

Complete and send this form, together with applicable fee(s), to: Mail **Mail Stop ISSUE FEE**
Commissioner for Patents
P.O. Box 1450
Alexandria, Virginia 22313-1450
or Fax (571)-273-2885

INSTRUCTIONS: This form should be used for transmitting the ISSUE FEE and PUBLICATION FEE (if required). Blocks 1 through 5 should be completed where appropriate. All further correspondence including the Patent, advance orders and notification of maintenance fees will be mailed to the current correspondence address as indicated unless corrected below or directed otherwise in Block 1, by (a) specifying a new correspondence address; and/or (b) indicating a separate "FEE ADDRESS" for maintenance fee notifications.

CURRENT CORRESPONDENCE ADDRESS (Note: Use Block 1 for any change of address)

25096 7590 05/16/2018
PERKINS COIE LLP - SEA General
PATENT-SEA
P.O. BOX 1247
SEATTLE, WA 98111-1247

Note: A certificate of mailing can only be used for domestic mailings of the Fee(s) Transmittal. This certificate cannot be used for any other accompanying papers. Each additional paper, such as an assignment or formal drawing, must have its own certificate of mailing or transmission.

Certificate of Mailing or Transmission
I hereby certify that this Fee(s) Transmittal is being deposited with the United States Postal Service with sufficient postage for first class mail in an envelope addressed to the Mail Stop ISSUE FEE address above, or being facsimile transmitted to the USPTO (571) 273-2885, on the date indicated below.

(Depositor's name)
(Signature)
(Date)

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
15/082,878	03/28/2016	Xiaodong Li	061240-8002.US05	1059

TITLE OF INVENTION: METHODS AND APPARATUS FOR MULTI-CARRIER COMMUNICATION SYSTEMS WITH ADAPTIVE TRANSMISSION AND FEEDBACK

APPLN. TYPE	ENTITY STATUS	ISSUE FEE DUE	PUBLICATION FEE DUE	PREV. PAID ISSUE FEE	TOTAL FEE(S) DUE	DATE DUE
nonprovisional	SMALL	$500	$0	$0	$500	08/16/2018

EXAMINER	ART UNIT	CLASS-SUBCLASS
LEVITAN, DMITRY	2461	370-329000

1. Change of correspondence address or indication of "Fee Address" (37 CFR 1.363).
❑ Change of correspondence address (or Change of Correspondence Address form PTO/SB/122) attached.
❑ "Fee Address" indication (or "Fee Address" Indication form PTO/SB/47; Rev 03-02 or more recent) attached. **Use of a Customer Number is required.**

2. For printing on the patent front page, list
(1) The names of up to 3 registered patent attorneys or agents OR, alternatively,
(2) The name of a single firm (having as a member a registered attorney or agent) and the names of up to 2 registered patent attorneys or agents. If no name is listed, no name will be printed.
1_____
2_____
3_____

3. ASSIGNEE NAME AND RESIDENCE DATA TO BE PRINTED ON THE PATENT (print or type)

PLEASE NOTE: Unless an assignee is identified below, no assignee data will appear on the patent. If an assignee is identified below, the document has been filed for recordation as set forth in 37 CFR 3.11. Completion of this form is NOT a substitute for filing an assignment.

(A) NAME OF ASSIGNEE (B) RESIDENCE: (CITY and STATE OR COUNTRY)

Please check the appropriate assignee category or categories (will not be printed on the patent) : ❑ Individual ❑ Corporation or other private group entity ❑ Government

4a. The following fee(s) are submitted:
❑ Issue Fee
❑ Publication Fee (No small entity discount permitted)
❑ Advance Order - # of Copies _____

4b. Payment of Fee(s): (**Please first reapply any previously paid issue fee shown above**)
❑ A check is enclosed.
❑ Payment by credit card. Form PTO-2038 is attached.
❑ The director is hereby authorized to charge the required fee(s), any deficiency, or credits any overpayment, to Deposit Account Number _____ (enclose an extra copy of this form).

5. **Change in Entity Status** (from status indicated above)
❑ Applicant certifying micro entity status. See 37 CFR 1.29 — NOTE: Absent a valid certification of Micro Entity Status (see forms PTO/SB/15A and 15B), issue fee payment in the micro entity amount will not be accepted at the risk of application abandonment.
❑ Applicant asserting small entity status. See 37 CFR 1.27 — NOTE: If the application was previously under micro entity status, checking this box will be taken to be a notification of loss of entitlement to micro entity status.
❑ Applicant changing to regular undiscounted fee status. — NOTE: Checking this box will be taken to be a notification of loss of entitlement to small or micro entity status, as applicable.

NOTE: This form must be signed in accordance with 37 CFR 1.31 and 1.33. See 37 CFR 1.4 for signature requirements and certifications.

Authorized Signature _____ Date _____

Typed or printed name _____ Registration No. _____

PTOL-85 Part B (10-13) Approved for use through 10/31/2013. OMB 0651-0033 U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE

UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
15/082,878	03/28/2016	Xiaodong Li	061240-8002.US05	1059

25096 7590 05/16/2018
PERKINS COIE LLP - SEA General
PATENT-SEA
P.O. BOX 1247
SEATTLE, WA 98111-1247

EXAMINER
LEVITAN, DMITRY

ART UNIT	PAPER NUMBER
2461	

DATE MAILED: 05/16/2018

Determination of Patent Term Adjustment under 35 U.S.C. 154 (b)
(Applications filed on or after May 29, 2000)

The Office has discontinued providing a Patent Term Adjustment (PTA) calculation with the Notice of Allowance.

Section 1(h)(2) of the AIA Technical Corrections Act amended 35 U.S.C. 154(b)(3)(B)(i) to eliminate the requirement that the Office provide a patent term adjustment determination with the notice of allowance. See Revisions to Patent Term Adjustment, 78 Fed. Reg. 19416, 19417 (Apr. 1, 2013). Therefore, the Office is no longer providing an initial patent term adjustment determination with the notice of allowance. The Office will continue to provide a patent term adjustment determination with the Issue Notification Letter that is mailed to applicant approximately three weeks prior to the issue date of the patent, and will include the patent term adjustment on the patent. Any request for reconsideration of the patent term adjustment determination (or reinstatement of patent term adjustment) should follow the process outlined in 37 CFR 1.705.

Any questions regarding the Patent Term Extension or Adjustment determination should be directed to the Office of Patent Legal Administration at (571)-272-7702. Questions relating to issue and publication fee payments should be directed to the Customer Service Center of the Office of Patent Publication at 1-(888)-786-0101 or (571)-272-4200.

OMB Clearance and PRA Burden Statement for PTOL-85 Part B

The Paperwork Reduction Act (PRA) of 1995 requires Federal agencies to obtain Office of Management and Budget approval before requesting most types of information from the public. When OMB approves an agency request to collect information from the public, OMB (i) provides a valid OMB Control Number and expiration date for the agency to display on the instrument that will be used to collect the information and (ii) requires the agency to inform the public about the OMB Control Number's legal significance in accordance with 5 CFR 1320.5(b).

The information collected by PTOL-85 Part B is required by 37 CFR 1.311. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 12 minutes to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, Virginia 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, Virginia 22313-1450. Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it displays a valid OMB control number.

Privacy Act Statement

The Privacy Act of 1974 (P.L. 93-579) requires that you be given certain information in connection with your submission of the attached form related to a patent application or patent. Accordingly, pursuant to the requirements of the Act, please be advised that: (1) the general authority for the collection of this information is 35 U.S.C. 2(b)(2); (2) furnishing of the information solicited is voluntary; and (3) the principal purpose for which the information is used by the U.S. Patent and Trademark Office is to process and/or examine your submission related to a patent application or patent. If you do not furnish the requested information, the U.S. Patent and Trademark Office may not be able to process and/or examine your submission, which may result in termination of proceedings or abandonment of the application or expiration of the patent.

The information provided by you in this form will be subject to the following routine uses:

1. The information on this form will be treated confidentially to the extent allowed under the Freedom of Information Act (5 U.S.C. 552) and the Privacy Act (5 U.S.C 552a). Records from this system of records may be disclosed to the Department of Justice to determine whether disclosure of these records is required by the Freedom of Information Act.
2. A record from this system of records may be disclosed, as a routine use, in the course of presenting evidence to a court, magistrate, or administrative tribunal, including disclosures to opposing counsel in the course of settlement negotiations.
3. A record in this system of records may be disclosed, as a routine use, to a Member of Congress submitting a request involving an individual, to whom the record pertains, when the individual has requested assistance from the Member with respect to the subject matter of the record.
4. A record in this system of records may be disclosed, as a routine use, to a contractor of the Agency having need for the information in order to perform a contract. Recipients of information shall be required to comply with the requirements of the Privacy Act of 1974, as amended, pursuant to 5 U.S.C. 552a(m).
5. A record related to an International Application filed under the Patent Cooperation Treaty in this system of records may be disclosed, as a routine use, to the International Bureau of the World Intellectual Property Organization, pursuant to the Patent Cooperation Treaty.
6. A record in this system of records may be disclosed, as a routine use, to another federal agency for purposes of National Security review (35 U.S.C. 181) and for review pursuant to the Atomic Energy Act (42 U.S.C. 218(c)).
7. A record from this system of records may be disclosed, as a routine use, to the Administrator, General Services, or his/her designee, during an inspection of records conducted by GSA as part of that agency's responsibility to recommend improvements in records management practices and programs, under authority of 44 U.S.C. 2904 and 2906. Such disclosure shall be made in accordance with the GSA regulations governing inspection of records for this purpose, and any other relevant (i.e., GSA or Commerce) directive. Such disclosure shall not be used to make determinations about individuals.
8. A record from this system of records may be disclosed, as a routine use, to the public after either publication of the application pursuant to 35 U.S.C. 122(b) or issuance of a patent pursuant to 35 U.S.C. 151. Further, a record may be disclosed, subject to the limitations of 37 CFR 1.14, as a routine use, to the public if the record was filed in an application which became abandoned or in which the proceedings were terminated and which application is referenced by either a published application, an application open to public inspection or an issued patent.
9. A record from this system of records may be disclosed, as a routine use, to a Federal, State, or local law enforcement agency, if the USPTO becomes aware of a violation or potential violation of law or regulation.

Notice of Allowability	Application No. 15/082,878	Applicant(s) LI ET AL.	
	Examiner Dmitry H. Levitan	Art Unit 2461	AIA (First Inventor to File) Status No

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address--

All claims being allowable, PROSECUTION ON THE MERITS IS (OR REMAINS) CLOSED in this application. If not included herewith (or previously mailed), a Notice of Allowance (PTOL-85) or other appropriate communication will be mailed in due course. **THIS NOTICE OF ALLOWABILITY IS NOT A GRANT OF PATENT RIGHTS.** This application is subject to withdrawal from issue at the initiative of the Office or upon petition by the applicant. See 37 CFR 1.313 and MPEP 1308.

1. ☒ This communication is responsive to *4/12/18*.
   ☐ A declaration(s)/affidavit(s) under **37 CFR 1.130(b)** was/were filed on_____.
2. ☐ An election was made by the applicant in response to a restriction requirement set forth during the interview on _____; the restriction requirement and election have been incorporated into this action.
3. ☒ The allowed claim(s) is/are *26-30,33-39,42 and 43*. As a result of the allowed claim(s), you may be eligible to benefit from the **Patent Prosecution Highway** program at a participating intellectual property office for the corresponding application. For more information, please see http://www.uspto.gov/patents/init_events/pph/index.jsp or send an inquiry to PPHfeedback@uspto.gov.
4. ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

   Certified copies:

   a) ☐ All b) ☐ Some *c) ☐ None of the:
   1. ☐ Certified copies of the priority documents have been received.
   2. ☐ Certified copies of the priority documents have been received in Application No. _____ .
   3. ☐ Copies of the certified copies of the priority documents have been received in this national stage application from the International Bureau (PCT Rule 17.2(a)).

   * Certified copies not received: _____.

Applicant has THREE MONTHS FROM THE "MAILING DATE" of this communication to file a reply complying with the requirements noted below. Failure to timely comply will result in ABANDONMENT of this application.
THIS THREE-MONTH PERIOD IS NOT EXTENDABLE.

5. ☐ CORRECTED DRAWINGS (as "replacement sheets") must be submitted.
   ☐ including changes required by the attached Examiner's Amendment / Comment or in the Office action of Paper No./Mail Date _____.

   Identifying indicia such as the application number (see 37 CFR 1.84(c)) should be written on the drawings in the front (not the back) of each sheet. Replacement sheet(s) should be labeled as such in the header according to 37 CFR 1.121(d).
6. ☐ DEPOSIT OF and/or INFORMATION about the deposit of BIOLOGICAL MATERIAL must be submitted. Note the attached Examiner's comment regarding REQUIREMENT FOR THE DEPOSIT OF BIOLOGICAL MATERIAL.

Attachment(s)

1. ☐ Notice of References Cited (PTO-892)
2. ☐ Information Disclosure Statements (PTO/SB/08), Paper No./Mail Date _____
3. ☐ Examiner's Comment Regarding Requirement for Deposit of Biological Material
4. ☐ Interview Summary (PTO-413), Paper No./Mail Date _____ .
5. ☐ Examiner's Amendment/Comment
6. ☐ Examiner's Statement of Reasons for Allowance
7. ☐ Other _____.

/Dmitry H Levitan/
Primary Examiner, Art Unit 2461

Issue Classification	Application/Control No.	Applicant(s)/Patent Under Reexamination
	15082878	LI ET AL.
	Examiner	**Art Unit**
	DMITRY H LEVITAN	2461

CPC						
Symbol					**Type**	**Version**
H04W		72	/	0406	F	2013-01-01
H04L		1	/	0003	A	2013-01-01
H04L		1	/	0009	A	2013-01-01
H04L		1	/	0026	I	2013-01-01
H04L		1	/	0029	I	2013-01-01
H04L		1	/	0068	I	2013-01-01
H04L		1	/	0073	I	2013-01-01
H04L		5	/	0007	I	2013-01-01
H04L		5	/	0046	I	2013-01-01
H04L		5	/	0048	I	2013-01-01
H04L		5	/	006	I	2013-01-01
H04L		5	/	0091	A	2013-01-01
H04L		27	/	2608	I	2013-01-01
H04W		52	/	26	A	2013-01-01
H04B		7	/	0413	I	2013-01-01
H04W		72	/	044	I	2013-01-01

CPC Combination Sets								
Symbol					**Type**	**Set**	**Ranking**	**Version**
			/					
			/					

NONE (Assistant Examiner)	(Date)	**Total Claims Allowed:** 14	
/DMITRY H LEVITAN/ Primary Examiner.Art Unit 2461 (Primary Examiner)	4/08/18 (Date)	O.G. Print Claim(s) 1	O.G. Print Figure Fig. 5

U.S. Patent and Trademark Office

Part of Paper No. 20180508

Issue Classification	Application/Control No.	Applicant(s)/Patent Under Reexamination
	15082878	LI ET AL.
	Examiner	**Art Unit**
	DMITRY H LEVITAN	2461

US ORIGINAL CLASSIFICATION		INTERNATIONAL CLASSIFICATION	
CLASS	SUBCLASS	CLAIMED	NON-CLAIMED
370	310	H 0 4 B 7 / 00 (2006.01.01)	

CROSS REFERENCE(S)					
CLASS	SUBCLASS (ONE SUBCLASS PER BLOCK)				

NONE (Assistant Examiner)	(Date)	Total Claims Allowed: 14	
/DMITRY H LEVITAN/ Primary Examiner.Art Unit 2461 (Primary Examiner)	4/08/18 (Date)	O.G. Print Claim(s) 1	O.G. Print Figure Fig. 5

U.S. Patent and Trademark Office

Part of Paper No. 20180508

Issue Classification	Application/Control No.	Applicant(s)/Patent Under Reexamination
	15082878	LI ET AL.
	Examiner	**Art Unit**
	DMITRY H LEVITAN	2461

☐ Claims renumbered in the same order as presented by applicant ☐ CPA ☐ T.D. ☐ R.1.47

Final	Original	Final	Original	Final	Original	Final	Original	Final	Original	Final	Original	Final	Original	Final	Original
	26		42												
	27		43												
	28														
	29														
	30														
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---	32														
	33														
	34														
	35														
	36														
	37														
	38														
	39														
---	40														
---	41														

NONE (Assistant Examiner)	(Date)	**Total Claims Allowed:** 14	
/DMITRY H LEVITAN/ Primary Examiner.Art Unit 2461 (Primary Examiner)	4/08/18 (Date)	O.G. Print Claim(s) 1	O.G. Print Figure Fig. 5

U.S. Patent and Trademark Office Part of Paper No. 20180508

Search Notes	Application/Control No.	Applicant(s)/Patent Under Reexamination
	15082878	LI ET AL.
	Examiner	**Art Unit**
	DMITRY H LEVITAN	2461

CPC- SEARCHED		
Symbol	**Date**	**Examiner**
H04W 72/044, H04B 7/0413,H04L 1/0026, 1/0029, 1/0068, 5/006, 5/0046	4/08/18	DL

CPC COMBINATION SETS - SEARCHED		
Symbol	**Date**	**Examiner**

US CLASSIFICATION SEARCHED			
Class	**Subclass**	**Date**	**Examiner**
370	310, 328, 349,350, 431, 436, 458	4/08/18	DL

* See search history printout included with this form or the SEARCH NOTES box below to determine the scope of the search.

SEARCH NOTES		
Search Notes	**Date**	**Examiner**
IEEE, EAST	4/08/18	DL

INTERFERENCE SEARCH			
US Class/ CPC Symbol	**US Subclass / CPC Group**	**Date**	**Examiner**
370	310	4/08/18	DL

EAST Search History

EAST Search History (Interference)

Ref #	Hits	Search Query	DBs	Default Operator	Plurals	Time Stamp
L3	17	((base$station or node$B or enodeB or BTS or BS and access$point or AP) and (((sub$carriers or carriers) near4 (configur$6 or structure)) near4 (var$7 or chang$4 or differ$5 or adapt$5 or modif$4 or switch$3 or flexi$5)) and ((fad$3 or condition or quality or qos or propagat$4 or feed$back or CQI))).clm.	US-PGPUB; USPAT	OR	ON	2018/05/08 10:25
L4	9	((base$station or node$B or enodeB or BTS or BS and access$point or AP) and (((sub$carriers or carriers) near4 (configur$6 or structure)) near4 (control or manag$7)) and ((fad$3 or condition or quality or qos or propagat$4 or feed$back or CQI))).clm.	US-PGPUB; USPAT	OR	ON	2018/05/08 10:29
L10	20	(MIMO and (base$station or node$B or enodeB or BTS or BS) and ((slot or interval or period) with (frequency or carriers)) and (((subcarriers or carriers or frequencies) near5 (structure or config$8)))).clm.	US-PGPUB; USPAT	OR	ON	2018/05/08 10:37

5/8/2018 10:40:01 AM
C:\Users\dlevitan\Documents\EAST\Workspaces\15082878.wsp

Index of Claims	Application/Control No.	Applicant(s)/Patent Under Reexamination
	15082878	LI ET AL.
	Examiner	**Art Unit**
	DMITRY H LEVITAN	2461

✓	Rejected	-	Cancelled	N	Non-Elected	A	Appeal
=	Allowed	÷	Restricted	I	Interference	O	Objected

☒ Claims renumbered in the same order as presented by applicant ☐ CPA ☐ T.D. ☐ R.1.47

CLAIM		DATE								
Final	Original	09/22/2017	05/08/2018							
	1	-	-							
	2	-	-							
	3	-	-							
	4	-	-							
	5	-	-							
	6	-	-							
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	31	✓	-							
	32	✓	-							
	33	✓	=							
	34	✓	=							
	35	✓	=							
	36	✓	=							

Index of Claims	Application/Control No.	Applicant(s)/Patent Under Reexamination
	15082878	LI ET AL.
	Examiner	**Art Unit**
	DMITRY H LEVITAN	2461

✓	Rejected	-	Cancelled	N	Non-Elected	A	Appeal
=	Allowed	÷	Restricted	I	Interference	O	Objected

☒ Claims renumbered in the same order as presented by applicant ☐ CPA ☐ T.D. ☐ R.1.47

CLAIM		DATE								
Final	Original	09/22/2017	05/08/2018							
	37	✓	=							
	38	✓	=							
	39	✓	=							
	40	✓	-							
	41	✓	-							
	42	✓	=							
	43	✓	=							

061PART B - FEE(S) TRANSMITTAL

Complete and send this form, together with applicable fee(s), to: Mail **Mail Stop ISSUE FEE**
Commissioner for Patents
P.O. Box 1450
Alexandria, Virginia 22313-1450
or Fax (571)-273-2885

INSTRUCTIONS: This form should be used for transmitting the ISSUE FEE and PUBLICATION FEE (if required). Blocks 1 through 5 should be completed where appropriate. All further correspondence including the Patent, advance orders and notification of maintenance fees will be mailed to the current correspondence address as indicated unless corrected below or directed otherwise in Block 1, by (a) specifying a new correspondence address; and/or (b) indicating a separate "FEE ADDRESS" for maintenance fee notifications.

CURRENT CORRESPONDENCE ADDRESS (Note: Use Block 1 for any change of address)

25096 7590 05/16/2018
PERKINS COIE LLP - SEA General
PATENT-SEA
P.O. Box 1247
Seattle, Washington 98111-1247

Note: A certificate of mailing can only be used for domestic mailings of the Fee(s) Transmittal. This certificate cannot be used for any other accompanying papers. Each additional paper, such as an assignment or formal drawing, must have its own certificate of mailing or transmission.

Certificate of Mailing or Transmission

I hereby certify that this Fee(s) Transmittal is being deposited with the United States Postal Service with sufficient postage for first class mail in an envelope addressed to the Mail Stop ISSUE FEE address above, or being facsimile transmitted to the USPTO (571) 273-2885, on the date indicated below.

Todd Nielsen	(Depositor's name)
/Todd Nielsen/	(Signature)
13 August 2018	(Date)

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
15/082,878	03/28/2016	Xiaodong Li	061240-8002.US05	1059

TITLE OF INVENTION: METHODS AND APPARATUS FOR MULTI-CARRIER COMMUNICATION SYSTEMS WITH ADAPTIVE TRANSMISSION AND FEEDBACK

APPLN. TYPE	ENTITY STATUS	ISSUE FEE DUE	PUBLICATION FEE DUE	PREV. PAID ISSUE FEE	TOTAL FEE(S) DUE	DATE DUE
nonprovisional	SMALL	$500	$0	$0	$500	08/16/2018

EXAMINER	ART UNIT	CLASS-SUBCLASS
LEVITAN, DMITRY	2461	370-329000

1. Change of correspondence address or indication of "Fee Address" (37 CFR 1.363).
- [ ] Change of correspondence address (or Change of Correspondence Address form PTO/SB/122) attached.
- [ ] "Fee Address" indication (or "Fee Address" Indication form PTO/SB/47; Rev 03-02 or more recent) attached. **Use of a Customer Number is required.**

2. For printing on the patent front page, list
(1) The names of up to 3 registered patent attorneys or agents OR, alternatively,
(2) The name of a single firm (having as a member a registered attorney or agent) and the names of up to 2 registered patent attorneys or agents. If no name is listed, no name will be printed.

1 Perkins Coie LLP
2
3

3. ASSIGNEE NAME AND RESIDENCE DATA TO BE PRINTED ON THE PATENT (print or type)

PLEASE NOTE: Unless an assignee is identified below, no assignee data will appear on the patent. If an assignee is identified below, the document has been filed for recordation as set forth in 37 CFR 3.11. Completion of this form is NOT a substitute for filing an assignment.

(A) NAME OF ASSIGNEE: Neocific, Inc.

(B) RESIDENCE: (CITY and STATE OR COUNTRY): Bellevue, Washington

Please check the appropriate assignee category or categories (will not be printed on the patent) : [ ] Individual [X] Corporation or other private group entity [ ] Government

4a. The following fee(s) are submitted:
- [X] Issue Fee
- [ ] Publication Fee (No small entity discount permitted)
- [ ] Advance Order - # of Copies _____

4b. Payment of Fee(s): **(Please first reapply any previously paid issue fee shown above)**
- [ ] A check is enclosed.
- [X] Payment by credit card.
- [X] The Director is hereby authorized to charge any deficiencies or credit any overpayment to Deposit Account Number 50-0665 .

5. **Change in Entity Status** (from status indicated above)
- [ ] Applicant certifying micro entity status. See 37 CFR 1.29 — NOTE: Absent a valid certification of Micro Entity Status (see forms PTO/SB/15A and 15B), issue fee payment in the micro entity amount will not be accepted at the risk of application abandonment.
- [ ] Applicant asserting small entity status. See 37 CFR 1.27 — NOTE: If the application was previously under micro entity status, checking this box will be taken to be a notification of loss of entitlement to micro entity status.
- [ ] Applicant changing to regular undiscounted fee status. — NOTE: Checking this box will be taken to be a notification of loss of entitlement to small or micro entity status, as applicable.

NOTE: This form must be signed in accordance with 37 CFR 1.31 and 1.33. See 37 CFR 1.4 for signature requirements and certifications.

Authorized Signature /Stephen Bishop/ Date 13 August 2018

Typed or printed name Stephen Bishop Registration No. 38,829

PTOL-85 Part B (10-13) Approved for use through 10/31/2013. OMB 0651-0033 U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE

61240-8002.US05/139921397.1

Electronic Patent Application Fee Transmittal

Application Number:	15082878
Filing Date:	28-Mar-2016
Title of Invention:	METHODS AND APPARATUS FOR MULTI-CARRIER COMMUNICATION SYSTEMS WITH ADAPTIVE TRANSMISSION AND FEEDBACK
First Named Inventor/Applicant Name:	Xiaodong Li
Filer:	Steven Beigelmacher/Todd Nielsen
Attorney Docket Number:	061240-8002.US05

Filed as Small Entity

Filing Fees for Utility under 35 USC 111(a)

Description	Fee Code	Quantity	Amount	Sub-Total in USD($)
Basic Filing:				
Pages:				
Claims:				
Miscellaneous-Filing:				
Petition:				
Patent-Appeals-and-Interference:				
Post-Allowance-and-Post-Issuance:				
UTILITY APPL ISSUE FEE	2501	1	500	500

Description	Fee Code	Quantity	Amount	Sub-Total in USD($)
Extension-of-Time:				
Miscellaneous:				
			Total in USD ($)	**500**

Electronic Acknowledgement Receipt	
EFS ID:	33451015
Application Number:	15082878
International Application Number:	
Confirmation Number:	1059
Title of Invention:	METHODS AND APPARATUS FOR MULTI-CARRIER COMMUNICATION SYSTEMS WITH ADAPTIVE TRANSMISSION AND FEEDBACK
First Named Inventor/Applicant Name:	Xiaodong Li
Customer Number:	25096
Filer:	Steven Beigelmacher/Todd Nielsen
Filer Authorized By:	Steven Beigelmacher
Attorney Docket Number:	061240-8002.US05
Receipt Date:	13-AUG-2018
Filing Date:	28-MAR-2016
Time Stamp:	15:48:41
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	yes
Payment Type	CARD
Payment was successfully received in RAM	$500
RAM confirmation Number	081418INTEFSW15493500
Deposit Account	
Authorized User	
The Director of the USPTO is hereby authorized to charge indicated fees and credit any overpayment as follows:	

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Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1	Issue Fee Payment (PTO-85B)	0612408002US05_IF_Transmittal_08_13_18.pdf	124256 c03576121be217a3bfade416dc07bb34d725c3f1	no	1
Warnings:					
Information:					
2	Fee Worksheet (SB06)	fee-info.pdf	30405 ee93136b78ecc99772e2a832fc54e4940f62f8ed	no	2
Warnings:					
Information:					
		Total Files Size (in bytes):	154661		

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<u>New Applications Under 35 U.S.C. 111</u>
If a new application is being filed and the application includes the necessary components for a filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application.
<u>National Stage of an International Application under 35 U.S.C. 371</u>
If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course.
<u>New International Application Filed with the USPTO as a Receiving Office</u>
If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.

UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NO.	ISSUE DATE	PATENT NO.	ATTORNEY DOCKET NO.	CONFIRMATION NO.
15/082,878	09/11/2018	10075941	061240-8002.US05	1059

25096 7590 08/23/2018
PERKINS COIE LLP - SEA General
PATENT-SEA
P.O. BOX 1247
SEATTLE, WA 98111-1247
UNITED STATES OF AMERICA

ISSUE NOTIFICATION

The projected patent number and issue date are specified above.

Determination of Patent Term Adjustment under 35 U.S.C. 154 (b)
(application filed on or after May 29, 2000)

The Patent Term Adjustment is 0 day(s). Any patent to issue from the above-identified application will include an indication of the adjustment on the front page.

If a Continued Prosecution Application (CPA) was filed in the above-identified application, the filing date that determines Patent Term Adjustment is the filing date of the most recent CPA.

Applicant will be able to obtain more detailed information by accessing the Patent Application Information Retrieval (PAIR) WEB site (http://pair.uspto.gov).

Any questions regarding the Patent Term Extension or Adjustment determination should be directed to the Office of Patent Legal Administration at (571)-272-7702. Questions relating to issue and publication fee payments should be directed to the Application Assistance Unit (AAU) of the Office of Data Management (ODM) at (571)-272-4200.

APPLICANT(s) (Please see PAIR WEB site http://pair.uspto.gov for additional applicants):

Xiaodong Li, Kirkland, WA;
Neocific, Inc., Bellevue, WA;
Titus Lo, Bellevue, WA;
Kemin Li, Bellevue, WA;
Haiming Huang, Bellevue, WA;

The United States represents the largest, most dynamic marketplace in the world and is an unparalleled location for business investment, innovation, and commercialization of new technologies. The USA offers tremendous resources and advantages for those who invest and manufacture goods here. Through SelectUSA, our nation works to encourage and facilitate business investment. To learn more about why the USA is the best country in the world to develop technology, manufacture products, and grow your business, visit SelectUSA.gov.

IR103 (Rev. 10/09)

Doc Code: PA..
Document Description: Power of Attorney

PTO/AIA/82A (07-13)
Approved for use through 03/31/2021. OMB 0651-0035
U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE
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TRANSMITTAL FOR POWER OF ATTORNEY TO ONE OR MORE REGISTERED PRACTITIONERS

NOTE: This form is to be submitted with the Power of Attorney by Applicant form (PTO/AIA/82B) to identify the application to which the Power of Attorney is directed, in accordance with 37 CFR 1.5, unless the application number and filing date are identified in the Power of Attorney by Applicant form. If neither form PTO/AIA/82A nor form PTO/AIA82B identifies the application to which the Power of Attorney is directed, the Power of Attorney will not be recognized in the application.

Application Number	15/082,878
Filing Date	March 28, 2016
First Named Inventor	Li et al.
Title	METHODS AND APPARATUS FOR MULTI-CARRIER COMMUNICATION SYSTEMS WITH ADAPTIVE TRANSMISSION AND FEEDBACK
Art Unit	2461
Examiner Name	LEVITAN, DMITRY
Attorney Docket Number	NEO-PT009.5

SIGNATURE of Applicant or Patent Practitioner

Signature	/Christina R. Walsh/	Date (Optional)	
Name	Christina R. Walsh	Registration Number	61553
Title (if Applicant is a juristic entity)			
Applicant Name (if Applicant is a juristic entity)	Neo Wireless LLC		

NOTE: This form must be signed in accordance with 37 CFR 1.33. See 37 CFR 1.4(d) for signature requirements and certifications. If more than one applicant, use multiple forms.

☑ *Total of 1 forms are submitted.

This collection of information is required by 37 CFR 1.131, 1.32, and 1.33. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.11 and 1.14. This collection is estimated to take 3 minutes to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

If you need assistance in completing the form, call 1-800-PTO-9199 and select option 2.

Doc Code: PA..
Document Description: Power of Attorney

PTO/AIA/82B (07-13)
Approved for use through 03/31/2021. OMB 0651-0035
U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE
Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it displays a valid OMB control number

POWER OF ATTORNEY BY APPLICANT

I hereby revoke all previous powers of attorney given in the application identified in either the attached transmittal letter or the boxes below.

Application Number	Filing Date

(Note: The boxes above may be left blank if information is provided on form PTO/AIA/82A.)

☑ I hereby appoint the Patent Practitioner(s) associated with the following Customer Number as my/our attorney(s) or agent(s), and to transact all business in the United States Patent and Trademark Office connected therewith for the application referenced in the attached transmittal letter (form PTO/AIA/82A) or identified above: 03624

OR

☐ I hereby appoint Practitioner(s) named in the attached list (form PTO/AIA/82C) as my/our attorney(s) or agent(s), and to transact all business in the United States Patent and Trademark Office connected therewith for the patent application referenced in the attached transmittal letter (form PTO/AIA/82A) or identified above. (Note: Complete form PTO/AIA/82C.)

Please recognize or change the correspondence address for the application identified in the attached transmittal letter or the boxes above to:

☑ The address associated with the above-mentioned Customer Number

OR

☐ The address associated with Customer Number:

OR

☐ Firm or Individual Name					
Address					
City		State		Zip	
Country					
Telephone		Email			

I am the Applicant (if the Applicant is a juristic entity, list the Applicant name in the box):

Neo Wireless LLC

☐ Inventor or Joint Inventor (title not required below)

☐ Legal Representative of a Deceased or Legally Incapacitated Inventor (title not required below)

☑ Assignee or Person to Whom the Inventor is Under an Obligation to Assign (provide signer's title if applicant is a juristic entity)

☐ Person Who Otherwise Shows Sufficient Proprietary Interest (e.g., a petition under 37 CFR 1.46(b)(2) was granted in the application or is concurrently being filed with this document) (provide signer's title if applicant is a juristic entity)

SIGNATURE of Applicant for Patent

The undersigned (whose title is supplied below) is authorized to act on behalf of the applicant (e.g., where the applicant is a juristic entity).

Signature	David Loo	Date (Optional)	
Name	David Loo		
Title	C.E.O., Neo Wireless LLC		

NOTE: Signature - This form must be signed by the applicant in accordance with 37 CFR 1.33. See 37 CFR 1.4 for signature requirements and certifications. If more than one applicant, use multiple forms.

☑ Total of 1 forms are submitted.

This collection of information is required by 37 CFR 1.131, 1.32, and 1.33. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.11 and 1.14. This collection is estimated to take 3 minutes to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

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PTO/AIA/14 (11-15)
Approved for use through 04/30/2017. OMB 0651-0032
U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE

SUPPLEMENTAL APPLICATION DATA SHEET

Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it contains a valid OMB control number.

Application Data Sheet 37 CFR 1.76	Attorney Docket Number	~~061240-8002.US05~~ NEO-PT009.5
	Application Number	15/082,878
Title of Invention	METHODS AND APPARATUS FOR MULTI-CARRIER COMMUNICATION SYSTEMS WITH ADAPTIVE TRANSMISSION AND FEEDBACK	

The application data sheet is part of the provisional or nonprovisional application for which it is being submitted. The following form contains the bibliographic data arranged in a format specified by the United States Patent and Trademark Office as outlined in 37 CFR 1.76.
This document may be completed electronically and submitted to the Office in electronic format using the Electronic Filing System (EFS) or the document may be printed and included in a paper filed application.

Secrecy Order 37 CFR 5.2:

☐ Portions or all of the application associated with this Application Data Sheet may fall under a Secrecy Order pursuant to 37 CFR 5.2 (Paper filers only. Applications that fall under Secrecy Order may not be filed electronically.)

Inventor Information:

Inventor 1 Remove

Legal Name

Prefix	Given Name	Middle Name	Family Name	Suffix
	Xiaodong		Li	

Residence Information (Select One) ◉ US Residency ◯ Non US Residency ◯ Active US Military Service

City	Kirkland	State/Province	WA	Country of Residence	US

Mailing Address of Inventor:

Address 1	1750 112th Ave NE
Address 2	Suite D159
City	Bellevue
State/Province	WA
Postal Code	98004
Country	US

Inventor 2 Remove

Legal Name

Prefix	Given Name	Middle Name	Family Name	Suffix
	Titus		Lo	

Residence Information (Select One) ◉ US Residency ◯ Non US Residency ◯ Active US Military Service

City	Bellevue	State/Province	WA	Country of Residence	US

Mailing Address of Inventor:

Address 1	1750 112th Ave NE
Address 2	Suite D159
City	Bellevue
State/Province	WA
Postal Code	98004
Country	US

Inventor 3 Remove

Legal Name

Prefix	Given Name	Middle Name	Family Name	Suffix
	Kemin		Li	

Residence Information (Select One) ◉ US Residency ◯ Non US Residency ◯ Active US Military Service

Application Data Sheet 37 CFR 1.76	Attorney Docket Number	~~061240-8002.US05~~ NEO-PT009.5
	Application Number	15/082,878
Title of Invention	METHODS AND APPARATUS FOR MULTI-CARRIER COMMUNICATION SYSTEMS WITH ADAPTIVE TRANSMISSION AND FEEDBACK	

City	Bellevue	**State/Province**	WA	**Country of Residence**	US

Mailing Address of Inventor:

Address 1	1750 112th Ave NE		
Address 2	Suite D159		
City	Bellevue	**State/Province**	WA
Postal Code	98004	**Country**	US

Inventor 4 Remove

Legal Name

Prefix	Given Name	Middle Name	Family Name	Suffix
	Haiming		Huang	

Residence Information (Select One) ◉ US Residency ○ Non US Residency ○ Active US Military Service

City	Bellevue	**State/Province**	WA	**Country of Residence**	US

Mailing Address of Inventor:

Address 1	1750 112th Ave NE		
Address 2	Suite D159		
City	Bellevue	**State/Province**	WA
Postal Code	98004	**Country**	US

All Inventors Must Be Listed - Additional Inventor Information blocks may be generated within this form by selecting the **Add** button. Add

Correspondence Information:

Enter either Customer Number or complete the Correspondence Information section below. For further information see 37 CFR 1.33(a).

☐ **An Address is being provided for the correspondence Information of this application.**

Customer Number	~~25096~~ 03624
Email Address	~~patentprocurement@perkinscoie.com~~ eoffice@vklaw.com Add Email Remove Email

Application Information:

Title of the Invention	METHODS AND APPARATUS FOR MULTI-CARRIER COMMUNICATION SYSTEMS WITH ADAPTIVE TRANSMISSION AND FEEDBACK		
Attorney Docket Number	~~061240-8002.US05~~ NEO-PT009.5 ~~**Small Entity Status Claimed**~~ ☒		
Application Type	Nonprovisional		
Subject Matter	Utility		
Total Number of Drawing Sheets (if any)	8	**Suggested Figure for Publication (if any)**	

Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it contains a valid OMB control number.

SUPPLEMENTAL APPLICATION DATA SHEET

Application Data Sheet 37 CFR 1.76	Attorney Docket Number	~~061240-8002.US05~~ NEO-PT009.5
	Application Number	15/082,878
Title of Invention	METHODS AND APPARATUS FOR MULTI-CARRIER COMMUNICATION SYSTEMS WITH ADAPTIVE TRANSMISSION AND FEEDBACK	

Filing By Reference:

Only complete this section when filing an application by reference under 35 U.S.C. 111(c) and 37 CFR 1.57(a). Do not complete this section if application papers including a specification and any drawings are being filed. Any domestic benefit or foreign priority information must be provided in the appropriate section(s) below (i.e., "Domestic Benefit/National Stage Information" and "Foreign Priority Information").

For the purposes of a filing date under 37 CFR 1.53(b), the description and any drawings of the present application are replaced by this reference to the previously filed application, subject to conditions and requirements of 37 CFR 1.57(a).

Application number of the previously filed application	Filing date (YYYY-MM-DD)	Intellectual Property Authority or Country

Publication Information:

☐ Request Early Publication (Fee required at time of Request 37 CFR 1.219)

☐ **Request Not to Publish.** I hereby request that the attached application not be published under 35 U.S.C. 122(b) and certify that the invention disclosed in the attached application **has not and will not** be the subject of an application filed in another country, or under a multilateral international agreement, that requires publication at eighteen months after filing.

Representative Information:

Representative information should be provided for all practitioners having a power of attorney in the application. Providing this information in the Application Data Sheet does not constitute a power of attorney in the application (see 37 CFR 1.32).
Either enter Customer Number or complete the Representative Name section below. If both sections are completed the customer Number will be used for the Representative Information during processing.

Please Select One:	◉ Customer Number	○ US Patent Practitioner	○ Limited Recognition (37 CFR 11.9)
Customer Number	~~25096~~ 03624		

Domestic Benefit/National Stage Information:

This section allows for the applicant to either claim benefit under 35 U.S.C. 119(e), 120, 121, 365(c), or 386(c) or indicate National Stage entry from a PCT application. Providing benefit claim information in the Application Data Sheet constitutes the specific reference required by 35 U.S.C. 119(e) or 120, and 37 CFR 1.78.
When referring to the current application, please leave the "Application Number" field blank.

Prior Application Status	Pending		Remove
Application Number	Continuity Type	Prior Application Number	Filing or 371(c) Date (YYYY-MM-DD)
15/082,878	Continuation of	14539917	2014-11-12

Application Data Sheet 37 CFR 1.76	Attorney Docket Number	~~061240-8002.US05~~ NEO-PT009.5
	Application Number	15/082,878
Title of Invention	METHODS AND APPARATUS FOR MULTI-CARRIER COMMUNICATION SYSTEMS WITH ADAPTIVE TRANSMISSION AND FEEDBACK	

Prior Application Status	Abandoned		Remove
Application Number	Continuity Type	Prior Application Number	Filing or 371(c) Date (YYYY-MM-DD)
14539917	Continuation of	13246677	2011-09-27

Prior Application Status	Patented			Remove	
Application Number	Continuity Type	Prior Application Number	Filing Date (YYYY-MM-DD)	Patent Number	Issue Date (YYYY-MM-DD)
13246677	Continuation of	12755313	2010-04-06	8027367	2011-09-27

Prior Application Status	Patented			Remove	
Application Number	Continuity Type	Prior Application Number	Filing Date (YYYY-MM-DD)	Patent Number	Issue Date (YYYY-MM-DD)
12755313	Continuation of	10583529	2007-05-10	7693032	2010-04-06

Prior Application Status	Expired		Remove
Application Number	Continuity Type	Prior Application Number	Filing or 371(c) Date (YYYY-MM-DD)
10583529	a 371 of international	PCTUS0504601	2005-02-14

Prior Application Status	Expired		Remove
Application Number	Continuity Type	Prior Application Number	Filing or 371(c) Date (YYYY-MM-DD)
PCTUS0504601	Claims benefit of provisional	60544521	2004-02-13

Additional Domestic Benefit/National Stage Data may be generated within this form by selecting the **Add** button.

Foreign Priority Information:

This section allows for the applicant to claim priority to a foreign application. Providing this information in the application data sheet constitutes the claim for priority as required by 35 U.S.C. 119(b) and 37 CFR 1.55. When priority is claimed to a foreign application that is eligible for retrieval under the priority document exchange program (PDX)[i] the information will be used by the Office to automatically attempt retrieval pursuant to 37 CFR 1.55(i)(1) and (2). Under the PDX program, applicant bears the ultimate responsibility for ensuring that a copy of the foreign application is received by the Office from the participating foreign intellectual property office, or a certified copy of the foreign priority application is filed, within the time period specified in 37 CFR 1.55(g)(1).

			Remove
Application Number	Country[i]	Filing Date (YYYY-MM-DD)	Access Code[i] (if applicable)

Additional Foreign Priority Data may be generated within this form by selecting the **Add** button.

Application Data Sheet 37 CFR 1.76	Attorney Docket Number	~~061240-8002.US05~~ NEO-PT009.5
	Application Number	15/082,878
Title of Invention	METHODS AND APPARATUS FOR MULTI-CARRIER COMMUNICATION SYSTEMS WITH ADAPTIVE TRANSMISSION AND FEEDBACK	

Statement under 37 CFR 1.55 or 1.78 for AIA (First Inventor to File) Transition Applications

☐ This application (1) claims priority to or the benefit of an application filed before March 16, 2013 and (2) also contains, or contained at any time, a claim to a claimed invention that has an effective filing date on or after March 16, 2013.
NOTE: By providing this statement under 37 CFR 1.55 or 1.78, this application, with a filing date on or after March 16, 2013, will be examined under the first inventor to file provisions of the AIA.

Application Data Sheet 37 CFR 1.76	Attorney Docket Number	~~061240-8002.US05~~ NEO-PT009.5
	Application Number	15/082,878
Title of Invention	METHODS AND APPARATUS FOR MULTI-CARRIER COMMUNICATION SYSTEMS WITH ADAPTIVE TRANSMISSION AND FEEDBACK	

Authorization or Opt-Out of Authorization to Permit Access:

When this Application Data Sheet is properly signed and filed with the application, applicant has provided written authority to permit a participating foreign intellectual property (IP) office access to the instant application-as-filed (see paragraph A in subsection 1 below) and the European Patent Office (EPO) access to any search results from the instant application (see paragraph B in subsection 1 below).

Should applicant choose not to provide an authorization identified in subsection 1 below, applicant **must opt-out** of the authorization by checking the corresponding box A or B or both in subsection 2 below.

NOTE: This section of the Application Data Sheet is **ONLY** reviewed and processed with the **INITIAL** filing of an application. After the initial filing of an application, an Application Data Sheet cannot be used to provide or rescind authorization for access by a foreign IP office(s). Instead, Form PTO/SB/39 or PTO/SB/69 must be used as appropriate.

1. Authorization to Permit Access by a Foreign Intellectual Property Office(s)

A. Priority Document Exchange (PDX) - Unless box A in subsection 2 (opt-out of authorization) is checked, the undersigned hereby **grants the USPTO authority** to provide the European Patent Office (EPO), the Japan Patent Office (JPO), the Korean Intellectual Property Office (KIPO), the State Intellectual Property Office of the People's Republic of China (SIPO), the World Intellectual Property Organization (WIPO), and any other foreign intellectual property office participating with the USPTO in a bilateral or multilateral priority document exchange agreement in which a foreign application claiming priority to the instant patent application is filed, access to: (1) the instant patent application-as-filed and its related bibliographic data, (2) any foreign or domestic application to which priority or benefit is claimed by the instant application and its related bibliographic data, and (3) the date of filing of this Authorization. See 37 CFR 1.14(h)(1).

B. Search Results from U.S. Application to EPO - Unless box B in subsection 2 (opt-out of authorization) is checked, the undersigned hereby **grants the USPTO authority** to provide the EPO access to the bibliographic data and search results from the instant patent application when a European patent application claiming priority to the instant patent application is filed. See 37 CFR 1.14(h)(2).

The applicant is reminded that the EPO's Rule 141(1) EPC (European Patent Convention) requires applicants to submit a copy of search results from the instant application without delay in a European patent application that claims priority to the instant application.

2. Opt-Out of Authorizations to Permit Access by a Foreign Intellectual Property Office(s)

☐ A. Applicant **DOES NOT** authorize the USPTO to permit a participating foreign IP office access to the instant application-as-filed. If this box is checked, the USPTO will not be providing a participating foreign IP office with any documents and information identified in subsection 1A above.

☐ B. Applicant **DOES NOT** authorize the USPTO to transmit to the EPO any search results from the instant patent application. If this box is checked, the USPTO will not be providing the EPO with search results from the instant application.

NOTE: Once the application has published or is otherwise publicly available, the USPTO may provide access to the application in accordance with 37 CFR 1.14.

Application Data Sheet 37 CFR 1.76	Attorney Docket Number	~~061240-8002.US05~~ NEO-PT009.5
	Application Number	15/082,878
Title of Invention	METHODS AND APPARATUS FOR MULTI-CARRIER COMMUNICATION SYSTEMS WITH ADAPTIVE TRANSMISSION AND FEEDBACK	

Applicant Information:

Providing assignment information in this section does not substitute for compliance with any requirement of part 3 of Title 37 of CFR to have an assignment recorded by the Office.

Applicant 1

If the applicant is the inventor (or the remaining joint inventor or inventors under 37 CFR 1.45), this section should not be completed. The information to be provided in this section is the name and address of the legal representative who is the applicant under 37 CFR 1.43; or the name and address of the assignee, person to whom the inventor is under an obligation to assign the invention, or person who otherwise shows sufficient proprietary interest in the matter who is the applicant under 37 CFR 1.46. If the applicant is an applicant under 37 CFR 1.46 (assignee, person to whom the inventor is obligated to assign, or person who otherwise shows sufficient proprietary interest) together with one or more joint inventors, then the joint inventor or inventors who are also the applicant should be identified in this section.

Clear

(●) Assignee ( ) Legal Representative under 35 U.S.C. 117 ( ) Joint Inventor

( ) Person to whom the inventor is obligated to assign. ( ) Person who shows sufficient proprietary interest

If applicant is the legal representative, indicate the authority to file the patent application, the inventor is:

Name of the Deceased or Legally Incapacitated Inventor:

If the Applicant is an Organization check here. ☒

Organization Name	~~Neocific, Inc.~~ Neo Wireless LLC		
Mailing Address Information For Applicant:			
Address 1	~~1750 112th Ave NE~~ 123 West Wayne Avenue, Floor 1		
Address 2	~~Suite D159~~		
City	~~Bellevue~~ Wayne	**State/Province**	~~WA~~ PA
Country	US	Postal Code	~~98004~~ 19087
Phone Number		Fax Number	
Email Address			

Additional Applicant Data may be generated within this form by selecting the Add button.

Assignee Information including Non-Applicant Assignee Information:

Providing assignment information in this section does not substitute for compliance with any requirement of part 3 of Title 37 of CFR to have an assignment recorded by the Office.

SUPPLEMENTAL APPLICATION DATA SHEET

PTO/AIA/14 (11-15)
Approved for use through 04/30/2017. OMB 0651-0032
U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE
Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it contains a valid OMB control number.

Application Data Sheet 37 CFR 1.76	Attorney Docket Number	~~061240-8002.US05~~ NEO-PT009.5
	Application Number	15/082,878
Title of Invention	METHODS AND APPARATUS FOR MULTI-CARRIER COMMUNICATION SYSTEMS WITH ADAPTIVE TRANSMISSION AND FEEDBACK	

Assignee 1

Complete this section if assignee information, including non-applicant assignee information, is desired to be included on the patent application publication. An assignee-applicant identified in the "Applicant Information" section will appear on the patent application publication as an applicant. For an assignee-applicant, complete this section only if identification as an assignee is also desired on the patent application publication.

If the Assignee or Non-Applicant Assignee is an Organization check here. Neo Wireless LLC X

Prefix	Given Name	Middle Name	Family Name	Suffix

Mailing Address Information For Assignee including Non-Applicant Assignee:

Address 1	123 West Wayne Avenue, Floor 1		
Address 2			
City	Wayne	**State/Province**	PA
Country i	US	Postal Code	19087
Phone Number		Fax Number	
Email Address			

Additional Assignee or Non-Applicant Assignee Data may be generated within this form by selecting the Add button.

Signature:

NOTE: This Application Data Sheet must be signed in accordance with 37 CFR 1.33(b). **However, if this Application Data Sheet is submitted with the INITIAL filing of the application and either box A or B is not checked in subsection 2 of the "Authorization or Opt-Out of Authorization to Permit Access" section, then this form must also be signed in accordance with 37 CFR 1.14(c).**

This Application Data Sheet **must** be signed by a patent practitioner if one or more of the applicants is a **juristic entity** (e.g., corporation or association). If the applicant is two or more joint inventors, this form must be signed by a patent practitioner, **all** joint inventors who are the applicant, or one or more joint inventor-applicants who have been given power of attorney (e.g., see USPTO Form PTO/AIA/81) on behalf of **all** joint inventor-applicants.

See 37 CFR 1.4(d) for the manner of making signatures and certifications.

Signature	~~/Stephen Bishop/~~ /Christina R. Walsh/			Date (YYYY-MM-DD)	~~2016-03-28~~ 2020-03-13
First Name	~~Stephen~~ Christina R.	Last Name	~~Bishop~~ Walsh	Registration Number	~~38829~~ 61553

Additional Signature may be generated within this form by selecting the Add button.

SUPPLEMENTAL APPLICATION DATA SHEET

Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it contains a valid OMB control number.

Application Data Sheet 37 CFR 1.76	Attorney Docket Number	~~061240-8002.US05~~ NEO-PT009.5
	Application Number	15/082,878
Title of Invention	METHODS AND APPARATUS FOR MULTI-CARRIER COMMUNICATION SYSTEMS WITH ADAPTIVE TRANSMISSION AND FEEDBACK	

This collection of information is required by 37 CFR 1.76. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 23 minutes to complete, including gathering, preparing, and submitting the completed application data sheet form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

Privacy Act Statement

The Privacy Act of 1974 (P.L. 93-579) requires that you be given certain information in connection with your submission of the attached form related to a patent application or patent. Accordingly, pursuant to the requirements of the Act, please be advised that: (1) the general authority for the collection of this information is 35 U.S.C. 2(b)(2); (2) furnishing of the information solicited is voluntary; and (3) the principal purpose for which the information is used by the U.S. Patent and Trademark Office is to process and/or examine your submission related to a patent application or patent. If you do not furnish the requested information, the U.S. Patent and Trademark Office may not be able to process and/or examine your submission, which may result in termination of proceedings or abandonment of the application or expiration of the patent.

The information provided by you in this form will be subject to the following routine uses:

1 The information on this form will be treated confidentially to the extent allowed under the Freedom of Information Act (5 U.S.C. 552) and the Privacy Act (5 U.S.C. 552a). Records from this system of records may be disclosed to the Department of Justice to determine whether the Freedom of Information Act requires disclosure of these records.

2. A record from this system of records may be disclosed, as a routine use, in the course of presenting evidence to a court, magistrate, or administrative tribunal, including disclosures to opposing counsel in the course of settlement negotiations.

3 A record in this system of records may be disclosed, as a routine use, to a Member of Congress submitting a request involving an individual, to whom the record pertains, when the individual has requested assistance from the Member with respect to the subject matter of the record.

4. A record in this system of records may be disclosed, as a routine use, to a contractor of the Agency having need for the information in order to perform a contract. Recipients of information shall be required to comply with the requirements of the Privacy Act of 1974, as amended, pursuant to 5 U.S.C. 552a(m).

5. A record related to an International Application filed under the Patent Cooperation Treaty in this system of records may be disclosed, as a routine use, to the International Bureau of the World Intellectual Property Organization, pursuant to the Patent CooperationTreaty.

6. A record in this system of records may be disclosed, as a routine use, to another federal agency for purposes of National Security review (35 U.S.C. 181) and for review pursuant to the Atomic Energy Act (42 U.S.C. 218(c)).

7. A record from this system of records may be disclosed, as a routine use, to the Administrator, General Services, or his/her designee, during an inspection of records conducted by GSA as part of that agency's responsibility to recommend improvements in records management practices and programs, under authority of 44 U.S.C. 2904 and 2906. Such disclosure shall be made in accordance with the GSA regulations governing inspection of records for this purpose, and any other relevant (i.e., GSA or Commerce) directive. Such disclosure shall not be used to make determinations about individuals.

8. A record from this system of records may be disclosed, as a routine use, to the public after either publication of the application pursuant to 35 U.S.C. 122(b) or issuance of a patent pursuant to 35 U.S.C. 151. Further, a record may be disclosed, subject to the limitations of 37 CFR 1.14, as a routine use, to the public if the record was filed in an application which became abandoned or in which the proceedings were terminated and which application is referenced by either a published application, an application open to public inspections or an issued patent.

9. A record from this system of records may be disclosed, as a routine use, to a Federal, State, or local law enforcement agency, if the USPTO becomes aware of a violation or potential violation of law or regulation.

Electronic Acknowledgement Receipt

EFS ID:	38858290
Application Number:	15082878
International Application Number:	
Confirmation Number:	1059
Title of Invention:	METHODS AND APPARATUS FOR MULTI-CARRIER COMMUNICATION SYSTEMS WITH ADAPTIVE TRANSMISSION AND FEEDBACK
First Named Inventor/Applicant Name:	Xiaodong Li
Customer Number:	25096
Filer:	Christina R. Walsh/Justin Slater
Filer Authorized By:	Christina R. Walsh
Attorney Docket Number:	061240-8002.US05
Receipt Date:	13-MAR-2020
Filing Date:	28-MAR-2016
Time Stamp:	14:28:41
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	no

File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1	Assignee showing of ownership per 37 CFR 3.73	NEO-PT009_5-373c_aia0096_EFS-20200313.PDF	123171 5f2ea2e7c1ff6b9ea62c3e4cbdf09c0574133184	no	3

Warnings:

Information:					
2	Power of Attorney	NEO-PT009_5-Executed_POA_ByApplicant_aia0082-20200313.PDF	353707 8001b184be6c059eb3e0cd6740b53d130e29bcbb	no	2
Warnings:					
Information:					
3	Application Data Sheet	NEO-PT009_5-Supplemental_ADS_EFS-20200313.PDF	641724 7825ce795d9b5319a831ac3ae0facd0138eb864b	no	10
Warnings:					
Information:					
This is not an USPTO supplied ADS fillable form					
			Total Files Size (in bytes):	1118602	

This Acknowledgement Receipt evidences receipt on the noted date by the USPTO of the indicated documents, characterized by the applicant, and including page counts, where applicable. It serves as evidence of receipt similar to a Post Card, as described in MPEP 503.

<u>New Applications Under 35 U.S.C. 111</u>
If a new application is being filed and the application includes the necessary components for a filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application.
<u>National Stage of an International Application under 35 U.S.C. 371</u>
If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course.
<u>New International Application Filed with the USPTO as a Receiving Office</u>
If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.

PTO/AIA/96 (08-12)
Approved for use through 01/31/2013. OMB 0651-0031
U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE
Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it displays a valid OMB control number.

STATEMENT UNDER 37 CFR 3.73(c)

Applicant/Patent Owner: Neo Wireless LLC

Application No./Patent No.: 15/082,878 Filed/Issue Date: March 28, 2016

Titled: METHODS AND APPARATUS FOR MULTI-CARRIER COMMUNICATION SYSTEMS WITH ADAPTIVE TRANSMISSION AND FEEDBACK

Neo Wireless LLC, a corporation

(Name of Assignee) (Type of Assignee, e.g., corporation, partnership, university, government agency, etc.)

states that, for the patent application/patent identified above, it is (choose **one** of options 1, 2, 3 or 4 below):

1. ☑ The assignee of the entire right, title, and interest.

2. ☐ An assignee of less than the entire right, title, and interest (check applicable box):

☐ The extent (by percentage) of its ownership interest is _____%. Additional Statement(s) by the owners holding the balance of the interest must be submitted to account for 100% of the ownership interest.

☐ There are unspecified percentages of ownership. The other parties, including inventors, who together own the entire right, title and interest are:

Additional Statement(s) by the owner(s) holding the balance of the interest must be submitted to account for the entire right, title, and interest.

3. ☐ The assignee of an undivided interest in the entirety (a complete assignment from one of the joint inventors was made). The other parties, including inventors, who together own the entire right, title, and interest are:

Additional Statement(s) by the owner(s) holding the balance of the interest must be submitted to account for the entire right, title, and interest.

4. ☐ The recipient, via a court proceeding or the like (*e.g.*, bankruptcy, probate), of an undivided interest in the entirety (a complete transfer of ownership interest was made). The certified document(s) showing the transfer is attached.

The interest identified in option 1, 2 or 3 above (not option 4) is evidenced by either (choose **one** of options A or B below):

A. ☐ An assignment from the inventor(s) of the patent application/patent identified above. The assignment was recorded in the United States Patent and Trademark Office at Reel _____, Frame _____, or for which a copy thereof is attached.

B. ☑ A chain of title from the inventor(s), of the patent application/patent identified above, to the current assignee as follows:

1. From: INVENTORS To: WALTICAL SOLUTIONS, INC.

The document was recorded in the United States Patent and Trademark Office at Reel 051261, Frame 0382, or for which a copy thereof is attached.

2. From: WALTICAL SOLUTIONS, INC. To: NEOCIFIC, INC.

The document was recorded in the United States Patent and Trademark Office at Reel 051258, Frame 0773, or for which a copy thereof is attached.

This collection of information is required by 37 CFR 3.73(b). The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.11 and 1.14. This collection is estimated to take 12 minutes to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

If you need assistance in completing the form, call 1-800-PTO-9199 and select option 2.

Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it displays a valid OMB control number.

STATEMENT UNDER 37 CFR 3.73(c)

3. From: NEOCIFIC, INC. To: CFIP NCF LLC

The document was recorded in the United States Patent and Trademark Office at
Reel 051116, Frame 0396, or for which a copy thereof is attached.

4. From: CFIP NCF LLC To: NEO WIRELESS LLC

The document was recorded in the United States Patent and Trademark Office at
Reel 051971, Frame 0226, or for which a copy thereof is attached.

5. From: _____ To: _____

The document was recorded in the United States Patent and Trademark Office at
Reel _____, Frame _____, or for which a copy thereof is attached.

6. From: _____ To: _____

The document was recorded in the United States Patent and Trademark Office at
Reel _____, Frame _____, or for which a copy thereof is attached.

☐ Additional documents in the chain of title are listed on a supplemental sheet(s).

☑ As required by 37 CFR 3.73(c)(1)(i), the documentary evidence of the chain of title from the original owner to the assignee was, or concurrently is being, submitted for recordation pursuant to 37 CFR 3.11.

[NOTE: A separate copy (i.e., a true copy of the original assignment document(s)) must be submitted to Assignment Division in accordance with 37 CFR Part 3, to record the assignment in the records of the USPTO. See MPEP 302.08]

The undersigned (whose title is supplied below) is authorized to act on behalf of the assignee.

/Christina R. Walsh/	March 13, 2020
Signature	Date
Christina R. Walsh	61553
Printed or Typed Name	Title or Registration Number

[Page 2 of 2]

Privacy Act Statement

The **Privacy Act of 1974 (P.L. 93-579)** requires that you be given certain information in connection with your submission of the attached form related to a patent application or patent. Accordingly, pursuant to the requirements of the Act, please be advised that: (1) the general authority for the collection of this information is 35 U.S.C. 2(b)(2); (2) furnishing of the information solicited is voluntary; and (3) the principal purpose for which the information is used by the U.S. Patent and Trademark Office is to process and/or examine your submission related to a patent application or patent. If you do not furnish the requested information, the U.S. Patent and Trademark Office may not be able to process and/or examine your submission, which may result in termination of proceedings or abandonment of the application or expiration of the patent.

The information provided by you in this form will be subject to the following routine uses:

1. The information on this form will be treated confidentially to the extent allowed under the Freedom of Information Act (5 U.S.C. 552) and the Privacy Act (5 U.S.C 552a). Records from this system of records may be disclosed to the Department of Justice to determine whether disclosure of these records is required by the Freedom of Information Act.
2. A record from this system of records may be disclosed, as a routine use, in the course of presenting evidence to a court, magistrate, or administrative tribunal, including disclosures to opposing counsel in the course of settlement negotiations.
3. A record in this system of records may be disclosed, as a routine use, to a Member of Congress submitting a request involving an individual, to whom the record pertains, when the individual has requested assistance from the Member with respect to the subject matter of the record.
4. A record in this system of records may be disclosed, as a routine use, to a contractor of the Agency having need for the information in order to perform a contract. Recipients of information shall be required to comply with the requirements of the Privacy Act of 1974, as amended, pursuant to 5 U.S.C. 552a(m).
5. A record related to an International Application filed under the Patent Cooperation Treaty in this system of records may be disclosed, as a routine use, to the International Bureau of the World Intellectual Property Organization, pursuant to the Patent Cooperation Treaty.
6. A record in this system of records may be disclosed, as a routine use, to another federal agency for purposes of National Security review (35 U.S.C. 181) and for review pursuant to the Atomic Energy Act (42 U.S.C. 218(c)).
7. A record from this system of records may be disclosed, as a routine use, to the Administrator, General Services, or his/her designee, during an inspection of records conducted by GSA as part of that agency's responsibility to recommend improvements in records management practices and programs, under authority of 44 U.S.C. 2904 and 2906. Such disclosure shall be made in accordance with the GSA regulations governing inspection of records for this purpose, and any other relevant (*i.e.*, GSA or Commerce) directive. Such disclosure shall not be used to make determinations about individuals.
8. A record from this system of records may be disclosed, as a routine use, to the public after either publication of the application pursuant to 35 U.S.C. 122(b) or issuance of a patent pursuant to 35 U.S.C. 151. Further, a record may be disclosed, subject to the limitations of 37 CFR 1.14, as a routine use, to the public if the record was filed in an application which became abandoned or in which the proceedings were terminated and which application is referenced by either a published application, an application open to public inspection or an issued patent.
9. A record from this system of records may be disclosed, as a routine use, to a Federal, State, or local law enforcement agency, if the USPTO becomes aware of a violation or potential violation of law or regulation.

UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NUMBER	FILING OR 371(C) DATE	FIRST NAMED APPLICANT	ATTY. DOCKET NO./TITLE
15/082,878	03/28/2016	Xiaodong Li	NEO-PT009.5

CONFIRMATION NO. 1059

POA ACCEPTANCE LETTER

3624
VOLPE AND KOENIG, P.C.
30 SOUTH 17TH STREET, 18th Floor
PHILADELPHIA, PA 19103

OC000000115500674

Date Mailed: 03/18/2020

NOTICE OF ACCEPTANCE OF POWER OF ATTORNEY

This is in response to the Power of Attorney filed 03/13/2020.

The Power of Attorney in this application is accepted. Correspondence in this application will be mailed to the above address as provided by 37 CFR 1.33.

Questions about the contents of this notice and the requirements it sets forth should be directed to the Office of Data Management, Application Assistance Unit, at **(571) 272-4000** or **(571) 272-4200** or **1-888-786-0101**.

/cvorachack/

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Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NUMBER	FILING OR 371(C) DATE	FIRST NAMED APPLICANT	ATTY. DOCKET NO./TITLE
15/082,878	03/28/2016	Xiaodong Li	061240-8002.US05

CONFIRMATION NO. 1059

POWER OF ATTORNEY NOTICE

25096
PERKINS COIE LLP - SEA General
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SEATTLE, WA 98111-1247

OC000000115500654

Date Mailed: 03/18/2020

NOTICE REGARDING CHANGE OF POWER OF ATTORNEY

This is in response to the Power of Attorney filed 03/13/2020.

- The Power of Attorney to you in this application has been revoked by the assignee who has intervened as provided by 37 CFR 3.71. Future correspondence will be mailed to the new address of record(37 CFR 1.33).

Questions about the contents of this notice and the requirements it sets forth should be directed to the Office of Data Management, Application Assistance Unit, at **(571) 272-4000** or **(571) 272-4200** or **1-888-786-0101**.

/cvorachack/

PATENT

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Application No.:	15/082,878	
Filed:	March 28, 2016	FILE: NEO-PT009.5
Patent No.:	10,075,941	DATE: March 23, 2020
Issued:	September 11, 2018	

DECLARATION OF LARGE ENTITY STATUS
PURSUANT TO 37 C.F.R. §1.27 (c)(1)

Commissioner for Patents
Mail Stop M Correspondence
P.O. Box 1450
Alexandria, VA 22313-1450

Sir:

The above-identified patent is no longer entitled to small entity status and should be considered a large entity for all further payments.

Respectfully submitted,

NEO WIRELESS LLC

By /John C. Donch Jr./
John C. Donch Jr., Esquire
Registration No. 43,593
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United Plaza
30 South 17th Street
Philadelphia, PA 19103-4009

JCD/dt

5670574-1

Electronic Acknowledgement Receipt

EFS ID:	38935736
Application Number:	15082878
International Application Number:	
Confirmation Number:	1059
Title of Invention:	METHODS AND APPARATUS FOR MULTI-CARRIER COMMUNICATION SYSTEMS WITH ADAPTIVE TRANSMISSION AND FEEDBACK
First Named Inventor/Applicant Name:	Xiaodong Li
Customer Number:	3624
Filer:	John C. Donch/Diane Thatcher
Filer Authorized By:	John C. Donch
Attorney Docket Number:	NEO-PT009.5
Receipt Date:	23-MAR-2020
Filing Date:	28-MAR-2016
Time Stamp:	11:03:12
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	no

File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1	Notification of loss of entitlement to small entity status	NET_PT009_5.pdf	47099 21d0a5e2bf88e33cb34e3f845f4aee0a6be75127	no	1

Warnings:

Information:	
Total Files Size (in bytes):	47099

This Acknowledgement Receipt evidences receipt on the noted date by the USPTO of the indicated documents, characterized by the applicant, and including page counts, where applicable. It serves as evidence of receipt similar to a Post Card, as described in MPEP 503.

New Applications Under 35 U.S.C. 111
If a new application is being filed and the application includes the necessary components for a filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application.
National Stage of an International Application under 35 U.S.C. 371
If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course.
New International Application Filed with the USPTO as a Receiving Office
If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.

AO 120 (Rev. 08/10)

TO: Mail Stop 8 Director of the U.S. Patent and Trademark Office P.O. Box 1450 Alexandria, VA 22313-1450	REPORT ON THE FILING OR DETERMINATION OF AN ACTION REGARDING A PATENT OR TRADEMARK

In Compliance with 35 U.S.C. § 290 and/or 15 U.S.C. § 1116 you are hereby advised that a court action has been filed in the U.S. District Court Western District of Texas Waco Division on the following

☐ Trademarks or ☑ Patents. (☐ the patent action involves 35 U.S.C. § 292.):

DOCKET NO.	DATE FILED	U.S. DISTRICT COURT
6:21-cv-00026	4/28/2021	Western District of Texas Waco Division

PLAINTIFF	DEFENDANT
Neo Wireless LLC	Apple Inc.

	PATENT OR TRADEMARK NO.	DATE OF PATENT OR TRADEMARK	HOLDER OF PATENT OR TRADEMARK
1	8,467,366	6/18/2013	Neo Wireless LLC
2	10,044,517	8/7/2018	Neo Wireless LLC
3	10,833,908	4/17/2018	Neo Wireless LLC
4	10,075,941	9/11/2018	Neo Wireless LLC
5	10,447,450	10/15/2019	Neo Wireless LLC

In the above—entitled case, the following patent(s)/ trademark(s) have been included:

DATE INCLUDED	INCLUDED BY ☐ Amendment ☐ Answer ☐ Cross Bill ☐ Other Pleading	
PATENT OR TRADEMARK NO.	DATE OF PATENT OR TRADEMARK	HOLDER OF PATENT OR TRADEMARK
1		
2		
3		
4		
5		

In the above—entitled case, the following decision has been rendered or judgement issued:

DECISION/JUDGEMENT

CLERK	(BY) DEPUTY CLERK	DATE

Copy 1—Upon initiation of action, mail this copy to Director Copy 3—Upon termination of action, mail this copy to Director
Copy 2—Upon filing document adding patent(s), mail this copy to Director Copy 4—Case file copy

AO 120 (Rev. 08/10)

TO:	Mail Stop 8 Director of the U.S. Patent and Trademark Office P.O. Box 1450 Alexandria, VA 22313-1450	REPORT ON THE FILING OR DETERMINATION OF AN ACTION REGARDING A PATENT OR TRADEMARK

In Compliance with 35 U.S.C. § 290 and/or 15 U.S.C. § 1116 you are hereby advised that a court action has been filed in the U.S. District Court Western District of Texas Waco Division on the following

☐ Trademarks or ☑ Patents. (☐ the patent action involves 35 U.S.C. § 292.):

DOCKET NO.	DATE FILED	U.S. DISTRICT COURT
6:21-cv-00025	4/28/2021	Western District of Texas Waco Division

PLAINTIFF	DEFENDANT
Neo Wireless LLC	LG Electronics Inc., LG Electronics U.S.A., Inc.

	PATENT OR TRADEMARK NO.	DATE OF PATENT OR TRADEMARK	HOLDER OF PATENT OR TRADEMARK
1	8,467,366	6/18/2013	Neo Wireless LLC
2	10,044,517	8/7/2018	Neo Wireless LLC
3	10,833,908	4/17/2018	Neo Wireless LLC
4	10,075,941	9/11/2018	Neo Wireless LLC
5	10,447,450	10/15/2019	Neo Wireless LLC

In the above—entitled case, the following patent(s)/ trademark(s) have been included:

DATE INCLUDED	INCLUDED BY ☐ Amendment ☐ Answer ☐ Cross Bill ☐ Other Pleading	
PATENT OR TRADEMARK NO.	DATE OF PATENT OR TRADEMARK	HOLDER OF PATENT OR TRADEMARK
1		
2		
3		
4		
5		

In the above—entitled case, the following decision has been rendered or judgement issued:

DECISION/JUDGEMENT

CLERK	(BY) DEPUTY CLERK	DATE

Copy 1—Upon initiation of action, mail this copy to Director Copy 3—Upon termination of action, mail this copy to Director
Copy 2—Upon filing document adding patent(s), mail this copy to Director Copy 4—Case file copy

Trials@uspto.gov
571-272-7822

Paper 12
Entered: March 14, 2022

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

DELL INC. and DELL TECHNOLOGIES INC.,
Petitioner,

v.

NEO WIRELESS LLC,
Patent Owner.

IPR2021-01468
Patent 10,075,941 B2

Before CHARLES J. BOUDREAU, MICHELLE N. ANKENBRAND, and MATTHEW S. MEYERS, *Administrative Patent Judges.*

MEYERS, *Administrative Patent Judge.*

DECISION
Denying Institution of *Inter Partes* Review
35 U.S.C. § 314

I. INTRODUCTION

A. Background and Summary

Dell Inc. and Dell Technologies, Inc. (collectively, "Petitioner") filed a Petition to institute an *inter partes* review of claims 1–14 (the "challenged claims") of U.S. Patent 10,075,941 B2 (Ex. 1001, the "'941 patent"). Paper 3 ("Petition" or "Pet."). Neo Wireless LLC ("Patent Owner") filed a Preliminary Response. Paper 9 ("Preliminary Response" or "Prelim. Resp.").

An *inter partes* review may not be instituted "unless . . . the information presented in the petition . . . shows that there is a reasonable likelihood that the petitioner would prevail with respect to at least 1 of the claims challenged in the petition." 35 U.S.C. § 314(a) (2018). We have authority, acting on the designation of the Director, to determine whether to institute an *inter partes* review under 35 U.S.C. § 314 and 37 C.F.R. § 42.4(a). Having considered the arguments and evidence presented by Petitioner and Patent Owner, we determine that Petitioner has not demonstrated a reasonable likelihood of prevailing on at least one of the challenged claims of the '941 patent. Accordingly, we do not institute an *inter partes* review of the challenged claims.

B. Real Parties in Interest

The parties identify themselves as the real parties in interest. Pet. 99; Paper 7, 1.

C. Related Proceedings

The parties identify, as matters involving or related to the '941 patent, *Neo Wireless LLC v. Dell Technologies Inc.*, Case No. 6:21-cv-0024 (W.D. Tex.) ("the parallel district court litigation"). Pet. 99; Paper 7, 1. Patent

Owner also identifies two former district court proceedings and two proceedings before the Board: IPR2021-01480 and IPR2021-01486. Paper 7, 1–2.

D. The '941 Patent

The '941 patent is titled "Methods and Apparatus for Multi-Carrier Communication Systems with Adaptive Transmission and Feedback." Ex. 1001, code (54). The '941 patent describes various methods to improve the performance of a wireless system, such as adaptive modulation and coding ("AMC"), channel estimation, transmission power control ("TPC"), and the adjustment of a subchannel configuration in accordance with the state of a communication channel. *Id.* at 1:34–48. The '941 patent, however, states that "[t]he subchannel configuration is normally defined and fixed in an operation, and it is usually not considered an adjustable function of the system to be adapted to the user profile and/or operational environment." *Id.* at 2:4–7.

The '941 patent describes a method for adaptive transmission of wireless communication signals in which modulation and coding scheme ("MCS"), coding rates, training pilot patterns, TPC levels, and subchannel configurations "are jointly adjusted to adapt to the channel conditions." Ex. 1001, 2:33–38. Figure 4 of the '941 patent is reproduced below.

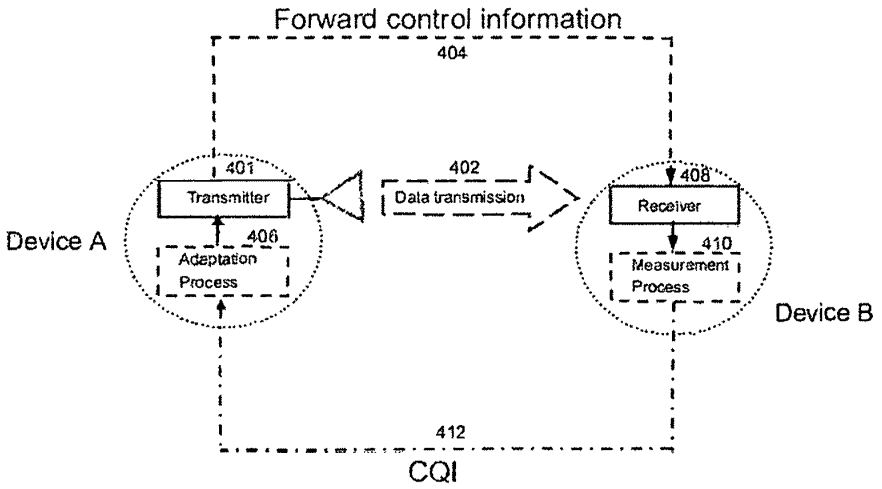

FIG. 4

Figure 4 shows an example of a control process between Device A and Device B. Ex. 1001, 2:17–18. Device A and Device B may be a base station and a mobile station that use adaptive transmission. *Id.* at 4:14–17. Specifically, based on output from adaptation process 406, Device A's transmitter 401 transmits data 402 and control information 404 to Device B. *Id.* at 4:17–19. Device B's receiver 408 receives data 402 and control information 404, whereas measurement process 410 measures channel conditions and feeds channel quality information ("CQI") 412 back to Device A. *Id.* at 4:20–24.

According to the'941 patent, "[t]he underlying principles of adaptive transmission and feedback are both to increase the degree of freedom of a transmission process and to supply information for the adaptation process of a communication system." Ex. 1001, 4:63–66. The '941 patent explains that when adaptive modulation, coding, training, and power control ("AMCTP") is used, a transmitter relies on CQI to select an appropriate AMCTP scheme for transmitting the next packet or retransmitting a

previously failed packet. *Id.* at 4:46–49. The '941 patent states that "[t]he adaptation process adjusts the allocated modulation schemes, coding rates, pilot patterns, power levels, spatial processing schemes, subchannel configurations, etc. in accordance with the transmission channel state and condition, for improving system performance and/or capacity." *Id.* at 3:66–4:4.

E. Illustrative Claim

Petitioner challenges claims 1–14 of the '941 patent. Pet. 2. Claims 1, 6, 8, and 13 are the independent challenged claims. Claim 1, reproduced below with Petitioner's bracketing, labels, and formatting, is representative.

> 1. [1pre-1] A link adaptation method by a base station serving a plurality of mobile stations in an Orthogonal Frequency Division Multiplexing (OFDM) communication system,
>
> [1pre-2] the communication system utilizing a transmission structure with time slots in the time domain and frequency subchannels in the frequency domain, the method comprising:
>
> [1a] transmitting a control message to a mobile station over a control channel,
>
> [1b] wherein:
>
> the control message contains transmission parameters allocated to the mobile station for a subsequent transmission of data by the base station over a frequency subchannel to the mobile station in a time slot; and
>
> [1c] the mobile station-specific transmission parameters indicate an antenna transmission scheme and a corresponding subchannel configuration,
>
> [1c-1] the antenna transmission scheme comprising a transmission diversity scheme or a multiple-input multiple-output (MIMO) scheme and
>
> [1c-2] the corresponding subchannel configuration characterized by distributed subcarriers or localized subcarriers in the frequency domain; and

> [1d] transmitting a data packet to the mobile station over the frequency subchannel in accordance with the mobile station-specific transmission parameters.

Ex. 1001, 9:5–31; Pet iv.

F. Prior Art and Asserted Grounds

Petitioner asserts that claims 1–14 of the '941 patent are unpatentable on the following grounds:

Claims Challenged	35 U.S.C. §	References
1–14	103(a)[1]	Walton '269,[2] Li[3]
2, 9	103(a)	Walton '269, Li, Gupta[4]
1, 3–8, 10–14	103(a)	PCT819,[5] Airy[6]

Petitioner also relies on the Declaration of Dr. Zhi Ding (Ex. 1003, "the Ding Declaration") in support of its arguments. Patent Owner relies on the Declaration of William P. Alberth Jr. (Ex. 2001, "the Alberth Declaration") in support of its arguments.

II. ANALYSIS

A. Legal Standards

"In an [*inter partes* review], the petitioner has the burden from the onset to show with particularity why the patent it challenges is unpatentable." *Harmonic Inc. v. Avid Tech., Inc.*, 815 F.3d 1356, 1363 (Fed.

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[1] The Leahy-Smith America Invents Act, Pub. L. No. 112-29, 125 Stat. 284 (2011) ("AIA"), amended 35 U.S.C. § 103. Because the '941 patent is alleged to have an effective filing date before the effective date of the applicable AIA amendments, we refer to the pre-AIA version of 35 U.S.C. § 103.
[2] US 9,473,269 B2, issued Oct. 18, 2016 (Ex. 1006, "Walton '269").
[3] US 6,947,748 B2, issued Sept. 20, 2005 (Ex. 1007, "Li").
[4] US 2004/0165683 A1, published Aug. 26, 2004 (Ex. 1008, "Gupta").
[5] WO 02/093819 A1, published Nov. 21, 2002 (Ex. 1009, "PCT819").
[6] US 6,400,699 B1, issued June 4, 2002 (Ex. 1010, "Airy").

Cir. 2016) (citing 35 U.S.C. § 312(a)(3) (2012) (requiring *inter partes* review petitions to identify "with particularity . . . the evidence that supports the grounds for the challenge to each claim")). This burden of persuasion never shifts to the patent owner. *See Dynamic Drinkware, LLC v. Nat'l Graphics*, Inc., 800 F.3d 1375, 1378 (Fed. Cir. 2015) (discussing the burden of proof in *inter partes* review).

A claim is unpatentable for obviousness if, to one of ordinary skill in the pertinent art, "the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made." *KSR Int'l Co. v. Teleflex Inc.*, 550 U.S. 398, 406 (2007) (quoting 35 U.S.C. § 103(a)). The question of obviousness is resolved on the basis of underlying factual determinations, including "the scope and content of the prior art"; "differences between the prior art and the claims at issue"; and "the level of ordinary skill in the pertinent art."[7] *Graham v. John Deere Co.*, 383 U.S. 1, 17–18 (1966).

A patent claim "is not proved obvious merely by demonstrating that each of its elements was, independently, known in the prior art." *KSR*, 550 U.S. at 418. An obviousness determination requires finding "both 'that a skilled artisan would have been motivated to combine the teachings of the prior art references to achieve the claimed invention, and that the skilled

[7] Additionally, secondary considerations, such as "commercial success, long felt but unsolved needs, failure of others, etc., might be utilized to give light to the circumstances surrounding the origin of the subject matter sought to be patented. As indicia of obviousness or nonobviousness, these inquiries may have relevancy." *Graham*, 383 U.S. at 17–18. Neither party, however, has presented any such evidence for us to consider.

artisan would have had a reasonable expectation of success in doing so.'" *Intelligent Bio-Sys., Inc. v. Illumina Cambridge Ltd.*, 821 F.3d 1359, 1367–68 (Fed. Cir. 2016) (citation omitted); *see KSR*, 550 U.S. at 418 (for an obviousness analysis, "it can be important to identify a reason that would have prompted a person of ordinary skill in the relevant field to combine the elements in the way the claimed new invention does").

"Although the *KSR* test is flexible, the Board 'must still be careful not to allow hindsight reconstruction of references . . . without any explanation as to *how* or *why* the references would be combined to produce the claimed invention.'" *TriVascular, Inc. v. Samuels*, 812 F.3d 1056, 1066 (Fed. Cir. 2016) (citation omitted). Further, an assertion of obviousness "cannot be sustained by mere conclusory statements; instead, there must be some articulated reasoning with some rational underpinning to support the legal conclusion of obviousness." *KSR*, 550 U.S. at 418 (quoting *In re Kahn*, 441 F.3d 977, 988 (Fed. Cir. 2006)); accord *In re NuVasive, Inc.*, 842 F.3d 1376, 1383 (Fed. Cir. 2016) (stating that "'conclusory statements'" amount to an "insufficient articulation[] of motivation to combine"; "instead, the finding must be supported by a 'reasoned explanation'" (citation omitted)); *In re Magnum Oil Tools Int'l, Ltd.*, 829 F.3d 1364, 1380 (Fed. Cir. 2016) ("To satisfy its burden of proving obviousness, a petitioner cannot employ mere conclusory statements. The petitioner must instead articulate specific reasoning, based on evidence of record, to support the legal conclusion of obviousness.").

We analyze the challenges presented in the Petition in accordance with the above-stated principles.

B. Level of Ordinary Skill in the Art

In determining the level of ordinary skill in the art, various factors may be considered, including the "type of problems encountered in the art; prior art solutions to those problems; rapidity with which innovations are made; sophistication of the technology; and educational level of active workers in the field." *In re GPAC Inc.*, 57 F.3d 1573, 1579 (Fed. Cir. 1995) (internal quotation marks and citation omitted).

Petitioner asserts that at the time of the invention a person of ordinary skill in the art ("POSITA") "would have had at least a Bachelor's degree in an academic area emphasizing electrical engineering or a similar discipline, and at least two years of experience in the field working with, teaching, or researching wireless communication networks" and that "[s]uperior education could compensate for a deficiency in work experience, and *vice-versa*." Pet. 5 (citing Ex. 1003 ¶¶ 32–33).

Patent Owner does not provide its own assessment regarding the level of skill in the art, or otherwise dispute Petitioner's assertion. *See generally* Prelim. Resp.; *see also* Ex. 2001 ¶ 23 (Patent Owner's expert "accept[s] Dr. Ding's proposed qualifications of a POSITA.").

Based on our review of the record at this stage, we find that Petitioner's proposal is consistent with the level of skill reflected in the prior art references of record. *See Daiichi Sankyo Co. v. Apotex, Inc.*, 501 F.3d 1254, 1256 (Fed. Cir. 2007) (listing the type of problems encountered in the art, prior art solutions to those problems, and the sophistication of the technology as factors that may be considered in determining the level of ordinary skill in the art). The prior art itself may be sufficient to demonstrate the level of skill in the art at the time of the invention. *See*

Okajima v. Bourdeau, 261 F.3d 1350, 1355 (Fed. Cir. 2001) (explaining that specific findings regarding ordinary skill level are not required "where the prior art itself reflects an appropriate level and a need for testimony is not shown") (quoting *Litton Indus. Prods., Inc. v. Solid State Sys. Corp.*, 755 F.2d 158, 163 (Fed. Cir. 1985)).

Accordingly, for purposes of this decision, we adopt Petitioner's definition of the person of ordinary skill in the art.

C. Claim Construction

In an *inter partes* review proceeding for a petition filed on or after November 13, 2018, a patent claim shall be construed using the same claim construction standard that would be used to construe the claim in a civil action under 35 U.S.C. § 282(b). 37 C.F.R. § 42.100(b).[8] This rule adopts the same claim construction standard used by Article III federal courts, which follow *Phillips v. AWH Corp.*, 415 F.3d 1303 (Fed. Cir. 2005) (en banc), and its progeny.

Under that standard, the words of a claim are generally given their "ordinary and customary meaning," which is the meaning the term would have to a person of ordinary skill at the time of the invention, in the context of the entire patent including the specification. *See Phillips*, 415 F.3d at 1312–13. "In determining the meaning of the disputed claim limitation, we look principally to the intrinsic evidence of record, examining the claim language itself, the written description, and the prosecution history, if in evidence." *DePuy Spine, Inc. v. Medtronic Sofamor Danek, Inc.*, 469 F.3d 1005, 1014 (Fed. Cir. 2006) (citing *Phillips*, 415 F.3d at 1312–17).

---

[8] The Petition in this case was accorded a filing date of September 15, 2021. *See* Paper 4, 1.

Petitioner submits that "[n]o formal claim constructions are necessary because 'claim terms need only be construed to the extent necessary to resolve the controversy.'" Pet. 5 (citing *Wellman, Inc. v. Eastman Chem. Co.*, 642 F.3d 1355, 1361 (Fed. Cir. 2011)).

Patent Owner responds that in the parallel district court litigation, it has asserted that the limitation "'the mobile station-specific transmission parameters indicate . . . a corresponding subchannel configuration . . . the corresponding subchannel configuration characterized by distributed subcarriers or localized subcarriers in the frequency domain' is entitled to its plain and ordinary meaning." Prelim. Resp. 2 (citing Ex. 2014, 23–25).[9] In this proceeding, however, other than asserting that it "applies that plain and ordinary meaning" to this limitation in its Preliminary Response (*id.*), Patent Owner provides little explanation with respect to its application. Thus, we address the meaning of the argued limitation below.

In doing so, we find it useful to first review the parties' arguments in the parallel district court litigation (Exs. 2011, 2014, 2015, 2016) for context before considering the argued limitation's meaning based on the language of the claim, the written description (Ex. 1001), and the prosecution history (Ex. 1002). *See Phillips*, 415 F.3d at 1319 ("[E]xtrinsic evidence may be useful to the court, but it is unlikely to result in a reliable interpretation of patent claim scope unless considered in the context of the intrinsic evidence.").

[9] Patent Owner also points out that the parties have agreed upon a meaning for limitations [1c] and [1c-1] in the parallel district court litigation that we need not reach in this decision. Prelim. Resp. 1–2.

In the parallel district court litigation, Petitioner contends that the argued limitation should be construed to mean "[t]he mobile station-specific transmission parameters indicate whether the subchannels are either distributed subcarriers, or localized subcarriers in the frequency domain." Ex. 2011, 16. In contrast, Patent Owner takes the position that this limitation "need not be construed and instead should be given its plain and ordinary meaning." Ex. 2014, 23. Patent Owner argues that Petitioner's interpretation adds additional limitations beyond the scope of what would be considered the plain and ordinary meaning of the limitation. Ex. 2014, 23. According to Patent Owner, the limitation at issue "does not require the mobile station-specific transmission parameters to include a specific, separate parameter whose only purpose is to disclose whether the subchannels are either distributed or localized subcarriers in the frequency domain." *Id.* Rather, Patent Owner asserts that "[t]he plain and ordinary meaning only requires mobile station-specific transmission parameters that indicate a corresponding subchannel configuration that is *characterized* by distributed subcarriers or localized subcarriers in the frequency domain." *Id.* Patent Owner "does not dispute that the claim requires the parameters be capable of indicating (alternatively) both a distributed and localized subcarrier configuration" (*id.*), but reasons that there is no need to indicate a type of subchannel configuration because "[a] subchannel configuration can be 'characterized by distributed or localized subcarriers' merely by employing either of those configurations." *Id.*

Petitioner responds first by pointing out that Patent Owner "admits that 'the claim requires the parameters be capable of indicating (alternatively) both a distributed and localized subcarrier configuration.'"

Ex. 2016, 13 (citing Ex. 2014, 23). Petitioner then argues that the "only dispute remaining is whether the transmission parameters must affirmatively indicate this feature," and takes the position that the prosecution history of the '941 patent supports an interpretation that the argued limitation "requires an affirmative indication of whether the subcarriers are distributed or localized." *Id.*

To support its position, Petitioner directs our attention to the '941 patent's prosecution history, where Applicant argued, to overcome the prior art of record,[10] "that the claims had been amended to indicate that [the] system transmitted subchannel information 'including **whether** the subchannels are "distributed subcarriers or localized subcarriers in the frequency domain."'" Ex. 2016, 13 (quoting Ex. 1002, 49). Petitioner, thus, concludes that "[b]y confirming that the transmitted information must include **whether** the subchannels are distributed or localized, the applicant represented that there must be something in the information affirmatively indicating this feature." *Id.* at 14.

Having considered the parties' arguments in the parallel district court litigation, we now turn to the intrinsic evidence of the '941 patent. *Sunovion Pharm., Inc. v. Teva Pharm. USA, Inc.*, 731 F.3d 1271, 1276 (Fed. Cir. 2013) ("When construing claim terms, we first look to, and primarily rely on, the intrinsic evidence, including the claims themselves, the specification, and the prosecution history of the patent, which is usually dispositive.").

We begin our analysis by considering the language of claim 1 as a whole. *See Brookhill-Wilk 1, LLC. v. Intuitive Surgical, Inc.*, 334 F.3d 1294, 1299 (Fed. Cir. 2003) ("While certain terms may be at the center of the

[10] US 7,436,757 B1, issued Oct. 14, 2008 ("Wilson").

claim construction debate, the context of the surrounding words of the claim also must be considered in determining the ordinary and customary meaning of those terms."). Claim 1 first recites the transmission of "a control message to a mobile station over a control channel" that "contains transmission parameters allocated to the mobile station for a subsequent transmission of data by the base station over a frequency subchannel to the mobile station in a time slot." Ex. 1001, 9:11–19 (Limitations [1a], [1b]). Claim 1 further recites that "the mobile station-specific transmission parameters indicate an antenna transmission scheme and a corresponding subchannel configuration," and identifies, *inter alia*, that "the corresponding subchannel configuration [is] characterized by distributed subcarriers or localized subcarriers in the frequency domain." *Id.* at 9:20–22, 9:25–27 (Limitations [1c], [1c-2]).

This language specifies that a "control message" that contains "transmission parameters" for "a subsequent transmission of data" is sent to a mobile station. This language further specifies that these "transmission parameters" are first transmitted to "indicate an antenna transmission scheme and a corresponding subchannel configuration." This language still further specifies that "the corresponding subchannel configuration [is] characterized by distributed subcarriers or localized subcarriers in the frequency domain." Thus, claim 1 explicitly recites the transmission of a control message that includes "transmission parameters" that "indicate . . . a corresponding subchannel configuration . . . characterized by distributed subcarriers or localized subcarriers in the frequency domain."

Turning to the Specification, the '941 patent states:

> Given the fact that different configurations of subchannel compositions are suitable for different scenarios or user profiles,

> subchannel configuration is included in the transmission adaptation process. In one embodiment, the subchannel configuration information is broadcast on the common forward control channel to all users such that each user is informed of its subchannel configuration.

Ex. 1001, 7:10–16; *see also id.* at 7:17–18 ("In another embodiment, the subchannel configuration is adjusted according to deployment scenarios."). Thus, the '941 patent describes that during its link adaptation process, a "subchannel configuration is included in the transmission adaptation process" to inform each user of the subchannel configuration, i.e., "distributed subcarriers or localized subcarriers," for a subsequent transmission of data in order for the system to adapt to different scenarios or user profiles.

Based on the language of claim 1 when viewed in the context of the '941 patent's Specification, we understand the argued limitation to require that the mobile station-specific transmission parameters contained in the control message would indicate[11] "a corresponding subchannel configuration," and as such, would indicate whether the subchannel configuration for a subsequent transmission is either "characterized by distributed subcarriers or localized subcarriers in the frequency domain."

We recognize that this understanding is similar to the construction that Petitioner advocates for in the parallel district court litigation. Ex. 2011, 16. However, we find this understanding to be supported by the language of claim 1 and consistent with the Specification of the '941 patent.

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[11] We note that a meaning of the term "indicate" is "to state or express briefly" (https://www.merriam-webster.com/dictionary/indicate).

In the parallel district court litigation, Patent Owner argues that such an interpretation "adds additional limitations beyond the scope of what would be considered the plain and ordinary meaning of the limitation." Ex. 2014, 23. According to Patent Owner, the limitation at issue "does not require the mobile station-specific transmission parameters to include a specific, separate parameter whose only purpose is to disclose whether the subchannels are either distributed or localized subcarriers in the frequency domain. *Id.* Rather, Patent Owner asserts that "[t]he plain and ordinary meaning only requires mobile station-specific transmission parameters that indicate a corresponding subchannel configuration that is *characterized* by distributed subcarriers or localized subcarriers in the frequency domain." *Id.*

At least one difficulty with Patent Owner's arguments is that they appear to be inconsistent with the language of claim 1 and the '941 patent's Specification. Patent Owner asserts that clam 1 does not require a limitation that "include[s] a specific, separate parameter whose only purpose is to disclose whether the subchannels are either distributed or localized subcarriers in the frequency domain." Ex. 2014, 23. However, as discussed above, claim 1 explicitly recites the transmission of a control message that includes "transmission parameters" that "indicate . . . a corresponding subchannel configuration . . . characterized by distributed subcarriers or localized subcarriers in the frequency domain." Thus, we find the argued limitation does require some affirmative indication, i.e., a mobile station-specific transmission parameter, that would at least "indicate . . . a corresponding subchannel configuration characterized by distributed subcarriers or localized subcarriers in the frequency domain" for a subsequent transmission from a base station to a mobile station.

Patent Owner's arguments also appear to be inconsistent with arguments made during the '941 patent's prosecution history. *See, e.g.*, Ex. 1002, 49. As briefly summarized above, to overcome Wilson, Applicant argued that Applicant's claims, as newly amended at that time, were different from Wilson because they were amended "to ***indicate*** that applicant's system transmits subchannel configuration information, including ***whether*** the subchannels are 'distributed subcarriers or localized subcarriers in the frequency domain.'" Ex. 1002, 49 (emphases added).[12] Applicant asserted that "such configuration information might be useful when assigning subchannels to users moving at different speeds." *Id.* Applicant also distinguished Wilson from the newly amended claims explaining that "Wilson is silent as to the transmission of subchannel information as defined by the applicant." *Id.* The Examiner, apparently finding these arguments persuasive, allowed the claims thereafter. *Id.* at 33.

Having reviewed the '941 patent's prosecution history, we find the intrinsic evidence suggests clearly that the claims were amended "to ***indicate*** that applicant's system transmits subchannel configuration information, including ***whether*** the subchannels are 'distributed subcarriers or localized subcarriers in the frequency domain.'" Ex. 1002, 49 (emphases added). Applicant further argued that "such configuration information might be useful when assigning subchannels to users moving at different speeds." *Id.*

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[12] Applicant further distinguished Wilson, from the newly amended claims, by asserting that "Wilson specifically limits its teaching to a MIMO system." Ex. 1002, 49. Applicant argued that "[b]y being exclusively directed to a MIMO system, Wilson has no need to transmit an antenna transmission scheme, and therefore fails to either disclose or suggest the use of the antenna transmission scheme as claimed by applicant." *Id.*

Thus, we find the '941 patent's prosecution history also supports the understanding that the mobile station-specific transmission parameter would affirmatively "indicate . . . a corresponding subchannel configuration characterized by distributed subcarriers or localized subcarriers in the frequency domain" for a subsequent transmission from a base station to a mobile station.

Patent Owner also argues in the parallel district court litigation that use of the transitional term "characterized by" suggests that the claim does not "require the subchannel configuration to explicitly include a 'localized' or 'distributed' indicator" (Ex. 2014, 24) because the subchannel configuration "could be determined based on the subchannel configuration itself (e.g., based on the allocation of resources across the subchannel)." *Id.* at 24–25. However, we need not reach this issue here in order to resolve the issue of whether to institute an *inter partes* review.

In the parallel district court litigation, the parties agree that "the claim requires the [mobile station-specific transmission] parameters be capable of indicating (alternatively) both a distributed and localized subcarrier configuration." Ex. 2014, 23; Ex. 2016, 13. We find this understanding to be consistent with the language of the claim and supported by the '941 patent's Specification. Because construing the argued limitation to require that the mobile station-specific transmission "parameters be capable of indicating (alternatively) both a distributed and localized subcarrier configuration" is sufficient to resolve the issue of whether to institute an *inter partes* review, we decline to speculate on whether the argued limitation "require[s] the subchannel configuration to explicitly include a 'localized' or 'distributed' indicator" or could simply be satisfied "based on the

subchannel configuration itself (e.g., based on the allocation of resources [sent] across the subchannel)." Ex. 2014, 24–25.

Therefore, while we do not provide an explicit construction of "the mobile station-specific transmission parameters indicate . . . a corresponding subchannel configuration . . . the corresponding subchannel configuration characterized by distributed subcarriers or localized subcarriers in the frequency domain," we determine that the correct construction requires, at a minimum, that the mobile station-specific transmission parameters are capable of indicating, as alternatives, both distributed subcarriers and localized subcarriers in the frequency domain as subchannel configurations. Independent claims 6, 8, and 13 include similar limitations. *See* Ex. 1001, 9:61–63, 10:23–25, 10:61–63.

We determine that no other terms require explicit construction to reach a decision on institution. *See Nidec Motor Corp. v. Zhongshan Broad Ocean Motor Co.*, 868 F.3d 1013, 1017 (Fed. Cir. 2017) (per curiam) (claim terms need to be construed "only to the extent necessary to resolve the controversy" (quoting *Vivid Techs., Inc. v. Am. Sci. & Eng'g, Inc.*, 200 F.3d 795, 803 (Fed. Cir. 1999))).

D. Alleged Obviousness over Walton '269 and Li

Petitioner asserts that claims 1–14 are unpatentable as obvious over Walton '269 and Li. Pet. 9–53. Petitioner also relies on the testimony of Dr. Ding to support its arguments. *Id.* (citing Ex. 1003). Patent Owner responds to Petitioner's assertions. Prelim. Resp. 3–21.

1. Overview of Walton '269 (Ex. 1006)

Walton '269 is titled "Method and Apparatus for Providing an Efficient Control Channel Structure in a Wireless Communication System."

Ex. 1006, code (54). Walton '269 relates "to a method and apparatus for providing an efficient control channel structure in a wireless local area network (WLAN) communication system." *Id.* at 1:10–13.

Figure 1 of Walton '269 is reproduced below.

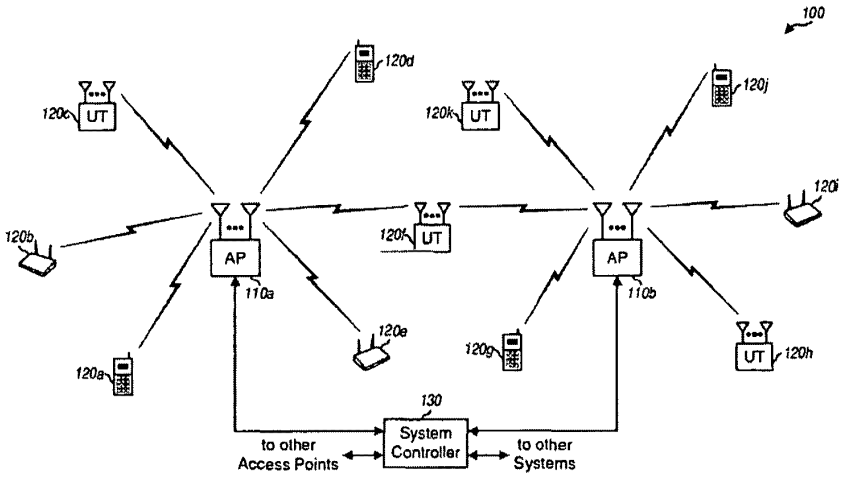

FIG. 1

Walton '269 depicts MIMO WLAN system 100 in Figure 1 includes access points 110a, 110b that support communication for user terminals 120a–120k. Ex. 1006, 3:24–28, 3:44–46. System 100 further includes system controller 130 that couples to access points 110a, 110b and may further couple to other systems and networks, such as "to a packet data network (PDN), a wired local area network (LAN), a wide area network (WAN), the Internet, a public switched telephone network (PSTN), a cellular communication network, etc." *Id.* at 3:60–66.

Walton '269 describes the use of various transmission modes for the system and the use of orthogonal frequency division multiplexing ("OFDM") to partition system bandwidth into orthogonal subbands. Ex. 1006, 4:56–5:9, 5:33–35. Walton '269 further describes the estimation of a downlink to obtain channel state information ("CSI"). *Id.* at 8:14–16.

Walton '269 explains that a system controller can receive CSI and packet/frame status to determine feedback information that is to be sent to an access point. *Id.* at 8:19–22. According to Walton '269, the feedback information is used "to perform a number of functions such as (1) selecting a set of user terminals for data transmission on the downlink and uplink, (2) selecting the transmission rate(s) and the transmission mode for each selected user terminal, and (3) assigning the available FCH/RCH resources to the selected terminals." *Id.* at 8:35–41.

Walton '269 describes an embodiment of a WLAN system that uses a channel structure, which further includes transport channels, designed to support efficient downlink and uplink transmissions. Ex. 1006, 2:8–16. Walton '269 explains that "[v]arious attributes of these transport channels may be configurable, which allows the system to easily adapt to changing channel and loading conditions." *Id.* at 2:16–19. For instance, Walton '269 describes using the forward control channel ("FCCH") by an "access point to allocate resources (e.g., channel assignments) on the downlink and uplink." *Id.* at 2:19–22.

2. Overview of Li (Ex. 1007)

Li is titled "OFDMA With Adaptive Subcarrier-Cluster Configuration and Selective Loading." Ex. 1007, code (54). Li "relates to multi-cell, multi-subscriber wireless systems using orthogonal frequency division multiplexing (OFDM)." *Id.* at 1:8–10. Li describes the phenomenon of frequency-selective fading, which causes different gains for different subcarriers. *Id.* at 1:43–44. Li explains that subcarriers can be allocated so each subscriber enjoys a high channel gain. *Id.* at 1:48–50. However, Li also explains that another problem, intercell interference, arises when the

same spectrum is used for multiple neighboring cells. *Id.* at 1:57–60. Li states that "it is advantageous to adaptively allocate the subcarriers so as to mitigate the effect of intercell interference." *Id.* at 1:60–63. Li describes one approach for subcarrier allocation is a joint optimization operation but that requires activity and channel knowledge of all subscribers in all cells, as well as frequent rescheduling every time a subscriber is dropped off the network or a new subscriber is added. *Id.* at 1:64–2:2.

Li describes a method for subcarrier selection that uses "a subscriber measuring channel and interference information for subcarriers based on pilot symbols received from a base station." Ex. 1007, 2:9–15. The method includes a "subscriber selecting a set of candidate subcarriers, providing feedback information on the set of candidate subcarriers to the base station, and receiving an indication of subcarriers of the set of subcarriers selected by the base station for use by the subscriber." *Id.* at 2:15–19.

Li further describes two categories of subcarrier clusters. These categories are depicted in Figure 9, which is reproduced below.

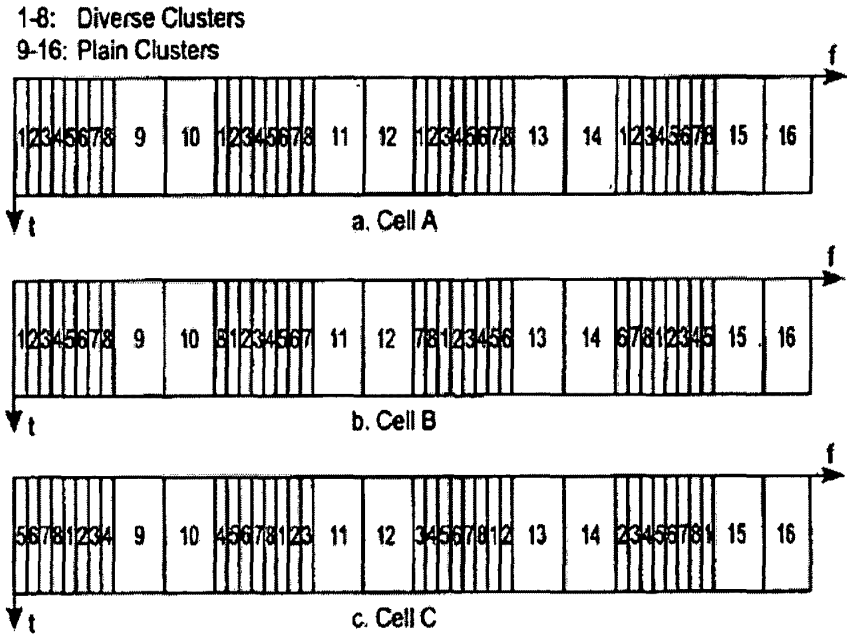

FIG. 9

Li explains that coherence clusters contain "multiple subcarriers close to each other." Ex. 1007, 14:17–18. Li explains that clusters 9–16 in Figure 9 are coherence clusters and frequencies having the same number in a cell (e.g., 9) are in the same coherence cluster. *Id.* at 14:36–37, 14:40–41. Conversely, Li describes diversity clusters as "containing multiple subcarriers with at least some of the subcarriers spread far apart over the spectrum." *Id.* at 14:18–20. Clusters 1–8 in Figure are diversity clusters and frequencies labeled the same number in a cell (e.g., 1) are part of one diversity cluster and frequencies labeled with a different number (e.g., 2) are part of another diversity cluster. *Id.* at 14:35–39.

Li states that "[t]he diversity clusters can be configured differently for different cells to reduce the effect of inter-cell interference through interference averaging." Ex. 1007, 14:42–44. For instance, Li explains that

the cluster configuration shown in Figure 9 results in the interference due to Cell A's cluster 1 being distributed to Cell B's clusters 1, 8, 7, and 6, which reduces the interference to any particular cluster in Cell B. *Id.* at 14:45–50.

3. Analysis of Claim 1

Petitioner asserts claim 1 would have been obvious over Walton '269 and Li. Pet. 20–39. We use Petitioner's notations to identify the claim elements, and focus on the dispositive claim limitation.

a) [1c-2] the corresponding subchannel configuration characterized by distributed subcarriers or localized subcarriers in the frequency domain; and

(1) Petitioner's Contentions

Petitioner asserts that the combination of Walton '269 and Li teaches the subject matter of limitation [1c-2]. Pet. 35–37. More particularly, Petitioner asserts that "Walton '269 teaches that the frequency ***channels have subbands*** and that 'each subband is associated with a ***respective subcarrier*** that may be modulated with data. For a MIMO system that utilizes OFDM, each spatial channel of each subband may be viewed as an independent transmission channel.'" *Id.* at 35 (quoting Ex. 1006, 5:32–43).

With regard to subchannel configurations being characterized by distributed subcarriers or localized subcarriers in the frequency domain, Petitioner contends that Li discloses the use of a cluster of subcarriers in the frequency domain. Pet. 36 (citing Ex. 1007, 5:9–19, Fig. 1A). Petitioner argues that Li discloses the use of "coherence clusters, which contain 'multiple subcarriers close to each other' and would have been understood by a POSITA to be '***localized subcarriers in the frequency domain***.'" *Id.* (citing Ex. 1007, 14:14–30; Ex. 1003 ¶¶ 126–127). Petitioner also contends that Li teaches the use of "diversity clusters, which contain 'multiple

subcarriers with at least some of the subcarriers spread far apart over the spectrum' and would have been understood by a POSITA to be '***distributed subcarriers.***'" *Id.* (citing Ex. 1007, 14:14–30; Ex. 1003 ¶¶ 126–127). Petitioner further asserts that Li's Figure 9 depicts diversity and coherence clusters. *Id.* at 36–37 (citing Ex. 1007, 14:31–44, Fig. 9; Ex. 1003 ¶ 127).

With regard to combining Walton '269 and Li, Petitioner contends that "Walton '269 discloses a system in which a base station serves a plurality of cells associated with mobile stations." Pet. 18 (citing Ex. 1006, 2:64–65, 3:24–58, Fig. 1). Petitioner argues that "Li is directed to avoiding issues arising from a base station that serves multiple cells." *Id.* (citing Ex. 1007, 1:15–63). According to Petitioner, "[i]t would have been obvious for a POSITA to combine the teachings of Walton '269 with the teaching of Li to enable Walton '269's system to avoid intercell interference and benefit from higher channel gain." *Id.* (citing Ex. 1003 ¶ 71). In an example of such a combination, Petitioner asserts that "coherence clusters may be used when a mobile station is mobile or is not in a fixed position close to the edge of a cell" and "[w]hen neither of these conditions is present, the base stations selects diversity clusters." *Id.* at 19 (citing Ex. 1007, 16:8–19, Fig. 11). Petitioner argues that "[d]iversity clusters are also desirable to reduce inter-cell interference through interference averaging." *Id.* at 19 (citing Ex. 1007, 14:42–44, 5:53–64; Ex. 1003 ¶ 71).

Petitioner further contends that it would have been obvious to one of ordinary skill in the art to configure Walton '269's frequency subbands in accordance with Li's diversity clusters or coherence clusters. Pet. 37 (citing Ex. 1006, 5:32–43; Ex. 1007, 14:14–44, Fig. 9; Ex. 1003 ¶ 128). Petitioner asserts that "[b]ecause of frequency-selective fading, uneven gains across

subcarriers, and uncorrelated channels and subscribers, Li explains that 'it is advantageous in an OFDMA system to adaptively allocate the subcarriers to subscribers so that each subscriber enjoys a high channel gain.'" *Id.* at 35 (citing Ex. 1007, 1:48–50). According to Petitioner, the combination of Walton '269 and Li

> would have merely involved combining prior art elements (e.g., Li's subchannel configuration of diversity clusters and coherence clusters with Walton '269's system) according to known methods (Li's subcarrier allocation method) to yield predictable and foreseeable results and would have been an application of a known technique to a known system (Walton '269's system) ready for improvement (e.g., less intercell interference, higher channel gain).

Id. at 19–20 (citing Ex. 1003 ¶ 72).

(2) Patent Owner's Contentions

Patent Owner contends that Petitioner's ground of unpatentability based on Walton '269 and Li is deficient. *See* Prelim. Resp. 3–21. Patent Owner asserts that the Petition fails to show a rationale to combine Walton '269 and Li "because the purported rationale to combine is premised on an assumption that the POSITA would have been motivated to avoid intercell interference in Walton-'269." Prelim. Resp. 3. Patent Owner contends there is no basis for this because the Petition does not establish that Walton '269 discloses any interfering cells. *Id.* at 3–4. More particularly, Patent Owner argues that Petitioner's rationale is founded on an assumption that Walton '269 teaches cells that may interfere with each other, but Petitioner has not shown that Walton '269 discloses cells. *Id.* at 5; *cf.* Pet. 18 (citing Ex. 1006, 2:64–65, 3:24–58, Fig. 1) ("Walton '269 discloses a system in which a base station serves a plurality of cells associated with mobile stations."). Patent Owner explains that Petitioner's citations to Walton '269 do not "support

even a preliminary finding that Walton-'269 teaches cells interfering with each other" because they do not mention cells. *Id.* at 5–6 (citing Ex. 1006, 2:64–64, 3:23–58, Fig. 1). Patent Owner concedes that Walton '269 mentions cells once, but only to teach that they are part of other systems that may couple to Walton '269's system, which demonstrates that the latter is not a network of cells. *Id.* at 6–7 (citing Ex. 1006, 3:60–66, Fig. 1).

According to Patent Owner, a "POSITA would have understood that Walton-'269 does not teach base stations serving any cells because, as Petitioner repeatedly admits, Walton-'269 teaches a WLAN system." Prelim. Resp. 9 (citing Pet. 9–11, 20–22, 30–31, 49). Relying on the declaration testimony of its expert, Patent Owner explains that WLAN is known colloquially as "WiFi" and "WiFi networks like those in Walton-'269, and indeed WLAN systems in general, do not have 'cells' like those discussed in Li, and so do not suffer from the 'intercell' interference problems discussed in Li." *Id.* at 9 (citing Ex. 1006 1:25–29, 5:51–56; Ex. 2001 ¶ 26).

Patent Owner contends that Walton '269's WLAN "does not have or support frequency subchannels like those in Li," and adding Li's frequency subchannels to Walton '269 "would require reengineering Walton-'269's entire frequency grouping structure, along with its control mechanisms, *and* losing compatibility with 802.11, for no clear reason other than to attempt using hindsight to recreate the claims." Prelim. Resp. 19 (citing Ex. 2001 ¶ 31). Patent Owner also asserts:

> Walton-'269's WiFi system does not share the same concerns as Li's cellular system. Li teaches that in a cellular system, there are fast-moving "mobile subscribers" that rapidly travel within a cell and between cells, e.g., in a car. And there are "fixed subscribers," some close to the base station and some at the cell

> boundaries. Ex. 1007 [Li] 15:52–59. The "subscriber and the base station intelligently selects diversity clusters to mobile subscribers or fixed subscribers at cell boundaries, and coherence clusters to fixed subscribers close to the base station." *Id.* WiFi networks don't have this mix of users. Most devices in a WLAN/WiFi network are slow moving or stationary and, in any event, stay within the coverage area of the access point. Ex. 2001 [Alberth Decl.] ¶¶ 32–33. Fast-moving users, in a WiFi network like that in Walton-'269, are generally an aberration. *Id.* Essentially, these devices are all fixed or nearly all fixed subscribers close to the "base station." *Id.* ¶ 33.

Id. at 19–20.

Patent Owner argues that Dr. Ding's testimony repeats the same allegation that Walton '269 serves a plurality of cells, but does not provide any additional basis for this allegation because "[i]t simply repeats the same statement as the attorney argument." Prelim. Resp. 7 (citing Ex. 1003 ¶ 71).

b) Discussion

Having considered the conflicting positions of the parties, we conclude that Petitioner has not shown a reasonable likelihood that it would prevail in challenging the patentability of independent claim 1. Instead, we agree with Patent Owner that Petitioner has not adequately established a rationale to combine Walton '269 and Li, as proposed.

Petitioner's analysis for the combination of Walton '269 and Li begins with the contention that "Walton '269 discloses a system in which a base station serves a plurality of *cells* associated with mobile stations." Pet. 18 (citing Ex. 1006, 2:64–65, 3:24–58, Fig. 1) (emphasis added). As Petitioner states, Walton '269 discloses a MIMO-WLAN system, an example of which is depicted in Walton '269's Figure 1. Pet. 10–11; Ex. 1006, 2:64–65. Figure 1 is reproduced below.

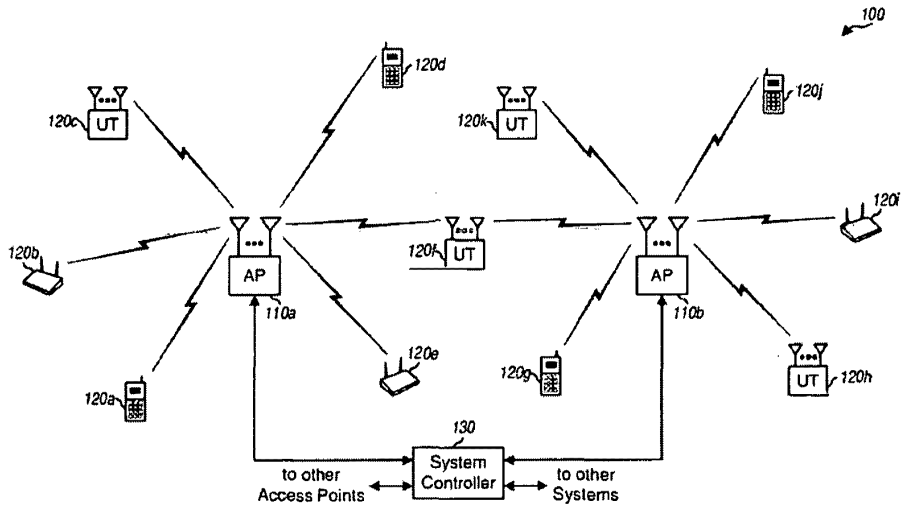

FIG. 1

Walton '269's MIMO WLAN system 100 includes access points 110a, 110b that support communication for user terminals 120a–120k. Ex. 1006, 3:25–28, 3:44–46. To the extent Petitioner asserts that access points 110a, 110b create cells that could interfere with one another, Petitioner has not explained adequately why access points 110a, 110b do so but instead provides only conclusory assertions. *See* Pet. 21 (citing Ex. 1006, 1:25–35) ("The base stations 110a, 110b serve the plurality of mobile stations 120a-120k at least because they 'act like hubs and/or routers and provide connectivity for' the mobile stations 120a-120k and may also allow the mobile stations 120a-120k access to LAN resources.").

While discussing what Walton '269 discloses (Pet. 9–12), Petitioner characterizes Walton '269 as being directed to "a Wireless Local Area Network (WLAN) Multiple-Input, Multiple-Output Orthogonal Frequency Division Multiplexing (MIMO-OFDM) communication system that includes an access point/base station and user terminals." Pet. 9 (citing Ex. 1006, FIG. 1, 1:25–35, 1:61–2:7, 2:64–65, 3:24–58). However, in its analysis of

the challenged claims, Petitioner asserts that "[a]s explained above, Walton '269 discloses a system in which a base station serves a plurality of cells associated with mobile stations." *Id.* at 18. The difficulty with Petitioner's later assertion, however, is that it mischaracterizes the scope and content of Walton '269's disclosure. As discussed in greater detail below, we find the record supports a finding that Walton '269 is not directed to a cellular system but is instead directed to a MIMO WLAN system that "includes a number of access points (APs) 110 that support communication for a number of user terminals (UTs) 120." Ex. 1006, 3:25–31.

When asserting that Walton '269's system serves cells, Petitioner makes several citations to Walton '269's disclosure. Pet. 18 (citing Ex. 1006, 2:64–65, 3:24–58, Fig. 1). The first citation is merely a brief description of Walton '269's Figure 1. *See* Ex. 1006, 2:64–65 ("FIG. 1 shows a block diagram of a MIMO LAN system in which the teachings of the invention are implemented."). The second citation is a description of system 100 shown in Walton '269's Figure 1, which does not mention cells. Although Petitioner does not cite to Dr. Ding's declaration to support its contention that Walton '269's base station serves a plurality of cells, Dr. Ding's testimony regarding Walton '269, and the proposed combination of Walton '269 and Li, mirrors the same conclusory assertions advanced in the Petition. *See, e.g.*, Ex. 1003 ¶¶ 59–64, 71–72, 125–128. As a result, we agree with Patent Owner that Dr. Ding's testimony does not provide an additional basis to support Petitioner's "allegation . . . that Walton-'269 'discloses a system in which a base station serves a plurality of cells associated with mobile stations.'" Prelim. Resp. 7; *see also* 37 C.F.R.

§ 42.65 ("Expert testimony that does not disclose the underlying facts or data on which the opinion is based is entitled to little or no weight.").

In contrast, we find persuasive the declaration testimony of Mr. Alberth, Patent Owner's expert, that Walton '269 is not directed to a cellular system. Ex. 2001 ¶¶ 25–26, 32–35. More particularly, Mr. Alberth states that WLANs are "based on the IEEE 802.11 standards . . . and are commonly called Wi-Fi." *Id.* ¶ 26. Mr. Alberth identifies that "Walton-'269 is based on Wi-Fi" (*id.* (citing. Ex. 1006, 1:25–29, 5:51–56)), and states that "[u]nlike a cellular network, WLANs like Wi-Fi do not have cells." *Id.* This understanding is also consistent with Walton '269's disclosure. In this regard Walton '269's only reference to cells, or a cellular network, is with respect to its ability to couple to "other systems and networks" such as "a packet data network (PDN), a wired local area network (LAN), a wide area network (WAN), the Internet, a public switched telephone network (PSTN), a cellular communication network, etc." Ex. 1006, 3:60–66.

Based on the current record, we find that Patent Owner's arguments and evidence, summarized above, undermine Petitioner's contention that "Walton '269 discloses a system in which a base station serves a plurality of cells associated with mobile stations." Pet. 18; *see* Prelim. Resp. 10 ("[T]he Petition simply assumes a plurality of interfering cells in Walton-'269, without supporting evidence or even argument."). Thus, we agree with Patent Owner that "[t]he Petition does not establish a rationale to combine Walton-'269 and Li as proposed, because the purported rationale to combine is premised on an assumption that the POSITA would have been motivated to avoid intercell interference in Walton-'269." Prelim. Resp. 3. *See*

Magnum Oil, 829 F.3d at 1380 ("To satisfy its burden of proving obviousness, a petitioner cannot employ mere conclusory statements.").

As noted above, Walton '269 is directed to a WLAN system (Ex. 1006, 1:9–13), also known as a Wi-Fi system, whereas Li is directed to a system for reducing interference between cells of a "multi-cell, multi-subscriber wireless system" (Ex. 1007, 1:7–10, 1:57–63, 14:42–44). According to Petitioner, "Li is directed to avoiding issues arising from a base station that serves multiple cells." Pet. 18 (citing Ex. 1007, 1:15–63). Given that the record does not support Petitioner's assertion that Walton '269 is concerned with cells, we are not persuaded that the proposed combination of Walton '269 and Li would have, as Petitioner suggests,

> merely involved combining prior art elements (e.g., Li's subchannel configuration of diversity clusters and coherence clusters with Walton '269's system) according to known methods (Li's subcarrier allocation method) to yield predictable and foreseeable results and would have been an application of a known technique to a known system (Walton '269's system) ready for improvement (e.g., less intercell interference, higher channel gain).

Id. at 19–20 (citing Ex. 1003 ¶ 72).

Instead, we agree with Patent Owner that "Walton-'269 does not teach that a base station serves a plurality of cells, nor that its system suffers from intercell interference that could be ameliorated by any teachings in Li concerning reduction of such interference." Prelim. Resp. 8; *see, e.g.*, Ex. 1007, 1:57–60 ("[W]ith aggressive frequency reuse plan, e.g., the same spectrum is used for multiple neighboring cells, the problem of intercell interference arises."). In making this determination, we credit the expert declaration testimony of Mr. Alberth stating that "Walton-'269's WLAN/Wi-Fi system does not share the same concerns as Li's cellular

system." Ex. 2001 ¶ 32. According to Mr. Alberth, "users in a cellular system travel rapidly within cells and between cells" (*id.* ¶ 31) whereas "[m]ost devices in a WLAN/Wi-Fi network like that taught in Walton-'269 are either stationary or move slowly." *Id.* ¶ 33. Here, Mr. Alberth states that

> [a] key feature of cellular is the ability to support moving devices which can hand off between cells. In 2004 Wi-Fi did not support fast handoff between the Wi-Fi access points. Wi-Fi access points are deployed and devices can migrate between the access points, but not with the robust handoff mechanisms supported between cells of a cellular system.

Id. ¶ 26.

Based on the current record, we are not persuaded that Petitioner has articulated sufficient rationale to explain why one of ordinary skill in the art would have combined the references in the manner claimed. *See KSR*, 550 U.S. at 418–19 ("[I]t can be important to identify a reason that would have prompted a person of ordinary skill in the relevant field to combine the elements in the way the claimed new invention does."). Other than speculation that "Walton '269 discloses a system in which a base station serves a plurality of cells associated with mobile stations" (Pet. 18), the record describes no problem in Walton '269 that one of ordinary skill in the art would have resolved with the techniques used in Li to address intercell interference. *Id.* (citing Ex. 1007, 1:48–50).

To the extent Petitioner argues that one of ordinary skill in the art would have found it obvious to combine Walton '269 and Li simply because both are related to similar methods and systems (Pet. 20), the fact that two references are related to similar disclosures, without more, is insufficient to establish a reason to combine their teachings. *See* Pet. 20; *Johns Manville Corp. v. Knauf Insulation, Inc.*, IPR2018-00827, Paper 9 at 10–11 (PTAB

Oct. 16, 2018) (informative) ("Mere compatibility of the references is . . . not sufficient."); *see also Securus Techs., Inc. v. Global Tel*Link Corp.*, 701 F. App'x 971, 977 (Fed. Cir. 2017) (unpublished) (holding that "a broad characterization of [two references] as both falling within the same alleged field," without more, was not "a sufficient rationale to support an obviousness conclusion," as "[s]uch short-cut logic would lead to the conclusion that any and all combinations of elements known in th[e] broad field would automatically be obvious, without the need for any further analysis"); *Microsoft Corp. v. Enfish, LLC*, 662 F. App'x 981, 990 (Fed. Cir. 2016) (unpublished) (holding that the fact that two references "were directed to the same art or same techniques" was "inadequate to show persuasively that a relevant skilled artisan would have been motivated to combine the references").

Therefore, based on the current record, we determine that Petitioner has not shown a reasonable likelihood of demonstrating that independent claim 1 would have been obvious over Walton '269 and Li.

4. Claims 2–14

We have considered Petitioner's arguments and evidence for independent claims 6, 8, and 13, and for dependent claims 2–5, 7, 9–12, and 14. Petitioner relies on the same arguments and evidence to address independent claims 6, 8, and 13, and so, does not provide contentions for these claims that remedy the deficiency discussed with respect to claim 1. *See* Pet. 46, 48, 51. Accordingly, for the reasons discussed with respect to claim 1, we conclude that Petitioner has not demonstrated a reasonable likelihood that it would prevail in showing that claims 2–14 are unpatentable under 35 U.S.C. § 103(a) as obvious over Walton '269 and Li.

E. Alleged Obviousness over Walton '269, Li, and Gupta

Petitioner challenges claims 2 and 9 by adding Gupta to the teachings of Walton '269 and Li, in case claims 2 and 9 are not obvious over the combination of Walton '269 and Li. Pet. 54–56. Petitioner relies upon Gupta for teaching the added limitations of these dependent claims and, thus, does not remedy the deficiencies of the asserted art with respect to claim 1. *Id.* Accordingly, for the same reasons discussed above, Petitioner fails to demonstrate a reasonable likelihood of prevailing in its assertion that the subject matter of claims 2 and 9 would have been obvious over the combination of Walton '269, Li, and Gupta.

F. Alleged Obviousness over PCT819 and Airy

Petitioner asserts that claims 1, 3–8, and 10–14 are unpatentable as obvious over PCT819 and Airy. Pet. 56–93. Petitioner also relies on the testimony of Dr. Ding to support its arguments. *Id.* (citing Ex. 1003). Patent Owner responds to Petitioner's assertions. Prelim. Resp. 21–33.

1. Overview of PCT819 (Ex. 1009)

PCT819 is titled "Method and Apparatus for Allocating Resources in a Multiple-Input Multiple-Output (MIMO) Communication System." Ex. 1009, code (54). PCT819 explains that "[e]ach MIMO channel between the base station and a terminal typically experiences different link characteristics and is associated with different transmission capability, so the spatial subchannels available to each terminal have different effective capacities." *Id.* ¶ 1005. PCT819 states that the "[e]fficient use of the available downlink resources (and higher throughput) may be achieved if the N_C available spatial subchannels are effectively allocated such that data is transmitted on these subchannels to a 'proper' set of terminals in the MIMO

system." *Id.* In view of this, PCT819 describes "a need in the art for techniques to allocate downlink resources in' a MIMO system to provide improved system performance." *Id.* ¶ 1006.

PCT819 describes a "MIMO mode," in which "all available downlink data streams are allocated to a single terminal that employs multiple antennas (i.e., a MIMO terminal)," and an "N-SIMO mode," in which "a single data stream is allocated to each of a number of distinct terminals, with each terminal employing multiple antennas (i.e., SIMO terminals)." Ex. 1009 ¶ 1007. Figure 1 of PCT819 depicts a MIMO communication system, which is reproduced below.

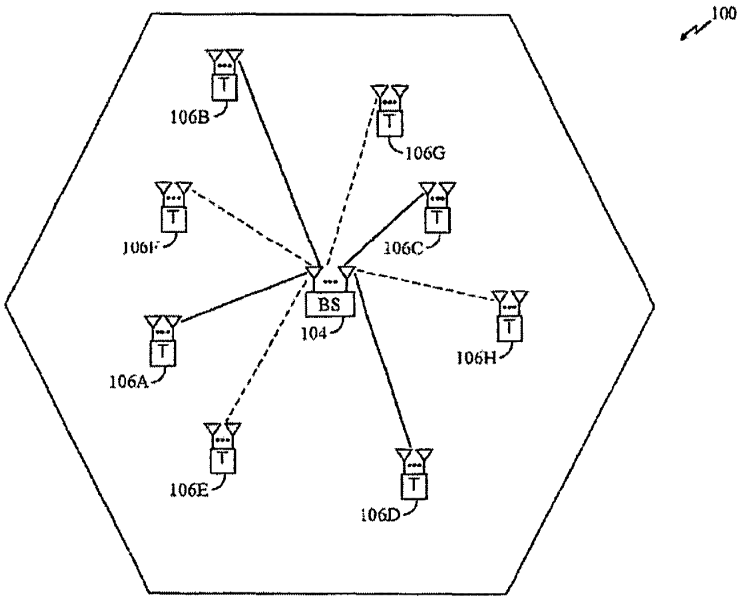

FIG. 1

Figure 1 of PCT819 illustrates MIMO communication system 100 using multiple transmit antennas and multiple receive antennas and includes base station 104 that communicates with terminals 106. Ex. 1009 ¶ 1023. PCT819 further describes encoding data in accordance with a particular coding scheme for transmission, interleaving encoded data based on a

particular interleaving scheme, and mapping the interleaved bits into modulation symbols for one or more transmission channels that have been selected for data transmission. *Id.* ¶ 1121. According to PCT819, the interleaving provides time diversity for the coded bits and may further provide frequency diversity. *Id.*

PCT819 also describes a receiver structure "when each data stream is transmitted over a respective transmit antenna (i.e., one data stream corresponding to each transmitted signal)." Ex. 1009 ¶ 1142. PCT819 states that "[f]or some other transmit processing schemes, a data stream may be transmitted over multiple transmit antennas, frequency subchannels, and/or time intervals to provide spatial, frequency, and time diversity, respectively." *Id.*

2. Overview of Airy (Ex. 1010)

Airy is titled "Transmission Scheduler for a Multiple Antenna Wireless Cellular Network." Ex. 1010, code (54). Airy "relates to scheduling of data wirelessly transmitted between a base control station having multiple antennas, and subscriber units." *Id.* at 1:7–9. Airy describes spatial multiplexing as "a transmission technology that exploits multiple antennae at both the base transceiver station and at the subscriber units to increase the bit rate in a wireless radio link with no additional power or bandwidth consumption." *Id.* at 1:20–24. Airy explains that this technique "typically results in fading of the modulated carrier signal" due to the multiple paths traveled by a modulated carrier signal, which "causes the modulated carrier signal to attenuate in amplitude when multiple paths subtractively combine." *Id.* at 2:3–6.

Airy also describes antenna diversity, which "is a technique used in multiple antenna-based communication system[s] to reduce the effects of multi-path fading." Ex. 1010, 2:9–11. Airy explains that "[a]ntenna diversity can be obtained by providing a transmitter and/or a subscriber with two or more antennae." *Id.* at 2:11–12. Airy further explains that "[i]t is desirable that the scheduling be adaptive to the quality of transmission links between the base station transceiver antennas and each of the subscribers (subscriber) units." *Id.* at 2:50–55.

Airy describes a process in which a scheduler receives information about the quality of transmission links between a base station transceiver and subscriber units. Ex. 1010, 5:29–31. Airy explains that "[t]he quality of the links can be used to determine whether the transmission of data should include spatial multiplexing or communication diversity." *Id.* at 5:31–34.

Airy further describes dividing the available frequency bandwidth into multiple data carriers. Ex. 1010, 9:3–5. Airy's Figure 6, which is reproduced below, depicts a frequency spectrum of OFDM sub-carrier signals. *Id.* at 3:60–61.

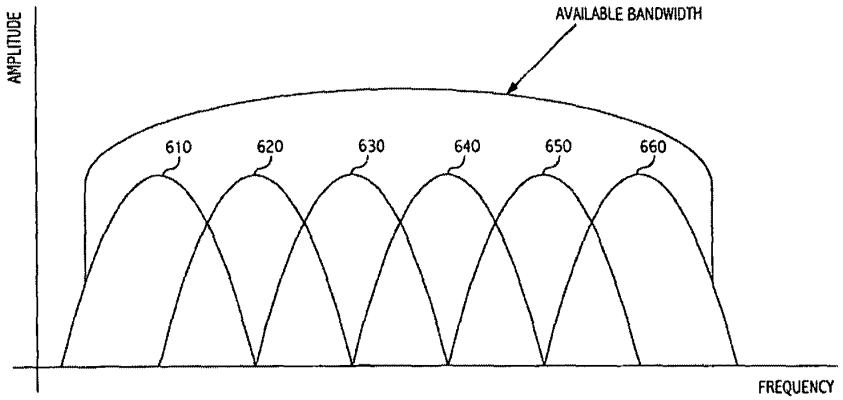

FIGURE 6

Specifically, Airy describes Figure 6 as showing OFDM sub-carrier signals 610, 620, 630, 640, 650, 660 that are each "modulated by separate symbols or combinations of symbols." *Id.* at 9:15–18.

Airy's Figure 7A is reproduced below.

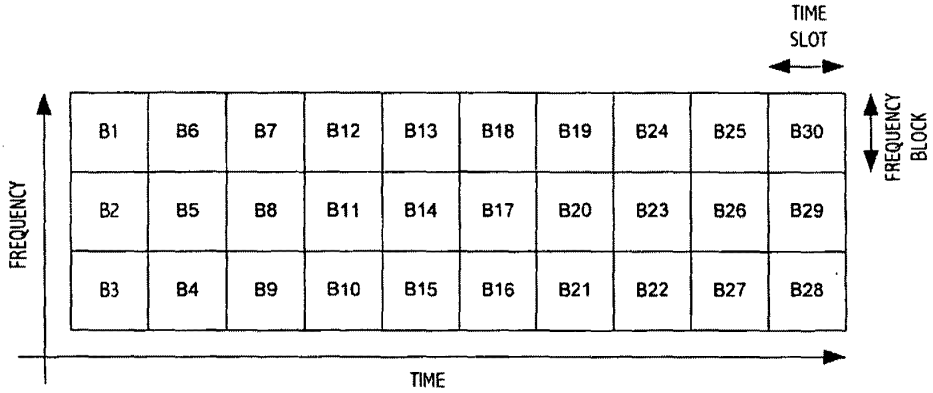

FIGURE 7A

Airy's Figure 7a depicts "a frame structure depicting blocks of transmission data defined by transmission time slots and transmission frequency blocks." Ex. 1010, 9:31–33. Airy explains that "data blocks B1, B2, and B3 can be transmitted during a first time slot, but over different frequency ranges or blocks." *Id.* at 9:34–37. Airy states that "[t]he different frequency ranges can be defined as different groupings or sets of the above described OFDM symbols." *Id.* at 9:39–41.

3. Analysis of Claim 1

Petitioner asserts claim 1 would have been obvious over PCT819 and Airy. Pet. 64–79. We use Petitioner's notations to identify the claim elements, and focus on the dispositive claim limitation.

a) [1c-2] the corresponding subchannel configuration characterized by distributed subcarriers or localized subcarriers in the frequency domain;

(1) Petitioner's Contentions

Petitioner asserts that the combination of PCT819 and Airy teaches the subject matter of limitation [1c-2]. Pet. 76–78. More particularly, Petitioner asserts that "[w]hile PCT819 does not explicitly reveal that the 'subchannel configuration [is] characterized by distributed subcarriers or localized subcarriers in the frequency domain,' Airy does describe this feature." *Id.* at 76 (citing Ex. 1003 ¶ 129).

According to Petitioner, "Airy discloses that the available frequency bandwidth can be divided into multiple data carriers in implementations involving OFDM." Pet. 76. (citing Ex. 1010, 9:1–14, 2:47–55, 6:50–56). Petitioner argues that Airy's Figure 6 shows subcarrier signals 610, 620, 630, 640, 650, 660, and Airy's Figure 7A "depicts 'a frame structure depicting blocks of transmission data defined by transmission time slots and

transmission frequency blocks' having different frequency ranges." *Id.* (citing Ex. 1010, 9:15–17, 9:31–44; Ex. 1003 ¶ 130).

Petitioner provides annotated copies of Airy's Figure 6 and Figure 7A to support its contentions, which are reproduced below.

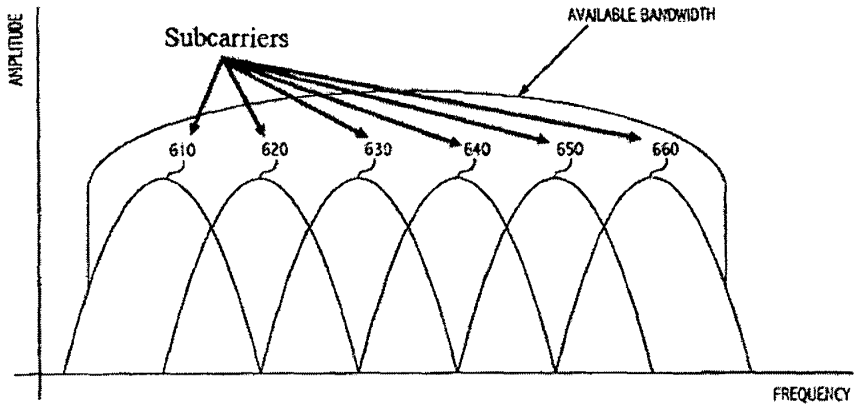

FIGURE 6
EX-1010, FIG. 6

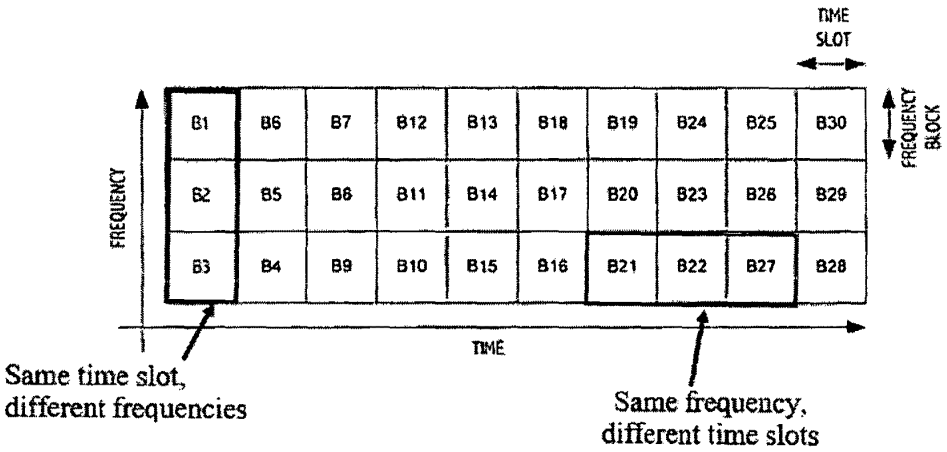

FIGURE 7A
EX-1010, FIG. 7A

Petitioner asserts that "[a]s shown in Airy's FIGS. 6 and 7A, Airy discloses dividing an OFDM channel band into subbands that are characterized by subcarriers that are equally distributed across the channel bandwidth." *Id.* at 78. Thus, Petitioner concludes that Airy "discloses a 'subchannel configuration characterized by distributed subcarriers or localized subcarriers in the frequency domain.'" *Id.* (citing Ex. 1003 ¶ 131).

(2) Patent Owner's Contentions

Patent Owner contends that Petitioner's ground of unpatentability based on PCT819 and Airy is deficient because "Airy does not disclose whether a mobile device's subcarriers are localized . . . or distributed." Prelim. Resp. 25 (citing Ex. 2001 ¶ 37; Ex. 1001, 7:1–3, 7:6–7). To support its argument, Patent Owner points out that Petitioner relies solely on Airy to teach "a corresponding subchannel configuration that is characterized by distributed subcarriers or localized subcarrier," but asserts that "the Petition does not contend that Airy teaches use of such localized and distributed subcarriers." *Id.* at 24–25 (citing Pet. 76–79).

Patent Owner argues that Petitioner improperly relies on Airy's Figures 6 and 7A as disclosing the argued limitation. Prelim. Resp. 24–26. According to Patent Owner, Airy's Figure 6 "merely shows that subcarriers exist and says nothing about whether or how they are *grouped*." *Id.* at 25 (citing Ex. 2001 ¶¶ 36–37). Similarly, Patent Owner argues that Airy's Figure 7A simply "involve[s] frequency blocks that are assigned to subscribers, but Airy does not say how these frequency blocks are selected, what frequencies they include, or how the maps are built." *Id.* at 26 (citing Ex. 2001 ¶ 39).

Not conceding that Airy "teach[es] either distributed or localized subcarriers as claimed" (Prelim. Resp. 26 (citing Ex. 2001 ¶ 29)), Patent Owner argues that even if Airy does disclose "'equally distributed' subcarriers,"

> Petitioner has not explained why the combined PCT819/Airy system would send a parameter to a mobile station that indicates a corresponding subchannel configuration that is characterized by distributed subcarriers or localized subcarrier when Petitioner has not shown that PCT819/Airy can use anything other than "distributed subcarriers" (indeed, Petitioner has not established that Airy teaches *either* distributed or localized subcarriers).

Id. at 23–24. Thus, Patent Owner concludes that "[b]ecause Airy is not said to use any particular configuration of subcarriers, Petitioner has not shown that the combination of PCT819 and Airy has any need to transmit a subchannel configuration." *Id.* at 27 (citing Ex. 2001 ¶ 38).

b) Discussion

Having considered the conflicting positions of the parties, we conclude that Petitioner has not shown a reasonable likelihood that it would prevail in challenging the patentability of independent claim 1. Instead, we agree with Patent Owner that Petitioner has not demonstrated that Airy teaches a "corresponding subchannel configuration characterized by distributed subcarriers or localized subcarriers in the frequency domain," as limitation [1c-2] recites.

As discussed above in our claim construction analysis, the correct construction of "the corresponding subchannel configuration characterized by distributed subcarriers or localized subcarriers in the frequency domain" requires, at a minimum, mobile station-specific transmission parameters that are capable of indicating, as alternatives, both distributed subcarriers and localized subcarriers in the frequency domain as subchannel configurations.

Therefore, even if we were to agree with Petitioner that Airy teaches distributed subcarriers (*see* Pet. 78 ("Airy discloses . . . subbands that are characterized by subcarriers that are equally distributed across the channel bandwidth.")), limitation [1c-2] does not simply require a corresponding subchannel configuration characterized by distributed subcarriers. Instead, claim 1 requires mobile station-specific transmission parameters that are capable of indicating, as alternatives, both distributed subcarriers and localized subcarriers in the frequency domain as subchannel configurations.

However, other than asserting that "Airy therefore discloses a 'subchannel configuration characterized by distributed subcarriers or localized subcarriers in the frequency domain'" (Pet. 78), Petitioner does not assert that Airy, alone or in combination with PCT819, teaches or suggests mobile station-specific transmission parameters that are capable of indicating, as alternatives, both distributed subcarriers and localized subcarriers in the frequency domain as subchannel configurations, as required by claim 1.

Petitioner's expert, Dr. Ding, also limits his opinion regarding limitation [1c-2] to whether Airy teaches distributed subcarriers. Ex. 1003 ¶ 131. Dr. Ding's declaration testimony regarding Airy's disclosure about distributed subcarriers simply mirrors the attorney arguments set forth in the Petition. *See id.* ¶¶ 129–132. For example, Dr. Ding states that "[a]s shown in Airy's FIGS. 6 and 7A, Airy discloses applying OFDM to divide an allocated channel band into subbands that are characterized by subcarriers that are equally distributed across the channel bandwidth." *Id.* ¶ 131. And, based on this statement, Dr. Ding concludes, without explaining, that "Airy therefore discloses a 'subchannel configuration characterized by distributed

subcarriers or localized subcarriers in the frequency domain.'" *Id.* Like Petitioner's attorney arguments, however, Dr. Ding's testimony only asserts that Airy teaches distributed subcarriers. As a result, Dr. Ding's testimony does not provide an additional basis to support Petitioner's contentions that Airy teaches limitation [1c-2] when properly construed. *See* 37 C.F.R. § 42.65 ("Expert testimony that does not disclose the underlying facts or data on which the opinion is based is entitled to little or no weight.").

Based on the above, we conclude that Petitioner has not shown sufficiently that Airy teaches or suggests "the corresponding subchannel configuration characterized by distributed subcarriers or localized subcarriers in the frequency domain," as recited by limitation [1c-2]. Moreover, Petitioner does not rely on PCT819 for that limitation. Accordingly, we further conclude that Petitioner has not shown that the proposed combination of PCT819 and Airy teaches or suggests the limitation.

In addition, we agree with Patent Owner that "[b]ecause Airy is not said to use any particular configuration of subcarriers, Petitioner has not shown that the combination of PCT819 and Airy has any need to transmit a subchannel configuration." Prelim. Resp. 27. Here, we find persuasive the declaration testimony of Patent Owner's expert, Mr. Alberth, who states:

> [t]he '941 patent teaches localized or distributed configurations for one particular mobile station (Ex. 1001 ['941 Patent] 7:1–7); but Airy's distribution in Fig. 6 is generic to OFDM and all mobile stations interacting with the system. Given this generic distribution of subcarriers there is no reason why Airy would have had a control message to indicate whether the subchannel configuration uses localized or distributed subcarriers.

Ex. 2001 ¶ 38. Thus, we also agree with Patent Owner that "Petitioner has not explained why the combined PCT819/Airy system would send a

parameter to a mobile station that indicates a corresponding subchannel configuration that is characterized by distributed subcarriers or localized subcarrier when Petitioner has not shown that PCT819/Airy can use anything other than 'distributed subcarriers.'" Prelim. Resp. 24.

Based on the above, we determine that Petitioner has not shown sufficiently that Airy teaches or suggests subchannel configurations "characterized by distributed subcarriers or localized subcarriers in the frequency domain," as claim 1 requires. Therefore, Petitioner has not adequately established on this record a reasonable likelihood of success that it would prevail in demonstrating that claim 1 is unpatentable over the combination of PCT819 and Airy.

c) Conclusion on Claim 1

Having considered the parties' arguments and evidence, we determine that Petitioner has not shown a reasonable likelihood of demonstrating that independent claim 1 would have been obvious over PCT819 and Airy.

4. Claims 3–8 and 10–14

We have considered Petitioner's arguments and evidence for independent claims 6, 8, and 13 and for dependent claims 3–5, 7, 10–12, and 14. Petitioner relies on the same arguments and evidence to address independent claims 6, 8, and 13, and so, does not provide contentions for these claims that remedy the deficiency discussed with respect to claim 1. *See* Pet. 85, 88, 92. Accordingly, for the reasons discussed with respect to claim 1, we conclude that Petitioner has not demonstrated a reasonable likelihood that it would prevail in showing that claims 3–8 and 10–14 are unpatentable under 35 U.S.C. § 103(a) as obvious over PCT819 and Airy.

III. DISCRETIONARY DENIAL

Patent Owner argues that we should exercise our discretion to deny institution of *inter partes* review in this case under 35 U.S.C. § 314(a), because of the parallel district court litigation and because Petitioner failed to disclose or apply their claim construction positions in the parallel district court litigation. Prelim. Resp. 93–98. Because we have considered the merits of the Petition and decline to institute an *inter partes* review on that basis, we need not determine whether it would be appropriate to discretionarily deny the Petition under § 314(a).

IV. CONCLUSION

For the foregoing reasons, we are not persuaded that the Petition establishes a reasonable likelihood that Petitioner would prevail in any of its challenges to claims 1–14 of the '941 patent.

V. ORDER

In consideration of the foregoing, it is hereby ordered that the Petition is *denied*, and no trial is instituted.

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AO 120 (Rev. 08/10)

TO:	Mail Stop 8 Director of the U.S. Patent and Trademark Office P.O. Box 1450 Alexandria, VA 22313-1450	REPORT ON THE FILING OR DETERMINATION OF AN ACTION REGARDING A PATENT OR TRADEMARK

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DOCKET NO.	DATE FILED	U.S. DISTRICT COURT
2:22-cv-00093	3/29/2022	Eastern District of Texas, Marshall Division

PLAINTIFF	DEFENDANT
Neo Wireless LLC	Toyota Motor North America, Inc., Toyota Motor Sales, U.S.A., Inc., & Toyota Motor Engineering & Manufacturing North America, Inc.

PATENT OR TRADEMARK NO.	DATE OF PATENT OR TRADEMARK	HOLDER OF PATENT OR TRADEMARK
1 8,467,366	6/18/2013	Neo Wireless LLC
2 10,075,941	9/11/2018	Neo Wireless LLC
3 10,447,450	10/15/2019	Neo Wireless LLC
4 10,771,302	9/8/2020	Neo Wireless LLC
5 10,833,908	4/17/2018	Neo Wireless LLC

In the above—entitled case, the following patent(s)/ trademark(s) have been included:

DATE INCLUDED	INCLUDED BY ☐ Amendment ☐ Answer ☐ Cross Bill ☐ Other Pleading	
PATENT OR TRADEMARK NO.	DATE OF PATENT OR TRADEMARK	HOLDER OF PATENT OR TRADEMARK
1		
2		
3		
4		
5		

In the above—entitled case, the following decision has been rendered or judgement issued:

DECISION/JUDGEMENT

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REPORT ON THE FILING OR DETERMINATION OF AN ACTION REGARDING A PATENT OR TRADEMARK

PATENT OR TRADEMARK NO.	DATE OF PATENT OR TRADEMARK	HOLDER OF PATENT OR TRADEMARK
6 10,965,512	3/30/2021	Neo Wireless LLC

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DOCKET NO.	DATE FILED	U.S. DISTRICT COURT
2:22-cv-00094	3/29/2022	Eastern District of Texas, Marshall Division

PLAINTIFF	DEFENDANT
Neo Wireless LLC	General Motors Company and General Motors LLC

PATENT OR TRADEMARK NO.	DATE OF PATENT OR TRADEMARK	HOLDER OF PATENT OR TRADEMARK
1 8,467,366	6/18/2013	Neo Wireless LLC
2 10,075,941	9/11/2018	Neo Wireless LLC
3 10,447,450	10/15/2019	Neo Wireless LLC
4 10,771,302	9/8/2020	Neo Wireless LLC
5 10,833,908	4/17/2018	Neo Wireless LLC

In the above—entitled case, the following patent(s)/ trademark(s) have been included:

DATE INCLUDED	INCLUDED BY ☐ Amendment ☐ Answer ☐ Cross Bill ☐ Other Pleading	
PATENT OR TRADEMARK NO.	DATE OF PATENT OR TRADEMARK	HOLDER OF PATENT OR TRADEMARK
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PATENT OR TRADEMARK NO.	DATE OF PATENT OR TRADEMARK	HOLDER OF PATENT OR TRADEMARK
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2:22-cv-00095	3/29/2022	Eastern District of Texas, Marshall Division

PLAINTIFF	DEFENDANT
Neo Wireless LLC	Tesla Inc.

	PATENT OR TRADEMARK NO.	DATE OF PATENT OR TRADEMARK	HOLDER OF PATENT OR TRADEMARK
1	8,467,366	6/18/2013	Neo Wireless LLC
2	10,075,941	9/11/2018	Neo Wireless LLC
3	10,447,450	10/15/2019	Neo Wireless LLC
4	10,771,302	9/8/2020	Neo Wireless LLC
5	10,833,908	4/17/2018	Neo Wireless LLC

In the above—entitled case, the following patent(s)/ trademark(s) have been included:

DATE INCLUDED	INCLUDED BY ☐ Amendment ☐ Answer ☐ Cross Bill ☐ Other Pleading	
PATENT OR TRADEMARK NO.	DATE OF PATENT OR TRADEMARK	HOLDER OF PATENT OR TRADEMARK
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PATENT OR TRADEMARK NO.	DATE OF PATENT OR TRADEMARK	HOLDER OF PATENT OR TRADEMARK
6 10,965,512	3/30/2021	Neo Wireless LLC

To Be Filed in CM/ECF

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In Compliance with 35 U.S.C. § 290 and/or 15 U.S.C. § 1116 you are hereby advised that a court action has been filed in the U.S. District Court Eastern District of Tennessee on the following

☐ Trademarks or ☑ Patents. (☐ the patent action involves 35 U.S.C. § 292.):

DOCKET NO.	DATE FILED	U.S. DISTRICT COURT
	3/29/2022	Eastern District of Tennessee

PLAINTIFF	DEFENDANT
Neo Wireless LLC	Volkswagen Group of America, Inc. & Volkswagen Group of America Chattanooga Operations, LLC

PATENT OR TRADEMARK NO.	DATE OF PATENT OR TRADEMARK	HOLDER OF PATENT OR TRADEMARK
1 8,467,366	6/18/2013	Neo Wireless LLC
2 10,075,941	9/11/2018	Neo Wireless LLC
3 10,447,450	10/15/2019	Neo Wireless LLC
4 10,771,302	9/8/2020	Neo Wireless LLC
5 10,833,908	4/17/2018	Neo Wireless LLC

In the above—entitled case, the following patent(s)/ trademark(s) have been included:

DATE INCLUDED	INCLUDED BY ☐ Amendment ☐ Answer ☐ Cross Bill ☐ Other Pleading	
PATENT OR TRADEMARK NO.	DATE OF PATENT OR TRADEMARK	HOLDER OF PATENT OR TRADEMARK
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In the above—entitled case, the following decision has been rendered or judgement issued:

DECISION/JUDGEMENT

CLERK	(BY) DEPUTY CLERK	DATE

Copy 1—Upon initiation of action, mail this copy to Director Copy 3—Upon termination of action, mail this copy to Director
Copy 2—Upon filing document adding patent(s), mail this copy to Director Copy 4—Case file copy

REPORT ON THE FILING OR DETERMINATION OF AN ACTION REGARDING A PATENT OR TRADEMARK

PATENT OR TRADEMARK NO.	DATE OF PATENT OR TRADEMARK	HOLDER OF PATENT OR TRADEMARK
6 10,965,512	3/30/2021	Neo Wireless LLC

AO 120 (Rev. 08/10)

TO:	Mail Stop 8 Director of the U.S. Patent and Trademark Office P.O. Box 1450 Alexandria, VA 22313-1450	REPORT ON THE FILING OR DETERMINATION OF AN ACTION REGARDING A PATENT OR TRADEMARK

In Compliance with 35 U.S.C. § 290 and/or 15 U.S.C. § 1116 you are hereby advised that a court action has been filed in the U.S. District Court for the Middle District of Tennessee on the following

☐ Trademarks or ☑ Patents. (☐ the patent action involves 35 U.S.C. § 292.):

DOCKET NO.	DATE FILED	U.S. DISTRICT COURT
3:22-cv-00220	3/29/2022	for the Middle District of Tennessee

PLAINTIFF	DEFENDANT
NEO Wireless, LLC	Nissan North America Inc.

PATENT OR TRADEMARK NO.	DATE OF PATENT OR TRADEMARK	HOLDER OF PATENT OR TRADEMARK
1 8467366		See attached complaint
2 10833408		
3 10075941		
4 10447450		
5 10965512		

In the above—entitled case, the following patent(s)/ trademark(s) have been included:

DATE INCLUDED	INCLUDED BY ☐ Amendment ☐ Answer ☐ Cross Bill ☑ Other Pleading	
PATENT OR TRADEMARK NO.	DATE OF PATENT OR TRADEMARK	HOLDER OF PATENT OR TRADEMARK
1 10771302		
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In the above—entitled case, the following decision has been rendered or judgement issued:

DECISION/JUDGEMENT

CLERK	(BY) DEPUTY CLERK	DATE
LYNDA M. HILL	VANESSA HAINES	4/4/2022

Copy 1—Upon initiation of action, mail this copy to Director **Copy 3—Upon termination of action, mail this copy to Director**
Copy 2—Upon filing document adding patent(s), mail this copy to Director **Copy 4—Case file copy**

AO 120 (Rev. 08/10)

TO:	Mail Stop 8 Director of the U.S. Patent and Trademark Office P.O. Box 1450 Alexandria, VA 22313-1450	REPORT ON THE FILING OR DETERMINATION OF AN ACTION REGARDING A PATENT OR TRADEMARK

In Compliance with 35 U.S.C. § 290 and/or 15 U.S.C. § 1116 you are hereby advised that a court action has been filed in the U.S. District Court Northern District of Ohio on the following

☑ Trademarks or ☐ Patents. (☐ the patent action involves 35 U.S.C. § 292.):

DOCKET NO.	DATE FILED	U.S. DISTRICT COURT
3:22-cv-01252	7/15/2022	Northern District of Ohio

PLAINTIFF	DEFENDANT
Neo Wireless LLC	FCA US, LLC

	PATENT OR TRADEMARK NO.	DATE OF PATENT OR TRADEMARK	HOLDER OF PATENT OR TRADEMARK
1	8,467,366	6/18/2013	Neo Wireless LLC
2	10,075,941	9/11/2018	Neo Wireless LLC
3	10,447,450	10/15/2019	Neo Wireless LLC
4	10,771,302	9/8/2020	Neo Wireless LLC
5	10,833,908	4/17/2018	Neo Wireless LLC

In the above—entitled case, the following patent(s)/ trademark(s) have been included:

DATE INCLUDED	INCLUDED BY ☐ Amendment ☐ Answer ☐ Cross Bill ☐ Other Pleading	
PATENT OR TRADEMARK NO.	DATE OF PATENT OR TRADEMARK	HOLDER OF PATENT OR TRADEMARK
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In the above—entitled case, the following decision has been rendered or judgement issued:

DECISION/JUDGEMENT

CLERK	(BY) DEPUTY CLERK	DATE

Copy 1—Upon initiation of action, mail this copy to Director **Copy 3—Upon termination of action, mail this copy to Director**
Copy 2—Upon filing document adding patent(s), mail this copy to Director **Copy 4—Case file copy**

REPORT ON THE FILING OR DETERMINATION OF AN ACTION REGARDING A PATENT OR TRADEMARK

PATENT OR TRADEMARK NO.	DATE OF PATENT OR TRADEMARK	HOLDER OF PATENT OR TRADEMARK
6 10,965,512	3/30/2021	Neo Wireless LLC

AO 120 (Rev. 08/10)

TO:	**Mail Stop 8** **Director of the U.S. Patent and Trademark Office** **P.O. Box 1450** **Alexandria, VA 22313-1450**	**REPORT ON THE FILING OR DETERMINATION OF AN ACTION REGARDING A PATENT OR TRADEMARK**

In Compliance with 35 U.S.C. § 290 and/or 15 U.S.C. § 1116 you are hereby advised that a court action has been filed in the U.S. District Court Middle District of Florida on the following

☐ Trademarks or ☒ Patents. (☐ the patent action involves 35 U.S.C. § 292.):

DOCKET NO.	DATE FILED	U.S. DISTRICT COURT
3:22-cv-780-J-MMHJBT	July 15, 2022	Middle District of Florida

PLAINTIFF	DEFENDANT
NEO WIRELESS, LLC	MERCEDES-BENZ USA, LLC

	PATENT OR TRADEMARK NO.	DATE OF PATENT OR TRADEMARK	HOLDER OF PATENT OR TRADEMARK
1	8,467,366	January 23, 2020	Neo Wireless LLC
2	10,833,908	June 16, 2020	Neo Wireless LLC
3	10,075,941	January 23, 2020	Neo Wireless LLC
4	10,447,450	January 23, 2020	Neo Wireless LLC
5	10,965,512	September 4, 2020	Neo Wireless
6	10,771,302	January 23, 2020	Neo Wireless LLC

CLERK	(BY) DEPUTY CLERK	DATE
ELIZABETH M. WARREN	Amy Thomas	July 20, 2022

Copy 1—Upon initiation of action, mail this copy to Director **Copy 3—Upon termination of action, mail this copy to Director**
Copy 2—Upon filing document adding patent(s), mail this copy to Director **Copy 4—Case file copy**

AO 120 (Rev. 08/10)

TO:	Mail Stop 8 Director of the U.S. Patent and Trademark Office P.O. Box 1450 Alexandria, VA 22313-1450	REPORT ON THE FILING OR DETERMINATION OF AN ACTION REGARDING A PATENT OR TRADEMARK

In Compliance with 35 U.S.C. § 290 and/or 15 U.S.C. § 1116 you are hereby advised that a court action has been filed in the U.S. District Court Northern District of Ohio on the following

☑ Trademarks or ☐ Patents. (☐ the patent action involves 35 U.S.C. § 292.):

DOCKET NO.	DATE FILED	U.S. DISTRICT COURT
3:22-cv-01252	7/15/2022	Northern District of Ohio

PLAINTIFF	DEFENDANT
Neo Wireless LLC	FCA US, LLC

PATENT OR TRADEMARK NO.	DATE OF PATENT OR TRADEMARK	HOLDER OF PATENT OR TRADEMARK
1 8,467,366	6/18/2013	Neo Wireless LLC
2 10,075,941	9/11/2018	Neo Wireless LLC
3 10,447,450	10/15/2019	Neo Wireless LLC
4 10,771,302	9/8/2020	Neo Wireless LLC
5 10,833,908	4/17/2018	Neo Wireless LLC

In the above—entitled case, the following patent(s)/ trademark(s) have been included:

DATE INCLUDED	INCLUDED BY ☐ Amendment ☐ Answer ☐ Cross Bill ☐ Other Pleading	
PATENT OR TRADEMARK NO.	DATE OF PATENT OR TRADEMARK	HOLDER OF PATENT OR TRADEMARK
1		
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In the above—entitled case, the following decision has been rendered or judgement issued:

DECISION/JUDGEMENT
Conditional Transfer Order (CTO 1) by the Judicial Panel on Multidistrict Litigation. In re: MDL 3034 Neo Wireless, LLC, Patent Litigation. Case Transferred to Eastern District of Michigan and assigned to the Honorable Terrence G. Berg.

CLERK	(BY) DEPUTY CLERK	DATE
Sandy Opacich	/s/Natalie Wlotzko	8/15/2022

Copy 1—Upon initiation of action, mail this copy to Director **Copy 3—Upon termination of action, mail this copy to Director**
Copy 2—Upon filing document adding patent(s), mail this copy to Director **Copy 4—Case file copy**

REPORT ON THE FILING OR DETERMINATION OF AN ACTION REGARDING A PATENT OR TRADEMARK

PATENT OR TRADEMARK NO.	DATE OF PATENT OR TRADEMARK	HOLDER OF PATENT OR TRADEMARK
6 10,965,512	3/30/2021	Neo Wireless LLC