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APPLICATION NO.	ISSUE DATE	PATENT NO.	ATTORNEY DOCKET NO.	CONFIRMATION NO.
16/120,258	02/19/2019	10211895	WBWL001H	3304

112117 7590 01/30/2019

Thomas D. Fortenberry, Attorney at Law
P.O. Box 2099
Woodville, TX 75979

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):

Roc Lastinger, Cave Creek, AZ;
Woodbury Wireless LLC, Pflugerville, TX;
John Spenik, Scottsdale, AZ, Deceased;
Brian C. Woodbury, Gilbert, AZ;

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INFORMATION DISCLOSURE STATEMENT BY APPLICANT (Not for submission under 37 CFR 1.99)		
	Application Number	
	Filing Date	
	First Named Inventor	Roc Lastinger
	Art Unit	
	Examiner Name	
	Attorney Docket Number	WBWL001H

	42	6118767		2000-09-12	Shen et al.	
	43	6246674		2001-06-12	Feuerstein et al.	
	44	7039441		2006-05-02	Reudink et al.	
	45	6542736		2003-04-01	Parkvall et al.	
	46	6693510		2004-02-17	Yamaguchi	
	47	6047175		2000-04-04	Trompower	
	48	6388999		2002-05-14	Gorsuch et al.	
	49	3317912		05/1967 ~~1963-07-04~~	Kelleher	
	50	4825222		1989-04-25	Butcher	
	51	5818385		1998-10-06	Bartholomew	
	52	5969689		1999-10-19	Martek et al.	

Change(s) applied to document, /P.H./ 1/10/2019

ALL REFERENCES CONSIDERED EXCEPT WHERE LINED THROUGH. /S.M.L/

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Page 000002

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Application of:	Confirmation No.: 3304
Roc Lastinger	Examiner: Siu M LEE
Application No.: 16/120,258	Art Unit: 2632
File Date: 2018-09-01	Docket No.: WBWL001H
Title: MIMO Methods and Systems	Date: Jan 4, 2019

COMMENTS ON STATEMENT OF REASONS FOR ALLOWANCE UNDER 37 C.F.R. § 1.104(e)

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

Examiner:

In response to the Notice of Allowance dated 12/11/2018, please enter the following remarks.

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Remarks:

The Examiner has stated the following in the Examiner's Statement of Reasons for Allowance:

> The present in invention describes a computer-implemented method, comprising: providing access to a multiple-input-multiple-output (MIMO)-capable access point including: a plurality of antennas; circuitry in communication with the antennas; and at least one radio in communication with the circuitry; selecting at least one channel based on one or more channel characteristics, for initiating a first transmission to a first portable wireless device and initiating a second transmission to a second portable wireless device, such that at least a portion of the first transmission occurs simultaneously with at least a portion of the second transmission and both occur via a first wireless protocol; receiving first information from the first portable wireless device that is based on a first measurement performed by the first portable wireless device; receiving second information from the second portable wireless device that is based on a second measurement performed by the second portable wireless device; altering at least one aspect of the first transmission, based on at least one of the first information or the second information, so as to reduce interference between the first transmission and the second transmission when the at least portion of the first transmission occurs simultaneously with the at least portion of the second transmission; altering at least one aspect of the second transmission, based on at least one of the first information or the second information, so as to reduce the interference between the first transmission and the second transmission when the at least portion of the first transmission occurs simultaneously with the at least portion of the second transmission; transmitting first data in connection with the first transmission to the first portable wireless device; transmitting second data in connection with the second transmission to the second portable wireless device; receiving third information from a third portable wireless device

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that is based on a third measurement performed by the third portable wireless device; altering at least one aspect of a third transmission, based on the third information, for further interference reduction; and transmitting third data in connection with the third transmission to the third portable wireless device, via a second wireless protocol including a 802.11n protocol, where the first wireless protocol includes another 802.11 protocol other than the 802.11n protocol. The closest prior art, US Patent 10,063,297 B1, 10,069,548 B2, and 9,859,963 B2 all disclose a similar method, but were overcame by the terminal disclaimer filed on 10/30/2018, other prior art of reference fails to disclose selecting at least one channel based on one or more channel characteristics,

for initiating a first transmission to a first portable wireless device and initiating a second transmission to a second portable wireless device, such that at least a portion of the first transmission occurs simultaneously with at least a portion of the second transmission and both occur via a first wireless protocol; receiving first information from the first portable wireless device that is based on a first measurement performed by the first portable wireless device; receiving second information from the second portable wireless device that is based on a second measurement performed by the second portable wireless device; altering at least one aspect of the first transmission, based on at least one of the first information or the second information, so as to reduce interference between the first transmission and the second transmission when the at least portion of the first transmission occurs simultaneously with the at least portion of the second transmission; altering at least one aspect of the second transmission, based on at least one of the first information or the second information, so as to reduce the interference between the first transmission and the second transmission when the at least portion of the first transmission occurs simultaneously with the at least portion of

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> the second transmission; transmitting first data in connection with the first transmission to the first portable wireless device; transmitting second data in connection with the second transmission to the second portable wireless device; receiving third information from a third portable wireless device that is based on a third measurement performed by the third portable wireless device; altering at least one aspect of a third transmission, based on the third information, for further interference reduction; and transmitting third data in connection with the third transmission to the third portable wireless device, via a second wireless protocol including a 802.11n protocol, where the first wireless protocol includes another 802.11 protocol other than the 802.11n protocol. These distinct feature have been added to indspendent claim 61, and similar feature have been added to independent claims 75, 87, and 89, thus rendering claims 61-90 allowable.

In response, applicant respectfully points out that features of at least some of the independent claims (e.g. 15, 27, and 29) are not necessarily the same as those the Examiner has highlighted above. For example, Claim 15 recites "positioning one or more multiple-input-multiple-output (MIMO)-capable access points so that the one or more multiple-input-multiple-output (MIMO)-capable access points provide a coverage dictated by a person positioning the one or more multiple-input-multiple-output (MIMO)-capable access points," in the context claimed, whereas Claim 29 recites "positioning one or more multiple-input-multiple-output (MIMO)-capable access points so that the one or more multiple-input-multiple-output (MIMO)-capable access points provide a desired coverage," in the context claimed. Further, Claim 27 does not have a "positioning" limitation (for example as found in Claim 15) and instead recites "providing access to a multiple-input-multiple-output (MIMO)-capable access point," in the context claimed.

Clearly, at least some of the independent claims are not necessarily limited to the features that the Examiner has noted in the Examiner's Statement of Reasons for Allowance, as noted above

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(by way of example only). Instead, each of the claims should only be limited by the language existing therein.

Further, although Applicant agrees with the Examiner's conclusion that these claims are allowable, Applicant notes that the claims may be allowable for reasons other than those identified by the Examiner and does not concede that the Examiner's characterizations of the terms of the claims and the prior art are correct. Each of the claims stands on its own merits and is patentable because of the combination it recites and not because of the presence or absence of any one particular element.

The Examiner's Statement was not prepared by Applicant and only contains the Examiner's possible positions in one or more reasons for allowability. Thus, any interpretation with respect to the Examiner's Statement of Reasons for Allowance should not be imputed to the Applicant.

Respectfully submitted,

Date: January 4, 2019

By: /Thomas D. Fortenberry/

THOMAS D. FORTENBERRY
Reg. No. 56,537
P.O. Box 2099
Woodville, Texas 75979
Tel. (409) 283-2811
Fax (409) 291-7042
ATTORNEY FOR APPLICANT

Exhibit 1002
Nokia v. Woodbury Wireless Inc.
Page 000007

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112117 7590 12/11/2018
Thomas D. Fortenberry, Attorney at Law
P.O. Box 2099
Woodville, TX 75979

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(Typed or printed name)
(Signature)
(Date)

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
16/120,258	09/01/2018	Roc Lastinger	WBWL001H	3304

TITLE OF INVENTION: MIMO Methods and Systems

APPLN. TYPE	ENTITY STATUS	ISSUE FEE DUE	PUBLICATION FEE DUE	PREV. PAID ISSUE FEE	TOTAL FEE(S) DUE	DATE DUE
nonprovisional	SMALL	$500	$0.00	$0.00	$500	03/11/2019

EXAMINER	ART UNIT	CLASS-SUBCLASS
LEE, SIU M	2632	375-267000

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 03-09 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.

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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 must have been previously recorded, or filed for recordation, as set forth in 37 CFR 3.11 and 37 CFR 3.81(a). Completion of this form is NOT a substitute for filing an assignment.

(A) NAME OF ASSIGNEE: Woodbury Wireless LLC

(B) RESIDENCE: (CITY and STATE OR COUNTRY): Woodville, Texas

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

4a. Fees submitted: ☒ Issue Fee ☐ Publication Fee (if required) ☐ Advance Order - # of Copies _____

4b. Method of Payment: *(Please first reapply any previously paid fee shown above)*

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5. **Change in Entity Status** (from status indicated above)

☐ Applicant certifying micro entity status. See 37 CFR 1.29

☐ Applicant asserting small entity status. See 37 CFR 1.27

☐ Applicant changing to regular undiscounted fee status.

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.
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.
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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 1/4/2019

Typed or printed name Thomas D. Fortenberry Registration No. 56,537

PTOL-85 Part B (08-18) Approved for use through 01/31/2020 OMB 0651-0033 U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE

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Nokia v. Woodbury Wireless Inc.
Page 000008

Electronic Patent Application Fee Transmittal

Application Number:	16120258
Filing Date:	01-Sep-2018
Title of Invention:	MIMO Methods and Systems
First Named Inventor/Applicant Name:	Roc Lastinger
Filer:	THOMAS DONALD FORTENBERRY
Attorney Docket Number:	WBWL001H

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:	34758788
Application Number:	16120258
International Application Number:	
Confirmation Number:	3304
Title of Invention:	MIMO Methods and Systems
First Named Inventor/Applicant Name:	Roc Lastinger
Customer Number:	112117
Filer:	THOMAS DONALD FORTENBERRY
Filer Authorized By:	
Attorney Docket Number:	WBWL001H
Receipt Date:	04-JAN-2019
Filing Date:	01-SEP-2018
Time Stamp:	10:06:47
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	010419INTEFSW10075200
Deposit Account	504964
Authorized User	Thomas Fortenberry
The Director of the USPTO is hereby authorized to charge indicated fees and credit any overpayment as follows: 37 CFR 1.16 (National application filing, search, and examination fees) 37 CFR 1.17 (Patent application and reexamination processing fees)	

37 CFR 1.19 (Document supply fees)

37 CFR 1.20 (Post Issuance fees)

37 CFR 1.21 (Miscellaneous fees and charges)

File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1	Post Allowance Communication - Incoming	20190104_WBWL001H_Comments_20190104.pdf	365701 a68326298c0f94503fcafb352491dc732680fc66	no	5
Warnings:					
Information:					
2	Issue Fee Payment (PTO-85B)	20190104_WBWL001H_fee-trans-doc_11-Dec-2018.pdf	145453 85e15b9384b24e0276cf1443da1094b864c35843	no	1
Warnings:					
Information:					
3	Fee Worksheet (SB06)	fee-info.pdf	29949 d5e01f3109ec328c06a3346b9004a670d5e37d68	no	2
Warnings:					
Information:					
		Total Files Size (in bytes):	541103		

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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.

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APPLICATION NUMBER	FILING OR 371(C) DATE	FIRST NAMED APPLICANT	ATTY. DOCKET NO./TITLE
16/120,258	09/01/2018	Roc Lastinger	WBWL001H

CONFIRMATION NO. 3304

112117
Thomas D. Fortenberry, Attorney at Law
P.O. Box 2099
Woodville, TX 75979

PUBLICATION NOTICE

OC000000104720499

Title:MIMO Methods and Systems

Publication No.US-2018-0375553-A1
Publication Date:12/27/2018

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 Public Records Division. The Public Records Division 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, Public Records Division, 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 https://portal.uspto.gov/pair/PublicPair. Prior to publication, such status information is confidential and may only be obtained by applicant using the private side of PAIR.

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Page 000013

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NOTICE OF ALLOWANCE AND FEE(S) DUE

112117 7590 12/11/2018

Thomas D. Fortenberry, Attorney at Law
P.O. Box 2099
Woodville, TX 75979

EXAMINER	
LEE, SIU M	
ART UNIT	PAPER NUMBER
2632	

DATE MAILED: 12/11/2018

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
16/120,258	09/01/2018	Roc Lastinger	WBWL001H	3304

TITLE OF INVENTION: MIMO Methods and Systems

APPLN. TYPE	ENTITY STATUS	ISSUE FEE DUE	PUBLICATION FEE DUE	PREV. PAID ISSUE FEE	TOTAL FEE(S) DUE	DATE DUE
nonprovisional	SMALL	$500	$0.00	$0.00	$500	03/11/2019

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.

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Page 000014

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(Typed or printed name)
(Signature)
(Date)

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
16/120,258	09/01/2018	Roc Lastinger	WBWL001H	3304

TITLE OF INVENTION: MIMO Methods and Systems

APPLN. TYPE	ENTITY STATUS	ISSUE FEE DUE	PUBLICATION FEE DUE	PREV. PAID ISSUE FEE	TOTAL FEE(S) DUE	DATE DUE
nonprovisional	SMALL	$500	$0.00	$0.00	$500	03/11/2019

EXAMINER	ART UNIT	CLASS-SUBCLASS
LEE, SIU M	2632	375-267000

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 03-09 or more recent) attached. **Use of a Customer Number is required.**

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(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. Fees submitted: ❑ Issue Fee ❑ Publication Fee (if required) ❑ Advance Order - # of Copies _____

4b. Method of Payment: *(Please first reapply any previously paid fee shown above)*

❑ Electronic Payment via EFS-Web ❑ Enclosed check ❑ Non-electronic payment by credit card (Attach form PTO-2038)

❑ The Director is hereby authorized to charge the required fee(s), any deficiency, or credit any overpayment to Deposit Account No. _____

5. **Change in Entity Status** (from status indicated above)

❑ Applicant certifying micro entity status. See 37 CFR 1.29

❑ Applicant asserting small entity status. See 37 CFR 1.27

❑ Applicant changing to regular undiscounted fee status.

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.
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.
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. _____

Exhibit 1002
Nokia v. Woodbury Wireless Inc.
Page 000015

UNITED STATES PATENT AND TRADEMARK OFFICE

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

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
16/120,258	09/01/2018	Roc Lastinger	WBWL001H	3304

112117 7590 12/11/2018

Thomas D. Fortenberry, Attorney at Law
P.O. Box 2099
Woodville, TX 75979

EXAMINER	
LEE, SIU M	
ART UNIT	PAPER NUMBER
2632	

DATE MAILED: 12/11/2018

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.

PTOL-85 (Rev. 02/11)

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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 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, 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. 16/120,258	Applicant(s) Lastinger et al.	
	Examiner SIU M LEE	Art Unit 2632	AIA 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 amendment filed on 10/30/2018.
   ☐ 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 61-90 . 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 areply 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 _____.

/SIU M LEE/
Primary Examiner, Art Unit 2632

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DETAILED ACTION

Notice of Pre-AIA or AIA Status

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

Response to Arguments

2. Applicant's arguments, see page 18, filed on 10/30/0218, with respect to double patenting rejection of claims 31-59 have been fully considered and are persuasive. The double patenting rejection of claims 31-59 has been withdrawn.

Allowable Subject Matter

3. Claims 61-90 are allowed.

4. The following is an examiner's statement of reasons for allowance:

The present in invention describes a computer-implemented method, comprising: providing access to a multiple-input-multiple-output (MIMO)-capable access point including: a plurality of antennas; circuitry in communication with the antennas; and at least one radio in communication with the circuitry; selecting at least one channel based on one or more channel characteristics, for initiating a first transmission to a first portable wireless device and initiating a second transmission to a second portable wireless device, such that at least a portion of the first transmission occurs simultaneously with at least a portion of the second transmission and both occur via a first wireless protocol; receiving first information from the first portable wireless device

that is based on a first measurement performed by the first portable wireless device; receiving second information from the second portable wireless device that is based on a second measurement performed by the second portable wireless device; altering at least one aspect of the first transmission, based on at least one of the first information or the second information, so as to reduce interference between the first transmission and the second transmission when the at least portion of the first transmission occurs simultaneously with the at least portion of the second transmission; altering at least one aspect of the second transmission, based on at least one of the first information or the second information, so as to reduce the interference between the first transmission and the second transmission when the at least portion of the first transmission occurs simultaneously with the at least portion of the second transmission; transmitting first data in connection with the first transmission to the first portable wireless device; transmitting second data in connection with the second transmission to the second portable wireless device; receiving third information from a third portable wireless device that is based on a third measurement performed by the third portable wireless device; altering at least one aspect of a third transmission, based on the third information, for further interference reduction; and transmitting third data in connection with the third transmission to the third portable wireless device, via a second wireless protocol including a 802.11n protocol, where the first wireless protocol includes another 802.11 protocol other than the 802.11n protocol. The closest prior art, US Patent 10,063,297 B1, 10,069,548 B2, and 9,859,963 B2 all disclose a similar method, but were overcame by the terminal disclaimer filed on 10/30/2018, other prior art of reference fails to disclose selecting at least one channel based on one or more channel characteristics,

for initiating a first transmission to a first portable wireless device and initiating a second transmission to a second portable wireless device, such that at least a portion of the first transmission occurs simultaneously with at least a portion of the second transmission and both occur via a first wireless protocol; receiving first information from the first portable wireless device that is based on a first measurement performed by the first portable wireless device; receiving second information from the second portable wireless device that is based on a second measurement performed by the second portable wireless device; altering at least one aspect of the first transmission, based on at least one of the first information or the second information, so as to reduce interference between the first transmission and the second transmission when the at least portion of the first transmission occurs simultaneously with the at least portion of the second transmission; altering at least one aspect of the second transmission, based on at least one of the first information or the second information, so as to reduce the interference between the first transmission and the second transmission when the at least portion of the first transmission occurs simultaneously with the at least portion of the second transmission; transmitting first data in connection with the first transmission to the first portable wireless device; transmitting second data in connection with the second transmission to the second portable wireless device; receiving third information from a third portable wireless device that is based on a third measurement performed by the third portable wireless device; altering at least one aspect of a third transmission, based on the third information, for further interference reduction; and transmitting third data in connection with the third transmission to the third portable wireless device, via a second wireless protocol including a 802.11n protocol, where the first wireless protocol

includes another 802.11 protocol other than the 802.11n protocol. These distinct feature have been added to independent claim 61, and similar feature have been added to independent claims 75, 87, and 89, thus rendering claims 61-90 allowable.

Any comments considered necessary by applicant must be submitted no later than the payment of the issue fee and, to avoid processing delays, should preferably accompany the issue fee. Such submissions should be clearly labeled "Comments on Statement of Reasons for Allowance."

Conclusion

6. Any inquiry concerning this communication or earlier communications from the examiner should be directed to SIU M LEE whose telephone number is (571)270-1083. The examiner can normally be reached on M-T 8:30-7:00.

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, Chieh M Fan can be reached on 571-272-3042. 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.

/SIU M LEE/
Primary Examiner, Art Unit 2632
12/5/2018

Search Notes	Application/Control No.	Applicant(s)/Patent Under Reexamination
	16/120,258	Lastinger et al.
	Examiner	Art Unit
	SIU M LEE	2632

CPC - Searched*		
Symbol	**Date**	**Examiner**
H04B 7/0456, 024, 0495	10/14/2018	Siu M. Lee
H04B 17/15	10/14/2018	Siu M. Lee
H04W 84/12, 18	10/14/2018	Siu M. Lee
H04W 80/04	10/14/2018	Siu M. Lee

CPC Combination Sets - Searched*		
Symbol	**Date**	**Examiner**

US Classification - Searched*			
Class	**Subclass**	**Date**	**Examiner**
370	338 328	10/14/2018	Siu M. Lee
455	422.1, 424, 443, 452.2	10/14/2018	Siu M. Lee
375	259, 260, 267, 285, 295, 296, 299	10/14/2018	Siu M. Lee

* 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**
EAST	10/14/2018	Siu M. Lee
Inventor name search - Roc LASTINGER, John SPENIK, Brian WOODBURY	10/14/2018	Siu M. Lee
Applicant name search - Woodbury Wireless	10/14/2018	Siu M. Lee
EAST	12/05/2018	Siu M. Lee
Inventor name search - Roc LASTINGER, John SPENIK, Brian WOODBURY	12/05/2018	Siu M. Lee
Applicant name search - Woodbury Wireless	12/05/2018	Siu M. Lee

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Search Notes	Application/Control No.	Applicant(s)/Patent Under Reexamination
	16/120,258	Lastinger et al.
	Examiner	Art Unit
	SIU M LEE	2632

Interference Search			
US Class/CPC Symbol	**US Subclass/CPC Group**	**Date**	**Examiner**
H04B	7/0456, 024, 0495	12/05/2018	Siu M. Lee
H04B	17/15	12/05/2018	Siu M. Lee
H04W	84/12, 18	12/05/2018	Siu M. Lee
H04W	80/04	12/05/2018	Siu M. Lee
370	338, 328	12/05/2018	Siu M. Lee
455	422.1, 424, 443, 452.2	12/05/2018	Siu M. Lee
375	259, 260, 267, 285, 295, 296, 299	12/05/2018	Siu M. Lee

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Index of Claims	Application/Control No.	Applicant(s)/Patent Under Reexamination
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	Examiner	Art Unit
	SIU M LEE	2632

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

CLAIMS

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

CLAIM		DATE								
Final	Original	10/14/2018	12/05/2018							
	1	-	-							
	2	-	-							
	3	-	-							
	4	-	-							
	5	-	-							
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	36	✓	-							
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	39	✓	-							
	40	✓	-							
	41	✓	-							
	42	✓	-							

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Index of Claims	Application/Control No.	Applicant(s)/Patent Under Reexamination
	16/120,258	Lastinger et al.
	Examiner	**Art Unit**
	SIU M LEE	2632

CLAIM		DATE								
Final	Original	10/14/2018	12/05/2018							
	43	✓	-							
	44	✓	-							
	45	✓	-							
	46	✓	-							
	47	✓	-							
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	55	✓	-							
	56	✓	-							
	57	✓	-							
	58	✓	-							
	59	✓	-							
	60	O	-							
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2	62		=							
3	63		=							
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24	84		=							
25	85		=							
26	86		=							
27	87		=							
28	88		=							
29	89		=							
30	90		=							

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Index of Claims	Application/Control No.	Applicant(s)/Patent Under Reexamination
	16/120,258	Lastinger et al.
	Examiner	**Art Unit**
	SIU M LEE	2632

CLAIM		DATE								
Final	Original	10/14/2018	12/05/2018							

Index of Claims	Application/Control No.	Applicant(s)/Patent Under Reexamination
	16/120,258	Lastinger et al.
	Examiner	Art Unit
	SIU M LEE	2632

CLAIM		DATE								
Final	Original	10/14/2018	12/05/2018							

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Issue Classification	Application/Control No.	Applicant(s)/Patent Under Reexamination
	16/120,258	Lastinger et al.
	Examiner	**Art Unit**
	SIU M LEE	2632

CPC								
Symbol							**Type**	**Version**
H04B	/	7	/	0456			F	2013-01-01
H04B	/	17	/	15			I	2015-01-15
H04B	/	7	/	0413			I	2013-01-01
H04B	/	7	/	024			I	2013-01-01
H04B	/	7	/	0495			I	2013-01-01

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

NONE		Total Claims Allowed:	
(Assistant Examiner)	(Date)	30	
/SIU M LEE/ Primary Examiner, Art Unit 2632	05 December 2018	O.G. Print Claim(s)	O.G. Print Figure
(Primary Examiner)	(Date)	1	11

U.S. Patent and Trademark Office — Part of Paper No.: 20181204

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Issue Classification	Application/Control No.	Applicant(s)/Patent Under Reexamination
	16/120,258	Lastinger et al.
	Examiner	Art Unit
	SIU M LEE	2632

INTERNATIONAL CLASSIFICATION					
CLAIMED					
H04B	/	7	/	06	

NON-CLAIMED					
	/		/		

US ORIGINAL CLASSIFICATION	
CLASS	SUBCLASS
375	267

CROSS REFERENCES(S)						
CLASS	SUBCLASS (ONE SUBCLASS PER BLOCK)					
375	259	260	267	285	295	299

NONE		Total Claims Allowed:	
(Assistant Examiner)	(Date)	30	
/SIU M LEE/ Primary Examiner, Art Unit 2632	05 December 2018	O.G. Print Claim(s)	O.G. Print Figure
(Primary Examiner)	(Date)	1	11

U.S. Patent and Trademark Office

Part of Paper No.: 20181204

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Issue Classification	Application/Control No.	Applicant(s)/Patent Under Reexamination
	16/120,258	Lastinger et al.
	Examiner	**Art Unit**
	SIU M LEE	2632

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

CLAIMS

Final	Original	Final	Original	Final	Original	Final	Original	Final	Original	Final	Original	Final	Original	Final	Original
	1		13		25		37		49	1	61	13	73	25	85
	2		14		26		38		50	2	62	14	74	26	86
	3		15		27		39		51	3	63	15	75	27	87
	4		16		28		40		52	4	64	16	76	28	88
	5		17		29		41		53	5	65	17	77	29	89
	6		18		30		42		54	6	66	18	78	30	90
	7		19		31		43		55	7	67	19	79		
	8		20		32		44		56	8	68	20	80		
	9		21		33		45		57	9	69	21	81		
	10		22		34		46		58	10	70	22	82		
	11		23		35		47		59	11	71	23	83		
	12		24		36		48		60	12	72	24	84		

NONE		**Total Claims Allowed:**	
(Assistant Examiner)	(Date)	30	
/SIU M LEE/ Primary Examiner, Art Unit 2632	05 December 2018	O.G. Print Claim(s)	O.G. Print Figure
(Primary Examiner)	(Date)	1	11

U.S. Patent and Trademark Office Part of Paper No.: 20181204

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Bibliographic Data

Application No: 16/120,258

Foreign Priority claimed: ○ Yes ◉ No

35 USC 119 (a-d) conditions met: ☐ Yes ☑ No ☐ Met After Allowance

Verified and Acknowledged: /SIU M LEE/ (Examiner's Signature) | (Initials)

Title: MIMO Methods and Systems

FILING or 371(c) DATE	CLASS	GROUP ART UNIT	ATTORNEY DOCKET NO.
09/01/2018	375	2632	WBWL001H
RULE			

APPLICANTS

Woodbury Wireless LLC, Pflugerville, TX, UNITED STATES

INVENTORS

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John Spenik Scottsdale, AZ, UNITED STATES

Brian C. Woodbury Gilbert, AZ, UNITED STATES

CONTINUING DATA

This application is a CON of 15824010 11/28/2017 PAT 10069548

15824010 is a CON of 15406661 01/13/2017 PAT 9859963

15406661 is a CON of 14952874 11/25/2015 PAT 9584197

14952874 is a CON of 14476628 09/03/2014 PAT 9503163

14476628 is a CON of 13348523 01/11/2012 PAT 8855089

13348523 is a CON of 13118386 05/28/2011 PAT 8345651

13118386 is a CON of 11709431 02/21/2007 PAT 8009646

11709431 has PRO of 60743376 02/28/2006

FOREIGN APPLICATIONS

IF REQUIRED, FOREIGN LICENSE GRANTED**

09/19/2018

**** SMALL ENTITY ****

STATE OR COUNTRY

UNITED STATES

ADDRESS

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P.O. Box 2099

Woodville, TX 75979
UNITED STATES

FILING FEE RECEIVED

$3,585

EAST Search History

EAST Search History (Prior Art)

Ref #	Hits	Search Query	DBs	Default Operator	Plurals	Time Stamp
S1	20203	(H04B7/0456 or H04B17/15 or H04B7/024 or H04B7/0495).cpc.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	ADJ	ON	2017/07/17 11:46
S2	20203	(H04B7/0456 or H04B17/15 or H04B7/024 or H04B7/0495).cpc.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	ADJ	ON	2017/07/17 12:56
S3	7602	S2 and mimo	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	ADJ	ON	2017/07/17 12:56
S4	474	S3 and (@pd<="20060228" OR @ad<="20060228" OR @rlad<="20060228" OR @prad<="20060228")	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	ADJ	ON	2017/07/17 12:57
S5	134	S4 and directional antenna	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	ADJ	ON	2017/07/17 13:51
S6	7	14/952874	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	ADJ	ON	2017/07/17 17:42
S7	1	S6 and (protocol).clm.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	ADJ	ON	2017/07/17 18:05
S8	6	S6 and (third).clm.	US-PGPUB;	ADJ	ON	2017/07/17

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			USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB			18:05
S9	43	"38325250".FMID.	US-PGPUB; USPAT; FPRS	ADJ	ON	2017/07/17 18:10
S10	95	(("LASTINGER") near3 ("Roc")).INV.	US-PGPUB; USPAT; USOCR	ADJ	ON	2017/07/17 18:34
S11	78	(("SPENIK") near3 ("John")).INV.	US-PGPUB; USPAT; USOCR	ADJ	ON	2017/07/17 18:34
S12	75	(("WOODBURY") near3 ("Brian")).INV.	US-PGPUB; USPAT; USOCR	ADJ	ON	2017/07/17 18:34
S13	16	(Woodbury Wireless).as. or (Woodbury Wireless).aanm.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	ADJ	ON	2017/07/17 18:35
S14	58	(S10 or S11 or S12 or S13) and mimo and direction$2 antenna	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	ADJ	ON	2017/07/17 18:35
S15	15	S14 and (third).clm.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	ADJ	ON	2017/07/17 19:45
S16	1	15/406661 and radio	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	ADJ	ON	2017/07/18 08:44
S17	95	(("LASTINGER") near3 ("Roc")).INV.	US-PGPUB; USPAT; USOCR	ADJ	ON	2017/07/18 11:17
S18	78	(("SPENIK") near3 ("John")).INV.	US-PGPUB; USPAT; USOCR	ADJ	ON	2017/07/18 11:17
S19	75	(("WOODBURY") near3 ("Brian")).INV.	US-PGPUB; USPAT; USOCR	ADJ	ON	2017/07/18 11:17
S20	16	(Woodbury Wireless).as. or (Woodbury Wireless).aanm.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO;	ADJ	ON	2017/07/18 11:17

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			DERWENT; IBM_TDB			
S21	58	(S17 or S18 or S19 or S20) and mimo and direction$2 antenna	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	ADJ	ON	2017/07/18 11:17
S22	6	14/952867	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	ADJ	ON	2017/07/18 12:09
S23	139731	(H04B7/0456,024,0495 or H04B17/15 or H04W84/12,18 or H04W80/04).cpc.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	ADJ	ON	2017/07/18 12:55
S24	102161	(370/338,328 or 455/422.1,424,443,452.2 or 375/259,260,267,285,295,296,299).ccls.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	ADJ	ON	2017/07/18 12:59
S25	1283	(S23 or S24) and mimo and directional antenna	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	ADJ	ON	2017/07/18 13:01
S26	100	S25 and (adaptive with beamforming)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	ADJ	ON	2017/07/18 13:01
S27	45	S26 and (@pd<="20060228" OR @ad<="20060228" OR @rlad<="20060228" OR @prad<="20060228")	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	ADJ	ON	2017/07/18 13:01
S28	45	S27 not (S17 or S18 or S19 or S20)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	ADJ	ON	2017/07/18 13:02
S29	1366	mimo same direction$2 antenna	US-PGPUB; USPAT; USOCR;	ADJ	ON	2017/07/18 13:28

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			FPRS; EPO; JPO; DERWENT; IBM_TDB			
S32	75	S29 and (adaptive with beamform$3)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	ADJ	ON	2017/07/18 13:29
S33	70	S32 and protocol	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	ADJ	ON	2017/07/18 13:33
S34	38	S33 and (@pd<="20060228" OR @ad<="20060228" OR @rlad<="20060228" OR @prad<="20060228")	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	ADJ	ON	2017/07/18 13:34
S35	364	S29 and (@pd<="20060228" OR @ad<="20060228" OR @rlad<="20060228" OR @prad<="20060228")	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	ADJ	ON	2017/07/18 13:42
S36	230	S35 and protocol	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	ADJ	ON	2017/07/18 13:43
S37	28	S36 and ((receiv$3 or feedback) with information with measur$5)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	ADJ	ON	2017/07/18 13:44
S38	87	S29 and (overlap$4 with mimo)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	ADJ	ON	2017/07/18 14:34
S39	68	S38 and (@pd<="20060228" OR @ad<="20060228" OR @rlad<="20060228" OR @prad<="20060228")	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	ADJ	ON	2017/07/18 14:34
S40	0	"9496931".pn. and protocol.clm.	US-PGPUB;	ADJ	ON	2017/07/18

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			USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB			15:01
S41	1	"9496931".pn. and (select$3 with channel).clm.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	ADJ	ON	2017/07/18 15:04
S42	1	"9496930".pn. and (select$3 with channel).clm.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	ADJ	ON	2017/07/18 15:13
S43	0	"9496931".pn. and (protocol).clm.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	ADJ	ON	2017/07/18 15:23
S44	1	"9496931".pn. and (select$3).clm.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	ADJ	ON	2017/07/18 15:24
S45	0	"9503163".pn. and (protocol).clm.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	ADJ	ON	2017/07/18 15:30
S46	1	"9503163".pn. and (select$3).clm.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	ADJ	ON	2017/07/18 15:30
S47	0	"8855089".pn. and (select$3).clm.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	ADJ	ON	2017/07/18 15:42
S48	0	"8855089".pn. and (protocol).clm.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT;	ADJ	ON	2017/07/18 15:48

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			IBM_TDB			
S49	0	"8855089".pn. and (select$3 with channel).clm.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	ADJ	ON	2017/07/18 15:48
S50	2	"8855089".pn.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	ADJ	ON	2017/07/18 15:49
S51	3	"8345651".pn.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	ADJ	ON	2017/07/18 15:50
S65	1	"9503163".pn. and protocol	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	ADJ	ON	2017/07/19 21:36
S66	0	14/952874.pn. and protocol	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	ADJ	ON	2017/07/19 21:36
S67	7	14/952874 and protocol	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	ADJ	ON	2017/07/19 21:36
S68	5	S67 and (direct$3 with transmi$5).clm.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	ADJ	ON	2017/07/19 22:16
S84	23	((("9503163") or ("8855089") or ("8345651") or ("8009646")).PN.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2017/10/23 13:35
S85	0	S84 and (protocol).clm.	US-PGPUB; USPAT; USOCR; FPRS;	ADJ	ON	2017/10/23 13:35

			EPO; JPO; DERWENT; IBM_TDB			
S86	1	S84 and (information with device).clm.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	ADJ	ON	2017/10/23 13:39
S103	3	15/406661	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	ADJ	ON	2018/05/09 13:25
S104	0	"9859963".pn. and "802".clm.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	ADJ	ON	2018/05/09 13:42
S105	2	15/406661 and "802"."11".clm.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	ADJ	ON	2018/05/09 13:42
S106	2	15/406661 and "802"."11?".clm.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	ADJ	ON	2018/05/09 13:43
S107	0	15/406661 and "802?11?".clm.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	ADJ	ON	2018/05/09 13:43
S108	2	15/406661 and ("802.11?" or "802.11").clm.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	ADJ	ON	2018/05/09 13:44
S109	3	15/406661 and ("802.11n" or "802.11").clm.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	ADJ	ON	2018/05/09 13:44
S110	200	("20010033622" | "20010046866" | "20010053677" | "20020006120" |	US-PGPUB; USPAT	ADJ	ON	2018/05/09 15:54

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		"6178328" | "6181918" | "6219541" | "6219554" | "6229486" | "6230016" | "6243584" | "6246674" | "6249256" | "6259685" | "6266527" | "6272337" | "6272348" | "6278723" | "6295453" | "6304762" | "6317598" | "6330429" | "6334057" | "6351643" | "6360107" | "6388999" | "6400697" | "6400704" | "6400955" | "6405043" | "6405058" | "6418316" | "6421542" | "6438386" | "6459901" | "6463301" | "6470183" | "6470195" | "6473467" | "6480558" | "6486832" | "6487414" | "6493331" | "6496490" | "6497599" | "6505045" | "6507568" | "6519240" | "6522885" | "6531985" | "6539203" | "6542485" | "6542736" | "6549169" | "6560443" | "6580912" | "6591108" | "6597920" | "6597927" | "6606499" | "6615047" | "6650655" | "6654612" | "6690657" | "6693510" | "6697626" | "6708036" | "6728544" | "6738599" | "6741837" | "6744743" | "6748218" | "6774864" | "6795409" | "6842632" | "6870515" | "6871073" | "6889047" | "6898431" | "6906674" | "6914577" | "6930991" | "6940845" | "6952454" | "6975666" | "6999772" | "7006464" | "7010015" | "7039441" | "7042856" | "7042858" | "7047473" | "7050812" | "7069009" | "7085572" | "7085579" | "7095709" | "7103325" | "7120395" | "7130636" | "7133380" | "7136654" | "7145880" | "7149239" | "7149255" | "7167690" | "7171248" | "7177298" | "7180877" | "7181258" | "7184772" | "7187933" | "7193562" | "7194017" | "7200405" | "7202824" | "7212822" | "7216267" | "7224977" | "7233810" | "7257376" | "7274944" | "7280467" | "7280829" | "7292198" | "7302278" | "7305246" | "7308270" | "7315533" | "7317750" | "7336930" | "7336956" | "7348930" | "7349480" | "7349496" | "7349701" | "7358912" | "7359675" | "7362280" | "7366178" | "7373151" | "7373176" | "7382840" | "7386036").PN.				
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		"7813441" | "7817603" | "7822386" | "7860502" | "7864735" | "7873319" | "7876838" | "7876840" | "7880683" | "7893882" | "7899497" | "7912012" | "7924879" | "7924949" | "7929921" | "7961696" | "7962826" | "7965252" | "7978608" | "7979072" | "7990841" | "7995512" | "8005128" | "8009646" | "8018904" | "8018975" | "8023466" | "8036129" | "8045988" | "8050178" | "8085814" | "8090006" | "8098683" | "8111678" | "8121177" | "8130854" | "8139658" | "8165094" | "8194776" | "8213292" | "8238342" | "8248993" | "8249024" | "8254259" | "8265675" | "8270383" | "8279836" | "8289902" | "8295884" | "8312142" | "8325695" | "8331324" | "8340072" | "8345651" | "8355321" | "8391338" | "8400922" | "8428039" | "8428636" | "8437760" | "8437761" | "8441918" | "8442009" | "8442051" | "8446879" | "8446892" | "8457263" | "8477803" | "8514863" | "8515352" | "8537782" | "8547951" | "8571132" | "8572250" | "8582441" | "8594252" | "8611305" | "8619713" | "8654648" | "8654689" | "8675509" | "8681684" | "8706116" | "8724480" | "8767885" | "8780957" | "8781399" | "8830816" | "8842581" | "8848765" | "8855089" | "8909226" | "8942082" | "8964912" | "8971461" | "9025581" | "9036515" | "9049610" | "9055545" | "9071403" | "9100152" | "9100964").PN.				
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		"20050002323"	"20050003763"				
		"20050003865"	"20050009476"				
		"20050018789"	"20050025271"				
		"20050026616"	"20050037766"				
		"20050047485"	"20050070294"				
		"20050075084"	"20050078742"				
		"20050085195"	"20050107091"				
		"20050111376"	"20050129218"				
		"20050141545"	"20050141593"				
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		"20050245270"	"20050272432"				
		"20050277400"	"20050277422"				
		"20050281228"	"20060002346"				
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		"20060072629"	"20060077935"				
		"20060088007"	"20060093067"				
		"20060104334"	"20060121946"				
		"20060133519"	"20060135169"				
		"20060146760"	"20060148484"				
		"20060159160"	"20060182063"				
		"20060192720"	"20060193268"				
		"20060195576"	"20060198459"				
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		"20060217124"	"20060227730"				
		"20060229017"	"20060233277"				
		"20060234777"	"20060245509"				
		"20060252436"	"20060262750"				
		"20060268962"	"20060276212"				
		"20060291371"	"20070010957"				
		"20070014387"	"20070025236"				
		"20070026807"	"20070054621"				
		"20070064586"	"20070066362"				
		"20070070937"	"20070070954"				
		"20070072550"	"20070081448"				
		"20070081455"	"20070093273"				
		"20070104165"	"20070105508"				
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		"20080279125"	"20090022066"				
		"20090022098"	"20090060076"				
		"20090103494"	"20090129334"				
		"20090168700"	"20090175222"				
		"20090180411"	"20090252200"				
		"20090274232"	"20090305711"				
		"20090327546"	"20100002585"				
		"20100002597"	"20100002618"				
		"20100020815"	"20100034148"				
		"20100040034"	"20100061243"				
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		"20100098014"	"20100142479"				
		"20100142638"	"20100238902"				
		"20100254354"	"20110019608"				
		"20110019656"	"20110064066"				
		"20110064172"	"20110069742"				

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		"20110096751" | "20110149869" | "20110149870" | "20110149997" | "20110206108" | "20110222504" | "20110228870" | "20110230141" | "20110235618" | "20110237262" | "20110244868" | "20110281603" | "20110292974" | "20110310725").PN.				
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		"6418316" | "6421542" | "6438386" | "6459901" | "6463301" | "6470183" | "6470195" | "6473467" | "6480558" | "6486832" | "6487414" | "6493331" | "6496490" | "6497599" | "6505045" | "6507568" | "6519240" | "6522885" | "6531985" | "6539203" | "6542485" | "6542736" | "6549169" | "6560443" | "6580912" | "6591108" | "6597920" | "6597927" | "6606499" | "6615047" | "6650655" | "6654612" | "6690657" | "6693510" | "6697626" | "6708036" | "6728544" | "6738599" | "6741837" | "6744743" | "6748218" | "6774864" | "6795409" | "6842632" | "6870515" | "6871073" | "6889047" | "6898431" | "6906674" | "6914577" | "6930991" | "6940845" | "6952454" | "6975666" | "6999772" | "7006464" | "7010015" | "7039441" | "7042856" | "7042858" | "7047473" | "7050812" | "7069009" | "7085572" | "7085579" | "7095709" | "7103325" | "7120395" | "7130636" | "7133380" | "7136654" | "7145880" | "7149239" | "7149255" | "7167690" | "7171248" | "7177298" | "7180877" | "7181258" | "7184772" | "7187933" | "7193562" | "7194017" | "7200405" | "7202824" | "7212822" | "7216267" | "7224977" | "7233810" | "7257376" | "7274944" | "7280467" | "7280829" | "7292198" | "7302278" | "7305246" | "7308270" | "7315533" | "7317750" | "7336930" | "7336956" | "7348930" | "7349480" | "7349496" | "7349701" | "7358912" | "7359675" | "7362280" | "7366178" | "7373151" | "7373176" | "7382840" | "7386036").PN.				
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		"8036129" | "8045988" | "8050178" | "8085814" | "8090006" | "8098683" | "8111678" | "8121177" | "8130854" | "8139658" | "8165094" | "8194776" | "8213292" | "8238342" | "8248993" | "8249024" | "8254259" | "8265675" | "8270383" | "8279836" | "8289902" | "8295884" | "8312142" | "8325695" | "8331324" | "8340072" | "8345651" | "8355321" | "8391338" | "8400922" | "8428039" | "8428636" | "8437760" | "8437761" | "8441918" | "8442009" | "8442051" | "8446879" | "8446892" | "8457263" | "8477803" | "8514863" | "8515352" | "8537782" | "8547951" | "8571132" | "8572250" | "8582441" | "8594252" | "8611305" | "8619713" | "8654648" | "8654689" | "8675509" | "8681684" | "8706116" | "8724480" | "8767885" | "8780957" | "8781399" | "8830816" | "8842581" | "8848765" | "8855089" | "8909226" | "8942082" | "8964912" | "8971461" | "9025581" | "9036515" | "9049610" | "9055545" | "9071403" | "9100152" | "9100964").PN.				
S122	64	(S110 or S111 or S112 or S113 or S114 or S115 or S116 or S117 or S118 or S119 or S120 or S121) and mimo and directional antenna	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	ADJ	ON	2018/05/09 15:58
S123	32	S122 and "802.11"	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	ADJ	ON	2018/05/09 16:03
S124	5	S122 and "802.11n"	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	ADJ	ON	2018/05/09 16:03
S125	100	(("LASTINGER") near3 ("Roc")).INV.	US-PGPUB; USPAT; USOCR	ADJ	ON	2018/05/09 16:09
S126	80	(("SPENIK") near3 ("John")).INV.	US-PGPUB; USPAT; USOCR	ADJ	ON	2018/05/09 16:09
S127	80	(("WOODBURY") near3 ("Brian")).INV.	US-PGPUB; USPAT; USOCR	ADJ	ON	2018/05/09 16:10
S128	47	woodbury.as. or woodbury.aanm.	US-PGPUB; USPAT; USOCR	ADJ	ON	2018/05/09 16:10
S129	7	(S125 or S126 or S127 or S128) and mimo and directional antenna and	US-PGPUB; USPAT;	ADJ	ON	2018/05/09 16:10

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		"802.11n"	USOCR			
S130	3	15/406661 and means	US-PGPUB; USPAT; USOCR	ADJ	ON	2018/05/09 16:27
S131	155354	(H04B7/0456,024,0495 or H04B17/15 or H04W84/12,18 or H04W80/04).cpc.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	ADJ	ON	2018/05/09 18:17
S132	104268	(370/338,328 or 455/422.1,424,443,452.2 or 375/259,260,267,285,295,296,299).ccls.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	ADJ	ON	2018/05/09 18:17
S133	486	(S131 or S132) and mimo and directional antenna and "802.11n"	US-PGPUB; USPAT; USOCR	ADJ	ON	2018/05/09 18:18
S134	77	S133 and (@pd<="20060228" OR @ad<="20060228" OR @rlad<="20060228" OR @prad<="20060228")	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	ADJ	ON	2018/05/09 18:18
S135	2	S134 and (adaptive with beamforming)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	ADJ	ON	2018/05/09 18:18
S136	1242	("6" or "7") and mimo and directional antenna and "802.11n"	US-PGPUB; USPAT; USOCR	ADJ	ON	2018/07/14 17:17
S150	171444	(H04B7/0456,024,0495 or H04B17/15 or H04W84/12,18 or H04W80/04).cpc.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	ADJ	ON	2018/10/11 14:53
S151	106089	(370/338,328 or 455/422.1,424,443,452.2 or 375/259,260,267,285,295,296,299).ccls.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	ADJ	ON	2018/10/11 14:53
S152	1528	(S150 or S151) and mimo and directional antenna	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	ADJ	ON	2018/10/11 15:36
S153	103	S152 and (adaptive with beamforming)	US-PGPUB;	ADJ	ON	2018/10/11

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		and (protocol or "802.11")	USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB			15:36
S154	102	(("LASTINGER") near3 ("Roc")).INV.	US-PGPUB; USPAT; USOCR	ADJ	ON	2018/10/11 17:22
S155	82	(("SPENIK") near3 ("John")).INV.	US-PGPUB; USPAT; USOCR	ADJ	ON	2018/10/11 17:22
S156	82	(("WOODBURY") near3 ("Brian")).INV.	US-PGPUB; USPAT; USOCR	ADJ	ON	2018/10/11 17:23
S157	22	(Woodbury Wireless).as. or (Woodbury Wireless).aanm.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	ADJ	ON	2018/10/11 17:23
S158	64	(S154 or S155 or S156 or S157) and mimo and directional antenna	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	ADJ	ON	2018/10/11 17:23
S159	0	S158 and (adaptive with beamforming) and (protocol or "802.11")	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	ADJ	ON	2018/10/11 17:23
S160	58	S158 and (protocol or "802.11")	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	ADJ	ON	2018/10/11 17:23
S161	58	S160 not S153	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	ADJ	ON	2018/10/11 17:23
S162	4	"10069548".pn.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	ADJ	ON	2018/10/11 17:49
S163	1	"10069548".pn. and (protocol).clm.	US-PGPUB; USPAT; USOCR;	ADJ	ON	2018/10/11 18:30

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			FPRS; EPO; JPO; DERWENT; IBM_TDB			
S164	3	"9859963".pn.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	ADJ	ON	2018/10/12 17:30
S165	7	"10063297".pn.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	ADJ	ON	2018/10/12 18:29
S166	16087	MU mimo	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	ADJ	ON	2018/10/13 22:35
S167	676	S166 and directional antenna	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	ADJ	ON	2018/10/13 22:44
S168	15	S167 and (@pd<="20060228" OR @ad<="20060228" OR @rlad<="20060228" OR @prad<="20060228")	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	ADJ	ON	2018/10/13 22:44
S169	8	10/749293	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	ADJ	ON	2018/10/13 23:32
S170	9	("2005/0141495").URPN.	USPAT	ADJ	ON	2018/10/13 23:33
S171	258	("20010046866" | "20010053677" | "20020006120" | "20020019233" | "20020037729" | "20020077152" | "20020149534" | "20020159405" | "20020197984" | "20030002442" | "20030087645" | "20030109285" | "20030125089" | "20030181180" | "20030184490" | "20030201937" | "20030210665" | "20040009791" | "20040106412" | "20040125779" | "20040150580" | "20040174303" | "20040183726" | "20040196834" | "20040217913" | "20050003763" |	US-PGPUB; USPAT	ADJ	ON	2018/10/14 00:20

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		"6898431" | "6906674" | "6914577" | "6930991" | "6940845" | "6975666" | "6999772" | "7010015" | "7039441" | "7042856" | "7050812" | "7069009" | "7085572" | "7085579" | "7130636" | "7133380" | "7136654" | "7145880" | "7149255" | "7171248" | "7177298" | "7180877" | "7181258" | "7184772" | "7187933" | "7193562" | "7194017" | "7200405" | "7202824" | "7212822" | "7216267" | "7257376" | "7274944" | "7280829" | "7292198" | "7302278" | "7305246" | "7308270" | "7315533" | "7336930" | "7336956" | "7348930" | "7349480" | "7349701" | "7358912" | "7359675" | "7362280" | "7366178" | "7373151" | "7373176" | "7382840" | "7400860" | "7415288" | "7424298").PN.				
S172	42	("7428269" | "7466985" | "7489282" | "7496147" | "7498996" | "7498999" | "7511680" | "7522515" | "7522552" | "7525486" | "7535866" | "7595756" | "7599699" | "7616959" | "7639106" | "7646343" | "7652632" | "7664195" | "7675474" | "7796544" | "7822386" | "7873319" | "7876838" | "7880683" | "7893882" | "7899497" | "7965252" | "8009646" | "8111678" | "8130854" | "8139658" | "8248993" | "8270383" | "8289902" | "8325695" | "8345651" | "8428039" | "8537782" | "8767885" | "8855089" | "8971461" | "9100152").PN.	US-PGPUB; USPAT	ADJ	ON	2018/10/14 00:20
S173	258	("20010046866" | "20010053677" | "20020006120" | "20020019233" | "20020037729" | "20020077152" | "20020149534" | "20020159405" | "20020197984" | "20030002442" | "20030087645" | "20030109285" | "20030125089" | "20030181180" | "20030184490" | "20030201937" | "20030210665" | "20040009791" | "20040106412" | "20040125779" | "20040150580" | "20040174303" | "20040183726" | "20040196834" | "20040217913" | "20050003763" | "20050003865" | "20050009476" | "20050037766" | "20050070294" | "20050075084" | "20050107091" | "20050169396" | "20050208949" | "20050245270" | "20050272432" | "20060013285" | "20060038738" | "20060104334" | "20060148484" | "20060192720" | "20060217124" | "20060262750" | "20070026807" | "20070070937" | "20070297371" | "20080024382" | "20080125154" | "20090022066" | "20100002618" | "20110228870" | "20110230141" | "20110281603" | "20110310874" | "20120147982" | "2272312" | "3317912" | "3681770" | "3803625" | "4101901" | "4128740" | "4144496" | "4475010" |	US-PGPUB; USPAT	ADJ	ON	2018/10/14 00:21

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		"4736453"	"4825222"	"4829554"			
		"5113525"	"5134709"	"5161249"			
		"5212930"	"5265263"	"5276907"			
		"5307507"	"5365571"	"5396649"			
		"5404574"	"5448761"	"5475864"			
		"5491833"	"5491837"	"5507008"			
		"5548813"	"5574977"	"5590399"			
		"5603082"	"5606727"	"5613200"			
		"5649292"	"5684491"	"5697059"			
		"5722043"	"5726978"	"5732353"			
		"5740536"	"5771449"	"5771454"			
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		"5818385"	"5828948"	"5835859"			
		"5887263"	"5896573"	"5901356"			
		"5926763"	"5956643"	"5960349"			
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		"6055230"	"6069591"	"6070090"			
		"6091954"	"6095820"	"6104935"			
		"6108321"	"6112092"	"6118767"			
		"6119011"	"6128497"	"6128498"			
		"6134442"	"6138024"	"6154654"			
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		"6219541"	"6219554"	"6229486"			
		"6230016"	"6243584"	"6246674"			
		"6249256"	"6259685"	"6266527"			
		"6272337"	"6272348"	"6278723"			
		"6295453"	"6304762"	"6317598"			
		"6330429"	"6334057"	"6351643"			
		"6360107"	"6388999"	"6400697"			
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		"6405058"	"6418316"	"6421542"			
		"6438386"	"6459901"	"6463301"			
		"6470183"	"6470195"	"6480558"			
		"6486832"	"6487414"	"6496490"			
		"6497599"	"6505045"	"6507568"			
		"6519240"	"6522885"	"6531985"			
		"6539203"	"6542485"	"6542736"			
		"6549169"	"6560443"	"6580912"			
		"6591108"	"6597920"	"6597927"			
		"6606499"	"6615047"	"6650655"			
		"6654612"	"6690657"	"6693510"			
		"6697626"	"6708036"	"6728544"			
		"6738599"	"6741837"	"6744743"			
		"6748218"	"6774864"	"6795409"			
		"6870515"	"6871073"	"6889047"			
		"6898431"	"6906674"	"6914577"			
		"6930991"	"6940845"	"6975666"			
		"6999772"	"7010015"	"7039441"			
		"7042856"	"7050812"	"7069009"			
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		"7133380"	"7136654"	"7145880"			
		"7149255"	"7171248"	"7177298"			
		"7180877"	"7181258"	"7184772"			
		"7187933"	"7193562"	"7194017"			
		"7200405"	"7202824"	"7212822"			
		"7216267"	"7257376"	"7274944"			
		"7280829"	"7292198"	"7302278"			
		"7305246"	"7308270"	"7315533"			
		"7336930"	"7336956"	"7348930"			
		"7349480"	"7349701"	"7358912"			
		"7359675"	"7362280"	"7366178"			
		"7373151"	"7373176"	"7382840"			

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		"7400860" | "7415288" | "7424298").PN.				
S174	42	("7428269" | "7466985" | "7489282" | "7496147" | "7498996" | "7498999" | "7511680" | "7522515" | "7522552" | "7525486" | "7535866" | "7595756" | "7599699" | "7616959" | "7639106" | "7646343" | "7652632" | "7664195" | "7675474" | "7796544" | "7822386" | "7873319" | "7876838" | "7880683" | "7893882" | "7899497" | "7965252" | "8009646" | "8111678" | "8130854" | "8139658" | "8248993" | "8270383" | "8289902" | "8325695" | "8345651" | "8428039" | "8537782" | "8767885" | "8855089" | "8971461" | "9100152").PN.	US-PGPUB; USPAT	ADJ	ON	2018/10/14 00:21
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S177	3	(S171 or S172 or S173 or S174 or S175 or S176) and mimo and protocol and "802.11n"	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	ADJ	ON	2018/10/14 00:23

EAST Search History (Interference)

Ref #	Hits	Search Query	DBs	Default Operator	Plurals	Time Stamp
S52	42070	(H04B7/0456,024,0495 or H04B17/15 or H04W84/12,18 or H04W80/04).cpc.	US-PGPUB; USPAT	ADJ	ON	2017/07/18 20:43
S53	68358	(370/338,328 or 455/422.1,424,443,452.2 or 375/259,260,267,285,295,296,299).ccls.	US-PGPUB; USPAT	ADJ	ON	2017/07/18 20:43
S54	180	(S52 and S53) and mimo and directional antenna	US-PGPUB; USPAT	ADJ	ON	2017/07/18 20:44
S55	65	S54 and (@pd<="20060228" OR @ad<="20060228" OR @rlad<="20060228" OR @prad<="20060228")	US-PGPUB; USPAT	ADJ	ON	2017/07/18 20:44
S56	61	S55 and protocol	US-PGPUB; USPAT	ADJ	ON	2017/07/18 20:44
S57	3832	mimo and directional antenna	US-PGPUB; USPAT	ADJ	ON	2017/07/18 21:39
S58	985	S57 and (antenna with protocol)	US-PGPUB; USPAT	ADJ	ON	2017/07/18 21:39
S59	8	S57 and (first protocol same second protocol)	US-PGPUB; USPAT	ADJ	ON	2017/07/18 21:40
S60	95	(("LASTINGER") near3 ("Roc")).INV.	US-PGPUB; USPAT	ADJ	ON	2017/07/18 21:43
S61	78	(("SPENIK") near3 ("John")).INV.	US-PGPUB; USPAT	ADJ	ON	2017/07/18 21:44
S62	75	(("WOODBURY") near3 ("Brian")).INV.	US-PGPUB; USPAT	ADJ	ON	2017/07/18 21:44
S63	10	(Woodbury Wireless).as. or (Woodbury Wireless).aanm.	US-PGPUB; USPAT	ADJ	ON	2017/07/18 21:44
S64	53	(S60 or S61 or S62 or S63) and mimo and direction$2 antenna	US-PGPUB; USPAT	ADJ	ON	2017/07/18 21:46
S69	193	MIMO and (overlap$4 with sector) and directional antenna	US-PGPUB; USPAT	ADJ	ON	2017/07/19 22:22
S70	78	S69 and (@pd<="20060228" OR @ad<="20060228" OR @rlad<="20060228" OR @prad<="20060228")	US-PGPUB; USPAT	ADJ	ON	2017/07/19 22:22
S71	96	(("LASTINGER") near3 ("Roc")).INV.	US-	ADJ	ON	2017/10/22

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			PGPUB; USPAT			18:23
S72	78	(("SPENIK") near3 ("John")).INV.	US-PGPUB; USPAT	ADJ	ON	2017/10/22 18:23
S73	76	(("WOODBURY") near3 ("Brian")).INV.	US-PGPUB; USPAT	ADJ	ON	2017/10/22 18:23
S74	10	(Woodbury Wireless).as. or (Woodbury Wireless).aanm.	US-PGPUB; USPAT	ADJ	ON	2017/10/22 18:24
S75	18	(S71 or S72 or S73 or S74) and mimo and direction$2 antenna and (transmi$5 with simultaneous$2)	US-PGPUB; USPAT	ADJ	ON	2017/10/22 18:30
S76	2	(S71 or S72 or S73 or S74) and mimo and direction$2 antenna and (transmi$5 with simultaneous$2).clm.	US-PGPUB; USPAT	ADJ	ON	2017/10/22 18:31
S77	44043	(H04B7/0456,024,0495 or H04B17/15 or H04W84/12,18 or H04W80/04).cpc.	US-PGPUB; USPAT	ADJ	ON	2017/10/22 19:02
S78	68402	(370/338,328 or 455/422.1,424,443,452.2 or 375/259,260,267,285,295,296,299).ccls.	US-PGPUB; USPAT	ADJ	ON	2017/10/22 19:02
S79	659	(S77 or S78) and mimo and direction$2 antenna and (transmi$5 with simultaneous$2)	US-PGPUB; USPAT	ADJ	ON	2017/10/22 19:02
S80	191	S79 and (@pd<="20060228" OR @ad<="20060228" OR @rlad<="20060228" OR @prad<="20060228")	US-PGPUB; USPAT	ADJ	ON	2017/10/22 19:02
S81	155	S80 and protocol	US-PGPUB; USPAT	ADJ	ON	2017/10/22 19:03
S82	57	S81 and (feedback with antenna)	US-PGPUB; USPAT	ADJ	ON	2017/10/22 19:04
S83	73	(S80) and (interference with transmi$5 with simultaneous$2)	US-PGPUB; USPAT	ADJ	ON	2017/10/22 19:05
S87	44043	(H04B7/0456,024,0495 or H04B17/15 or H04W84/12,18 or H04W80/04).cpc.	US-PGPUB; USPAT	ADJ	ON	2017/10/23 09:55
S88	68402	(370/338,328 or 455/422.1,424,443,452.2 or 375/259,260,267,285,295,296,299).ccls.	US-PGPUB; USPAT	ADJ	ON	2017/10/23 09:55
S89	659	(S87 or S88) and mimo and direction$2 antenna and (transmi$5 with simultaneous$2)	US-PGPUB; USPAT	ADJ	ON	2017/10/23 09:55
S90	191	S89 and (@pd<="20060228" OR @ad<="20060228" OR @rlad<="20060228" OR @prad<="20060228")	US-PGPUB; USPAT	ADJ	ON	2017/10/23 09:55
S91	73	(S90) and (interference with transmi$5 with simultaneous$2)	US-PGPUB; USPAT	ADJ	ON	2017/10/23 09:55
S92	0	S91 and (adaptive with directional antenna) and (interference with directinal antenna)	US-PGPUB; USPAT	ADJ	ON	2017/10/23 09:55
S93	34	S91 and (adaptive with directional antenna)	US-	ADJ	ON	2017/10/23

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			PGPUB; USPAT			10:02
S94	15	(10/880387 or 10/869201) and (feedback or (information with device))	US-PGPUB; USPAT	ADJ	ON	2017/10/23 11:31
S95	13413	(directional antenna) and (@pd<="20060228" OR @ad<="20060228" OR @rlad<="20060228" OR @prad<="20060228")	US-PGPUB; USPAT	ADJ	ON	2017/10/23 11:40
S96	174	S95 and ((feedback or (information with device)) with (alter$3 or adjust$4 or chang$3) with antenna)	US-PGPUB; USPAT	ADJ	ON	2017/10/23 11:45
S97	4	adjust$4 with directional antenna with ((reduc$3 or mitigat$3) near3 interference)	US-PGPUB; USPAT	ADJ	ON	2017/10/23 13:06
S98	0	(adapt$3 or adjust$4) with directional antenna with ((reduc$3 or mitigat$3) near3 interference) with beamform$3	US-PGPUB; USPAT	ADJ	ON	2017/10/23 16:19
S99	41	(adapt$3 or adjust$4) with directional antenna with beamform$3	US-PGPUB; USPAT	ADJ	ON	2017/10/23 16:19
S100	8	S99 and (@pd<="20060228" OR @ad<="20060228" OR @rlad<="20060228" OR @prad<="20060228")	US-PGPUB; USPAT	ADJ	ON	2017/10/23 16:19
S101	159	(adapt$3 or adjust$4) with beamform$3 with interference with (device or UE or terminal or user equipment)	US-PGPUB; USPAT	ADJ	ON	2017/10/23 16:32
S102	26	S101 and (@pd<="20060228" OR @ad<="20060228" OR @rlad<="20060228" OR @prad<="20060228")	US-PGPUB; USPAT	ADJ	ON	2017/10/23 16:32
S137	100	(("LASTINGER") near3 ("Roc")).INV.	US-PGPUB; USPAT	ADJ	ON	2018/07/14 17:08
S138	80	(("SPENIK") near3 ("John")).INV.	US-PGPUB; USPAT	ADJ	ON	2018/07/14 17:08
S139	80	(("WOODBURY") near3 ("Brian")).INV.	US-PGPUB; USPAT	ADJ	ON	2018/07/14 17:08
S140	47	woodbury.as. or woodbury.aanm.	US-PGPUB; USPAT	ADJ	ON	2018/07/14 17:08
S141	7	(S137 or S138 or S139 or S140) and mimo and directional antenna and "802.11n"	US-PGPUB; USPAT	ADJ	ON	2018/07/14 17:08
S142	50413	(H04B7/0456,024,0495 or H04B17/15 or H04W84/12,18 or H04W80/04).cpc.	US-PGPUB; USPAT	ADJ	ON	2018/07/14 17:17
S143	68429	(370/338,328 or 455/422.1,424,443,452.2 or 375/259,260,267,285,295,296,299).ccls.	US-PGPUB; USPAT	ADJ	ON	2018/07/14 17:17
S144	522	(S142 or S143) and mimo and directional antenna and "802.11n"	US-PGPUB; USPAT	ADJ	ON	2018/07/14 17:17
S145	80	S144 and (@pd<="20060228" OR @ad<="20060228" OR @rlad<="20060228" OR @prad<="20060228")	US-PGPUB; USPAT	ADJ	ON	2018/07/14 17:18

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S146	18	S145 and (beamform$3 or beam?form$3)	US-PGPUB; USPAT	ADJ	ON	2018/07/14 17:19
S147	575	(beamform$3 or beam?form$3) and mimo and directional antenna and "802.11n"	US-PGPUB; USPAT	ADJ	ON	2018/07/14 18:10
S148	30	S147 and (@pd<="20060228" OR @ad<="20060228" OR @rlad<="20060228" OR @prad<="20060228")	US-PGPUB; USPAT	ADJ	ON	2018/07/14 18:10
S149	12	S148 not S146	US-PGPUB; USPAT	ADJ	ON	2018/07/14 18:10
S178	53424	(H04B7/0456,024,0495 or H04B17/15 or H04W84/12,18 or H04W80/04).cpc.	US-PGPUB; USPAT	ADJ	ON	2018/12/04 17:34
S179	68432	(370/338,328 or 455/422.1,424,443,452.2 or 375/259,260,267,285,295,296,299).ccls.	US-PGPUB; USPAT	ADJ	ON	2018/12/04 17:34
S180	194	(S178 and S179) and mimo and directional antenna	US-PGPUB; USPAT	ADJ	ON	2018/12/04 17:41
S181	78	S180 and (@pd<="20060228" OR @ad<="20060228" OR @rlad<="20060228" OR @prad<="20060228")	US-PGPUB; USPAT	ADJ	ON	2018/12/04 17:45
S182	53424	(H04B7/0456,024,0495 or H04B17/15 or H04W84/12,18 or H04W80/04).cpc.	US-PGPUB; USPAT	ADJ	ON	2018/12/04 17:46
S183	68432	(370/338,328 or 455/422.1,424,443,452.2 or 375/259,260,267,285,295,296,299).ccls.	US-PGPUB; USPAT	ADJ	ON	2018/12/04 17:46
S184	194	(S182 and S183) and mimo and directional antenna	US-PGPUB; USPAT	ADJ	ON	2018/12/04 17:46
S185	78	S184 and (@pd<="20060228" OR @ad<="20060228" OR @rlad<="20060228" OR @prad<="20060228")	US-PGPUB; USPAT	ADJ	ON	2018/12/04 17:46
S186	21	S185 and "802.11n"	US-PGPUB; USPAT	ADJ	ON	2018/12/04 17:46
S187	1	"20150111589".pn.	US-PGPUB; USPAT	ADJ	ON	2018/12/04 17:56
S188	102	(("LASTINGER") near3 ("Roc")).INV.	US-PGPUB; USPAT	ADJ	ON	2018/12/04 18:22
S189	82	(("SPENIK") near3 ("John")).INV.	US-PGPUB; USPAT	ADJ	ON	2018/12/04 18:22
S190	82	(("WOODBURY") near3 ("Brian")).INV.	US-PGPUB; USPAT	ADJ	ON	2018/12/04 18:23
S191	14	(Woodbury Wireless).as. or (Woodbury Wireless).aanm.	US-PGPUB; USPAT	ADJ	ON	2018/12/04 18:23
S192	57	(S188 or S189 or S190 or S191) and mimo and direction$2 antenna	US-PGPUB; USPAT	ADJ	ON	2018/12/04 18:23

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S193	53	S192 and (interference near3 reduc$4)	US-PGPUB; USPAT	ADJ	ON	2018/12/04 18:30
S194	289	"802.11n" and (interference near3 reduc$4) and mimo and direction$2 antenna	US-PGPUB; USPAT	ADJ	ON	2018/12/04 20:43
S195	46	S194 and (@pd<="20060228" OR @ad<="20060228" OR @rlad<="20060228" OR @prad<="20060228")	US-PGPUB; USPAT	ADJ	ON	2018/12/04 20:48
S196	515	"802.11n" and (interference near3 reduc$4 with transmi$5) and mimo	US-PGPUB; USPAT	ADJ	ON	2018/12/04 22:50
S197	171	S196 and ("802.11" with "802.11n")	US-PGPUB; USPAT	ADJ	ON	2018/12/04 22:51
S198	289	"802.11n" and (interference near3 reduc$4) and mimo and direction$2 antenna	US-PGPUB; USPAT	ADJ	ON	2018/12/04 22:51
S199	46	S198 and (@pd<="20060228" OR @ad<="20060228" OR @rlad<="20060228" OR @prad<="20060228")	US-PGPUB; USPAT	ADJ	ON	2018/12/04 22:51
S200	165	S197 not S199	US-PGPUB; USPAT	ADJ	ON	2018/12/04 22:51
S201	7	S200 and (@pd<="20060228" OR @ad<="20060228" OR @rlad<="20060228" OR @prad<="20060228")	US-PGPUB; USPAT	ADJ	ON	2018/12/04 22:51
S202	96	sounding feedback and mimo and ("802.11n" with "802.11")	US-PGPUB; USPAT	ADJ	ON	2018/12/05 17:50

12/ 5/ 2018 11:13:32 PM
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Doc Code: DIST.E.FILE **Document Description: Electronic Terminal Disclaimer - Filed**	PTO/SB/26 U.S. Patent and Trademark Office Department of Commerce

Electronic Petition Request	**TERMINAL DISCLAIMER TO OBVIATE A DOUBLE PATENTING REJECTION OVER A "PRIOR" PATENT**
Application Number	16120258
Filing Date	01-Sep-2018
First Named Inventor	Roc Lastinger
Attorney Docket Number	WBWL001H
Title of Invention	MIMO Methods and Systems

☒ Filing of terminal disclaimer does not obviate requirement for response under 37 CFR 1.111 to outstanding Office Action

☒ This electronic Terminal Disclaimer is not being used for a Joint Research Agreement.

Owner	Percent Interest
Woodbury Wireless, LLC	100%

The owner(s) with percent interest listed above in the instant application hereby disclaims, except as provided below, the terminal part of the statutory term of any patent granted on the instant application which would extend beyond the expiration date of the full statutory term of prior patent number(s)

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as the term of said prior patent is presently shortened by any terminal disclaimer. The owner hereby agrees that any patent so granted on the instant application shall be enforceable only for and during such period that it and the prior patent are commonly owned. This agreement runs with any patent granted on the instant application and is binding upon the grantee, its successors or assigns.

In making the above disclaimer, the owner does not disclaim the terminal part of the term of any patent granted on the instant application that would extend to the expiration date of the full statutory term of the prior patent, "as the term of said prior patent is presently shortened by any terminal disclaimer," in the event that said prior patent later:
- expires for failure to pay a maintenance fee;
- is held unenforceable;
- is found invalid by a court of competent jurisdiction;
- is statutorily disclaimed in whole or terminally disclaimed under 37 CFR 1.321;
- has all claims canceled by a reexamination certificate;
- is reissued; or
- is in any manner terminated prior to the expiration of its full statutory term as presently shortened by any terminal disclaimer.

(●) Terminal disclaimer fee under 37 CFR 1.20(d) is included with Electronic Terminal Disclaimer request. ( ) I certify, in accordance with 37 CFR 1.4(d)(4), that the terminal disclaimer fee under 37 CFR 1.20(d) required for this terminal disclaimer has already been paid in the above-identified application.	
Applicant claims the following fee status: (●) Small Entity ( ) Micro Entity ( ) Regular Undiscounted I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code and that such willful false statements may jeopardize the validity of the application or any patent issued thereon.	
THIS PORTION MUST BE COMPLETED BY THE SIGNATORY OR SIGNATORIES I certify, in accordance with 37 CFR 1.4(d)(4) that I am: (●) An attorney or agent registered to practice before the Patent and Trademark Office who is of record in this application Registration Number 56537 ( ) A sole inventor ( ) A joint inventor; I certify that I am authorized to sign this submission on behalf of all of the inventors as evidenced by the power of attorney in the application ( ) A joint inventor; all of whom are signing this request	
Signature	/Thomas D. Fortenberry/
Name	Thomas D. Fortenberry

*Statement under 37 CFR 3.73(b) is required if terminal disclaimer is signed by the assignee (owner).
Form PTO/SB/96 may be used for making this certification. See MPEP § 324.

Electronic Patent Application Fee Transmittal

Application Number:	16120258
Filing Date:	01-Sep-2018
Title of Invention:	MIMO Methods and Systems
First Named Inventor/Applicant Name:	Roc Lastinger
Filer:	THOMAS DONALD FORTENBERRY
Attorney Docket Number:	WBWL001H

Filed as Small Entity

Filing Fees for Utility under 35 USC 111(a)

Description	Fee Code	Quantity	Amount	Sub-Total in USD($)
Basic Filing:				
STATUTORY OR TERMINAL DISCLAIMER	2814	1	160	160
Pages:				
Claims:				
Miscellaneous-Filing:				
Petition:				
Patent-Appeals-and-Interference:				
Post-Allowance-and-Post-Issuance:				

Description	Fee Code	Quantity	Amount	Sub-Total in USD($)
Extension-of-Time:				
Miscellaneous:				
		Total in USD ($)		**160**

Doc Code: DISQ.E.FILE
Document Description: Electronic Terminal Disclaimer – Approved

Application No.: 16120258

Filing Date: 01-Sep-2018

Applicant/Patent under Reexamination: Lastinger

Electronic Terminal Disclaimer filed on October 30, 2018

☒ APPROVED

This patent is subject to a terminal disclaimer

☐ DISAPPROVED

Approved/Disapproved by: Electronic Terminal Disclaimer automatically approved by EFS-Web

U.S. Patent and Trademark Office

Electronic Acknowledgement Receipt	
EFS ID:	34157568
Application Number:	16120258
International Application Number:	
Confirmation Number:	3304
Title of Invention:	MIMO Methods and Systems
First Named Inventor/Applicant Name:	Roc Lastinger
Customer Number:	112117
Filer:	THOMAS DONALD FORTENBERRY
Filer Authorized By:	
Attorney Docket Number:	WBWL001H
Receipt Date:	30-OCT-2018
Filing Date:	01-SEP-2018
Time Stamp:	13:02:31
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	yes
Payment Type	CARD
Payment was successfully received in RAM	$160
RAM confirmation Number	103018INTEFSW13022900
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	Terminal Disclaimer-Filed (Electronic)	eTerminal-Disclaimer.pdf	33866 ed29a2b2186a131b79fdc84ce2d1bb05979da75f	no	2
Warnings:					
Information:					
2	Fee Worksheet (SB06)	fee-info.pdf	30133 e5163a3e776ed1a8e5856f1240f8bb6c521e3b41	no	2
Warnings:					
Information:					
		Total Files Size (in bytes):	63999		

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.

Electronic Acknowledgement Receipt

EFS ID:	34157475
Application Number:	16120258
International Application Number:	
Confirmation Number:	3304
Title of Invention:	MIMO Methods and Systems
First Named Inventor/Applicant Name:	Roc Lastinger
Customer Number:	112117
Filer:	THOMAS DONALD FORTENBERRY
Filer Authorized By:	
Attorney Docket Number:	WBWL001H
Receipt Date:	30-OCT-2018
Filing Date:	01-SEP-2018
Time Stamp:	12:55:04
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	Applicant Arguments/Remarks Made in an Amendment	20181030_WBWL001H_Amendment.pdf	86796 680b07b160e8750281dee5de2f11e010596830c3	no	18

Warnings:

Information:	
Total Files Size (in bytes):	86796

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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.

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Application of:	Confirmation No.: 3304
Roc Lastinger	Examiner: LEE, SIU M
Application No.: 16/120,258	Art Unit: 2632
File Date: 09-01-2018	Docket No.: WBWL001H
Title: MIMO Methods and Systems	Date: 10/30/2018

AMENDMENT A

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

Examiner:

In response to the Office Action dated 10/18/2018, please consider the following believed to place the claims in condition for allowance.

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Amendments to the Claims:

This listing of claims replaces all prior versions and listings of claims in the application:

1.-60. (Cancelled)

61. (New) A computer-implemented method, comprising:

providing access to a multiple-input-multiple-output (MIMO)-capable access point including:

a plurality of antennas;

circuitry in communication with the antennas; and

at least one radio in communication with the circuitry;

selecting at least one channel based on one or more channel characteristics, for initiating a first transmission to a first portable wireless device and initiating a second transmission to a second portable wireless device, such that at least a portion of the first transmission occurs simultaneously with at least a portion of the second transmission and both occur via a first wireless protocol;

receiving first information from the first portable wireless device that is based on a first measurement performed by the first portable wireless device;

receiving second information from the second portable wireless device that is based on a second measurement performed by the second portable wireless device;

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altering at least one aspect of the first transmission, based on at least one of the first information or the second information, so as to reduce interference between the first transmission and the second transmission when the at least portion of the first transmission occurs simultaneously with the at least portion of the second transmission;

altering at least one aspect of the second transmission, based on at least one of the first information or the second information, so as to reduce the interference between the first transmission and the second transmission when the at least portion of the first transmission occurs simultaneously with the at least portion of the second transmission;

transmitting first data in connection with the first transmission to the first portable wireless device;

transmitting second data in connection with the second transmission to the second portable wireless device;

receiving third information from a third portable wireless device that is based on a third measurement performed by the third portable wireless device;

altering at least one aspect of a third transmission, based on the third information, for further interference reduction; and

transmitting third data in connection with the third transmission to the third portable wireless device, via a second wireless protocol including a 802.11n protocol, where the first wireless protocol includes another 802.11 protocol other than the 802.11n protocol.

62. (New) The computer-implemented method of Claim 61, wherein the third transmission to the third portable wireless device is initiated via a particular channel that is different, in at least one respect, from the at least one channel, for preventing interference between the third

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transmission via the 802.11n protocol, and at least one of the first transmission or the second transmission via the another 802.11 protocol.

63. (New) The computer-implemented method of Claim 62, wherein a plurality of radios are utilized including a first radio configured to communicate via the another 802.11 protocol and a second radio configured to communicate via the 802.11n protocol, and different antennas are used for the another 802.11 protocol and the 802.11n protocol, so that sufficient resources are available to the 802.11n protocol and the another 802.11 protocol, when at least a portion of the third transmission occurs simultaneously with at least one of the first transmission or the second transmission.

64. (New) The computer-implemented method of Claim 63, wherein the at least one channel includes multiple channels that, together, have a greater bandwidth than the particular channel.

65. (New) The computer-implemented method of Claim 61, wherein the at least one channel includes multiple channels including a first channel and a second channel, and the first transmission to the first portable wireless device is initiated via the first channel, and the second transmission to the second portable wireless device is initiated via the second channel.

66. (New) The computer-implemented method of Claim 61, wherein the first transmission and the second transmission are both initiated on the at least one channel which includes the same single channel.

67. (New) The computer-implemented method of Claim 61, wherein the third transmission to the third portable wireless device is initiated via a particular channel that is different from the at least one channel.

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68. (New) The computer-implemented method of Claim 61, wherein the third transmission to the third portable wireless device is initiated via a particular channel that is the same as the at least one channel.

69. (New) The computer-implemented method of Claim 61, wherein the first transmission occurs simultaneously with the second transmission with both the first transmission and the second transmission using all of the antennas.

70. (New) The computer-implemented method of Claim 61, wherein the first transmission occurs simultaneously with the second transmission with both the first transmission and the second transmission using different subsets of the antennas.

71. (New) The computer-implemented method of Claim 61, wherein the multiple-input-multiple-output (MIMO)-capable access point includes a multiple-user multiple-input-multiple-output (MU-MIMO)-capable access point.

72. (New) The computer-implemented method of Claim 61, and further comprising: utilizing a plurality of radios including a first radio configured to communicate via the another 802.11 protocol and a second radio configured to communicate via the 802.11n protocol, so that sufficient resources are available to the 802.11n protocol and the another 802.11 protocol, when at least a portion of the third transmission occurs simultaneously with at least one of the first transmission or the second transmission.

73. (New) The computer-implemented method of Claim 61, wherein a channel difference is used for the 802.11n protocol and the another 802.11 protocol for increased data throughput.

74. (New) The computer-implemented method of Claim 61, wherein different radios, different antennas, and a channel difference are used for the first wireless protocol and the second wireless protocol for increased data throughput.

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75. (New) A computer-implemented method, comprising:

positioning one or more multiple-input-multiple-output (MIMO)-capable access points so that the one or more multiple-input-multiple-output (MIMO)-capable access points provide a coverage dictated by a person positioning the one or more multiple-input-multiple-output (MIMO)-capable access points, each of the one or more multiple-input-multiple-output (MIMO)-capable access points including:

a plurality of antennas;

circuitry in communication with the antennas; and

at least one radio in communication with the circuitry;

selecting at least one channel based on one or more channel characteristics, for initiating a first transmission to a first portable wireless device and initiating a second transmission to a second portable wireless device, such that at least a portion of the first transmission occurs simultaneously with at least a portion of the second transmission and both occur via a first wireless protocol;

receiving first information from the first portable wireless device that is based on a first measurement performed by the first portable wireless device;

receiving second information from the second portable wireless device that is based on a second measurement performed by the second portable wireless device;

altering at least one aspect of the first transmission, based on at least one of the first information or the second information, so as to reduce interference between the first

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transmission and the second transmission when the at least portion of the first transmission occurs simultaneously with the at least portion of the second transmission;

altering at least one aspect of the second transmission, based on at least one of the first information or the second information, so as to reduce the interference between the first transmission and the second transmission when the at least portion of the first transmission occurs simultaneously with the at least portion of the second transmission;

transmitting first data in connection with the first transmission to the first portable wireless device;

transmitting second data in connection with the second transmission to the second portable wireless device;

receiving third information from a third portable wireless device that is based on a third measurement performed by the third portable wireless device;

altering at least one aspect of a third transmission, based on the third information, for further interference reduction; and

transmitting third data in connection with the third transmission to the third portable wireless device, via a second wireless protocol including a 802.11n protocol, where the first wireless protocol includes another 802.11 protocol other than the 802.11n protocol.

76. (New) The computer-implemented method of Claim 75, wherein the third transmission to the third portable wireless device is initiated via a particular channel that is different, in at least one respect, from the at least one channel, for preventing interference between the third transmission via the 802.11n protocol, and at least one of the first transmission or the second transmission via the another 802.11 protocol.

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77. (New) The computer-implemented method of Claim 76, wherein a plurality of radios are utilized including a first radio configured to communicate via the another 802.11 protocol and a second radio configured to communicate via the 802.11n protocol, and different antennas are used for the another 802.11 protocol and the 802.11n protocol, so that sufficient resources are available to the 802.11n protocol and the another 802.11 protocol, when at least a portion of the third transmission occurs simultaneously with at least one of the first transmission or the second transmission.

78. (New) The computer-implemented method of Claim 75, wherein the at least one aspect of the first transmission is altered based on at least one of the first information or the second information, so as to direct the first transmission more towards the first portable wireless device as compared to the second portable wireless device; and the at least one aspect of the second transmission is altered based on at least one of the first information or the second information, so as to direct the second transmission more towards the second portable wireless device as compared to the first portable wireless device.

79. (New) The computer-implemented method of Claim 75, wherein the at least one channel includes multiple channels including a first channel and a second channel, and the first transmission to the first portable wireless device is initiated via the first channel, and the second transmission to the second portable wireless device is initiated via the second channel.

80. (New) The computer-implemented method of Claim 75, wherein the first transmission and the second transmission are both initiated on the at least one channel which includes the same single channel.

81. (New) The computer-implemented method of Claim 75, wherein the third transmission to the third portable wireless device is initiated via a particular channel that is different from the at least one channel.

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82. (New) The computer-implemented method of Claim 75, wherein the third transmission to the third portable wireless device is initiated via a particular channel that is the same as the at least one channel.

83. (New) The computer-implemented method of Claim 75, and further comprising: utilizing a plurality of radios including a first radio configured to communicate via the first wireless protocol and a second radio configured to communicate via the second wireless protocol.

84. (New) The computer-implemented method of Claim 75, and further comprising: utilizing a plurality of radios including a first radio configured to communicate via the another 802.11 protocol and a second radio configured to communicate via the 802.11n protocol, so that sufficient resources are available to the 802.11n protocol and the another 802.11 protocol, when at least a portion of the third transmission occurs simultaneously with at least one of the first transmission or the second transmission.

85. (New) The computer-implemented method of Claim 75, wherein the first portable wireless device includes a first multiple-input-multiple-output (MIMO)-capable portable wireless device, and the second portable wireless device includes a second multiple-input-multiple-output (MIMO)-capable portable wireless device.

86. (New) The computer-implemented method of Claim 75, wherein the one or more multiple-input-multiple-output (MIMO)-capable access points include a plurality of the multiple-input-multiple-output (MIMO)-capable access points which are positioned so that the plurality of the multiple-input-multiple-output (MIMO)-capable access points collectively provide an overlap in the coverage as dictated by the person positioning of the plurality of the multiple-input-multiple-output (MIMO)-capable access points.

87. (New) A computer-implemented method, comprising:

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providing access to a multiple-input-multiple-output (MIMO)-capable access point including:

a plurality of antennas;

circuitry in communication with the antennas; and

at least one radio in communication with the circuitry;

sending a first signal to a first portable wireless device;

receiving a second signal from the first portable wireless device;

based on the second signal, permitting data communication via the multiple-input-multiple-output (MIMO)-capable access point for the first portable wireless device;

sending a third signal to a second portable wireless device;

receiving a fourth signal from the second portable wireless device;

based on the fourth signal, permitting data communication via the multiple-input-multiple-output (MIMO)-capable access point for the second portable wireless device;

selecting at least one channel based on one or more channel characteristics, for initiating a first transmission to the first portable wireless device and initiating a second transmission to the second portable wireless device, such that at least a portion of the first transmission occurs simultaneously with at least a portion of the second transmission and both occur via a first wireless protocol;

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receiving first information from the first portable wireless device that is based on a first measurement performed by the first portable wireless device;

receiving second information from the second portable wireless device that is based on a second measurement performed by the second portable wireless device;

altering at least one aspect of the first transmission, based on at least one of the first information or the second information, so as to reduce interference between the first transmission and the second transmission when the at least portion of the first transmission occurs simultaneously with the at least portion of the second transmission;

altering at least one aspect of the second transmission, based on at least one of the first information or the second information, so as to reduce the interference between the first transmission and the second transmission when the at least portion of the first transmission occurs simultaneously with the at least portion of the second transmission;

transmitting first data in connection with the first transmission to the first portable wireless device;

transmitting second data in connection with the second transmission to the second portable wireless device;

receiving third information from a third portable wireless device that is based on a third measurement performed by the third portable wireless device;

altering at least one aspect of a third transmission, based on the third information; and

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transmitting third data in connection with the third transmission to the third portable wireless device, via a second wireless protocol.

88. (New) The computer-implemented method of Claim 87, wherein the first signal, the second signal, the third signal, and the fourth signal, are communicated for authentication purposes.

89. (New) A computer-implemented method, comprising:

positioning one or more multiple-input-multiple-output (MIMO)-capable access points so that the one or more multiple-input-multiple-output (MIMO)-capable access points provide a desired coverage, each of the one or more multiple-input-multiple-output (MIMO)-capable access points including:

a plurality of antennas;

circuitry in communication with the antennas; and

at least one radio in communication with the circuitry;

causing communicative coupling between the one or more multiple-input-multiple-output (MIMO)-capable access points and a server;

receiving a first signal from a first portable wireless device;

based on the first signal, permitting data communication via the multiple-input-multiple-output (MIMO)-capable access point for the first portable wireless device;

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receiving a second signal from a second portable wireless device;

based on the second signal, permitting data communication via the multiple-input-multiple-output (MIMO)-capable access point for the second portable wireless device;

selecting at least one channel based on one or more channel characteristics, for initiating a first transmission to the first portable wireless device and initiating a second transmission to the second portable wireless device, such that at least a portion of the first transmission occurs simultaneously with at least a portion of the second transmission and both occur via a first wireless protocol;

receiving first information from the first portable wireless device that is based on a first measurement performed by the first portable wireless device;

receiving second information from the second portable wireless device that is based on a second measurement performed by the second portable wireless device;

altering at least one aspect of the first transmission, based on at least one of the first information or the second information, so as to reduce interference between the first transmission and the second transmission when the at least portion of the first transmission occurs simultaneously with the at least portion of the second transmission;

altering at least one aspect of the second transmission, based on at least one of the first information or the second information, so as to reduce the interference between the first transmission and the second transmission when the at least portion of the first transmission occurs simultaneously with the at least portion of the second transmission;

transmitting first data in connection with the first transmission to the first portable wireless device;

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transmitting second data in connection with the second transmission to the second portable wireless device;

receiving third information from a third portable wireless device that is based on a third measurement performed by the third portable wireless device;

altering at least one aspect of a third transmission, based on the third information, for further interference reduction; and

transmitting third data in connection with the third transmission to the third portable wireless device, via a second wireless protocol including a 802.11n protocol, where the first wireless protocol includes another 802.11 protocol other than the 802.11n protocol.

90. (New) The computer-implemented method of Claim 89, wherein at least one of:

said circuitry includes at least one of: a switch, at least one phased array, a controller, or a processor;

said circuitry includes radio chain circuitry;

said other 802.11 protocol is a variant of the 802.11n protocol;

said other 802.11 protocol is an advancement over the 802.11n protocol;

said channel characteristics include at least one of a data throughput, a signal-to-noise ratio, a reduced signal error, a reduced data error, a reduced retransmission request, a reduced interference, a rejection of multipath signal, a higher transmission rate, or a signal strength;

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a difference in channels are used for the first wireless protocol and the second wireless protocol for increased data throughput, and the difference involves data throughput;

an entirety of the first transmission occurs simultaneously with an entirety of the second transmission;

said first transmission occurs simultaneously with the second transmission with both the first transmission and the second transmission using all of the antennas;

said first transmission occurs simultaneously with the second transmission with both the first transmission and the second transmission using only a subset of the antennas;

said first transmission occurs simultaneously with the second transmission with both the first transmission and the second transmission using a same subset of the antennas;

said first transmission occurs simultaneously with the second transmission with both the first transmission and the second transmission using different subsets of the antennas;

said antennas are MIMO antennas;

said altering at least one aspect includes selecting a physical sector;

said altering at least one aspect includes selecting a virtual sector;

said altering at least one aspect includes altering beamforming;

said altering at least one aspect includes altering weighting;

said antennas are fixed in direction;

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said antennas are varied in direction via beamforming;

said antennas are directional by virtue of being capable of changing direction via beamforming;

said antennas exhibit temporal diversity;

said antennas include directional antennas;

said antennas include omnidirectional antennas;

said antennas include directional antennas that are omnidirectional;

said antennas include directional antennas that have omnidirectional capabilities;

said antennas include directional antennas that are less than omnidirectional;

said at least one radio includes a single radio;

said first, second, and/or third information include a measurement of a signal-to-noise ratio;

said first data, the second data, and the third each include different data;

said antennas have associated therewith a MIMO virtual sector including an area where a MIMO physical sector is to operate;

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said first portable wireless device includes a first multiple-input-multiple-output (MIMO)-capable portable wireless device;

said second portable wireless device includes a second multiple-input-multiple-output (MIMO)-capable portable wireless device;

said third portable wireless device includes a third multiple-input-multiple-output (MIMO)-capable portable wireless device;

said antennas form MIMO virtual sectors that are capable of being selected to provide MIMO physical sectors; or

said first portable wireless device includes at least one of a mobile device, a client, a computer, or a hand-held device.

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Remarks:

The claims have been objected to. Such objections are deemed overcome by virtue of the clarifications made hereinabove to the claims.

Claims are rejected on the ground of non-statutory double patenting as being unpatentable over the following U.S. Patents:

USPN 10,069,548 B2
USPN 9,859,963 B2
USPN 10,063,297 B1

Such rejection is deemed overcome by virtue of the terminal disclaimer submitted herewith.

It is believed that all of the pending issues have been addressed. However, the absence of a reply to a specific rejection, issue, or comment does not signify agreement with or concession of that rejection, issue, or comment. In addition, because the arguments made above may not be exhaustive, there may be reasons for patentability of any or all pending claims (or other claims) that have not been expressed. Still yet, nothing in this reply should be construed as intention to concede any issue with regard to any claim, except as specifically stated in this reply. Finally, it should be noted that no claims are intended to be construed under 35 U.S.C. 112, paragraph 6.

Respectfully submitted,

Date: October 30, 2018

By: /Thomas D. Fortenberry/

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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
16/120,258	09/01/2018	Roc Lastinger	WBWL001H	3304

112117 7590 10/18/2018

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EXAMINER	
LEE, SIU M	

ART UNIT	PAPER NUMBER
2632	

NOTIFICATION DATE	DELIVERY MODE
10/18/2018	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):

eofficeaction@appcoll.com
tom@tflawoffices.com

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Office Action Summary	**Application No.** 16/120,258	**Applicant(s)** Lastinger et al.	
	Examiner SIU M LEE	**Art Unit** 2632	**AIA 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 9/1/2018.

☐ 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) 31-60 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) 31-59 is/are rejected.

8) ☑ Claim(s) 60 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 9/1/2018 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: _____.

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DETAILED ACTION

Notice of Pre-AIA or AIA Status

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

Claim Objections

2. Claims 45 and 56 objected to because of the following informalities:

(1) Regarding claim 45:

Line 4 recites "a positioner", the examiner suggests changing to "a **position**".

(2) Regarding claim 56:

Line 5 recites "the positioner", the examiner suggests changing to "the **position**".

Appropriate correction is required.

Double Patenting

3. 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.

4. Claims 31-59 are rejected on the ground of nonstatutory double patenting as being unpatentable over claim 16-25, 27-37, 41, 43-44, and 58-59 of U.S. Patent No.10,069,548 B2. Although the claims at issue are not identical, they are not patentably distinct from each other because of the following comparison.

Claim	Instant Application	Claim	Patent 10,069,548 B2
31	A computer-implemented method, comprising: providing access to a **multiple-input-multiple-output (MIMO)-capable** access point including: a plurality of antennas; circuitry in communication with the antennas; and at least one radio in communication with the circuitry; selecting at least one channel based on one or more channel characteristics, for initiating a first transmission to a first portable wireless device and initiating a second transmission to a second portable wireless device, such that at least a portion of the first transmission occurs simultaneously with at least a portion of the second transmission	16	A computer-implemented method, comprising: providing access to an access point including: a plurality of directional antennas; circuitry in communication with the directional antennas; and at least one radio in communication with the circuitry; selecting at least one channel based on one or more channel characteristics, for initiating a first transmission to a first multiple-input-multiple-output (MIMO)-capable portable wireless device and initiating a second transmission to a second multiple-input-multiple-output (MIMO)-capable portable wireless device, such that at least a portion of the first

	and both occur via a first wireless protocol; receiving first information from the first portable wireless device that is based on a first measurement performed by the first portable wireless device; receiving second information from the second portable wireless device that is based on a second measurement performed by the second portable wireless device; altering at least one aspect of the first transmission, based on at least one of the first information or the second information, so as to direct the first transmission more towards the first portable wireless device as		transmission occurs simultaneously with at least a portion of the second transmission and both occur via a first wireless protocol; receiving first information from the first multiple-input-multiple-output (MIMO)-capable portable wireless device that is based on a first measurement performed by the first multiple-input-multiple-output (MIMO)-capable portable wireless device; receiving second information from the second multiple-input-multiple-output (MIMO)-capable portable wireless device that is based on a second measurement performed by the second multiple-input-multiple-output (MIMO)-capable portable wireless device; altering at least one aspect of the first transmission in connection with a first multiple of the directional antennas, based on at least one of the first information or the second information, so as to direct the first

	compared to the second portable wireless device, thereby reducing interference between the first transmission and the second transmission when the at least portion of the first transmission occurs simultaneously with the at least portion of the second transmission; altering at least one aspect of the second transmission, based on at least one of the first information or the second information, so as to direct the second transmission more towards the second portable wireless device as compared to the first portable wireless device, thereby reducing the interference between the first transmission and the second transmission when the at least portion of the first transmission occurs		transmission more towards the first multiple-input-multiple-output (MIMO)-capable portable wireless device as compared to the second multiple-input-multiple-output (MIMO)-capable portable wireless device, thereby reducing interference between the first transmission and the second transmission when the at least portion of the first transmission occurs simultaneously with the at least portion of the second transmission; altering at least one aspect of the second transmission in connection with a second multiple of the directional antennas, based on at least one of the first information or the second information, so as to direct the second transmission more towards the second multiple-input-multiple-output (MIMO)-capable portable wireless device as compared to the first multiple-input-multiple-output (MIMO)-capable portable wireless device, thereby reducing the

	simultaneously with the at least portion of the second transmission;		interference between the first transmission and the second transmission when the at least portion of the first transmission occurs simultaneously with the at least portion of the second transmission;
	transmitting first data in connection with the first transmission to the first portable wireless device;		transmitting first data in connection with the first transmission to the first multiple-input-multiple-output (MIMO)-capable portable wireless device, utilizing the first multiple of the directional antennas;
	transmitting second data in connection with the second transmission to the second portable wireless device;		transmitting second data in connection with the second transmission to the second multiple-input-multiple-output (MIMO)-capable portable wireless device, utilizing the second multiple of the directional antennas;
	receiving third information from a third portable wireless device that is based on a third measurement performed by the third portable wireless device;		receiving third information from a third multiple-input-multiple-output (MIMO)-capable portable wireless device that is based on a third measurement performed by the third

	altering at least one aspect of a third transmission, based on the third information, so as to direct the third transmission towards the third portable wireless device; and transmitting third data in connection with the third transmission to the third portable wireless device, via a second wireless protocol including a 802.11n protocol, where the first wireless protocol includes another 802.11 protocol other than the 802.11n protocol.		multiple-input-multiple-output (MIMO)-capable portable wireless device; altering at least one aspect of a third transmission in connection with a third multiple of the directional antennas, based on the third information, so as to direct the third transmission towards the third multiple-input-multiple-output (MIMO)-capable portable wireless device; and transmitting third data in connection with the third transmission to the third multiple-input-multiple-output (MIMO)-capable portable wireless device, utilizing the third multiple of the directional antennas, via a second wireless protocol including a 802.11n protocol, where the first wireless protocol includes another 802.11 protocol other than the 802.11n protocol.
32	The computer-implemented method of Claim 31, wherein the third transmission to the third portable wireless device is initiated via a	17	The computer-implemented method of claim 16, wherein the third transmission to the third multiple-input-multiple-output (MIMO)-capable

	particular channel that is different, in at least one respect, from the at least one channel, for preventing interference between the third transmission via the 802.11n protocol, and at least one of the first transmission or the second transmission via the another 802.11 protocol.		portable wireless device is initiated via a particular channel that is different, in at least one respect, from the at least one channel, for preventing interference between the third transmission via the 802.11n protocol, and at least one of the first transmission or the second transmission via the another 802.11 protocol.
33	The computer-implemented method of Claim 32, wherein a plurality of radios are utilized including a first radio configured to communicate via the another 802.11 protocol and a second radio configured to communicate via the 802.11n protocol, and different antennas are used for the another 802.11 protocol and the 802.11n protocol, so that sufficient resources are available to the 802.11n protocol and the another 802.11 protocol, when at least a portion of the third transmission occurs simultaneously	18	The computer-implemented method of claim 17, wherein a plurality of radios are utilized including a first radio configured to communicate via the another 802.11 protocol and a second radio configured to communicate via the 802.11n protocol, and different antennas are used for the another 802.11 protocol and the 802.11n protocol, so that sufficient resources are available to the 802.11n protocol and the another 802.11 protocol, when at least a portion of the third transmission occurs simultaneously

	with at least one of the first transmission or the second transmission.		with at least one of the first transmission or the second transmission.
34	The computer-implemented method of Claim 33, wherein the at least one channel includes multiple channels that, together, have a greater bandwidth than the particular channel.	19	The computer-implemented method of claim 18, wherein the at least one channel includes multiple channels that, together, have a greater bandwidth than the particular channel.
35	The computer-implemented method of Claim 31, wherein the at least one channel includes multiple channels including a first channel and a second channel, and the first transmission to the first portable wireless device is initiated via the first channel, and the second transmission to the second portable wireless device is initiated via the second channel.	20	The computer-implemented method of claim 16, wherein the at least one channel includes multiple channels including a first channel and a second channel, and the first transmission to the first multiple-input-multiple-output (MIMO)-capable portable wireless device is initiated via the first channel, and the second transmission to the second multiple-input-multiple-output (MIMO)-capable portable wireless device is initiated via the second channel.
36	The computer-implemented method of Claim 31, wherein the first transmission and the second	21	The computer-implemented method of claim 16, wherein the first transmission and the second

	transmission are both initiated on the at least one channel which includes the same single channel.		transmission are both initiated on the at least one channel which includes the same single channel.
37	The computer-implemented method of Claim 31, wherein the third transmission to the third portable wireless device is initiated via a particular channel that is different from the at least one channel.	22	The computer-implemented method of claim 16, wherein the third transmission to the third multiple-input-multiple-output (MIMO)-capable portable wireless device is initiated via a particular channel that is different from the at least one channel.
38	The computer-implemented method of Claim 31, wherein the third transmission to the third portable wireless device is initiated via a particular channel that is the same as the at least one channel.	23	The computer-implemented method of claim 16, wherein the third transmission to the third multiple-input-multiple-output (MIMO)-capable portable wireless device is initiated via a particular channel that is the same as the at least one channel.
39	The computer-implemented method of Claim 31, wherein the first transmission occurs simultaneously with the second transmission with both the first transmission and the second transmission using all of the antennas.	24	The computer-implemented method of claim 16, wherein the first multiple of the directional antennas, the second multiple of the directional antennas, and the third multiple of the directional antennas are mutually-exclusive.

40	The computer-implemented method of Claim 31, wherein the first transmission occurs simultaneously with the second transmission with both the first transmission and the second transmission using different subsets of the antennas.	25	The computer-implemented method of claim 16, wherein the first multiple of the directional antennas, the second multiple of the directional antennas, and the third multiple of the directional antennas **each share at least one of the directional antennas**.
41	The computer-implemented method of Claim 31, wherein the multiple-input- multiple-output (MIMO)-capable access point includes a multiple-user multiple-input-multiple-output (MU-MIMO)-capable access point.	16	selecting at least one channel based on one or more channel characteristics, for initiating a first transmission to a first multiple-input-multiple-output (MIMO)-capable portable wireless device and initiating a second transmission to a second multiple-input-multiple-output (MIMO)-capable portable wireless device
42	The computer-implemented method of Claim 31, and further comprising: utilizing a plurality of radios including a first radio configured to communicate via the another 802.11 protocol and a second radio configured to communicate via the	27	The computer-implemented method of claim 16, and further comprising: utilizing a plurality of radios including a first radio configured to communicate via the another 802.11 protocol and a second radio configured to communicate via the

	802.11n protocol, so that sufficient resources are available to the 802.11n protocol and the another 802.11 protocol, when at least a portion of the third transmission occurs simultaneously with at least one of the first transmission or the second transmission.		802.11n protocol, so that sufficient resources are available to the 802.11n protocol and the another 802.11 protocol, when at least a portion of the third transmission occurs simultaneously with at least one of the first transmission or the second transmission.
43	The computer-implemented method of Claim 31, wherein a **channel difference** is used for the 802.11n protocol and the another 802.11 protocol for increased data throughput.	28	The computer-implemented method of claim 16, wherein **different radios and different antennas** are used for the 802.11n protocol and the another 802.11 protocol for increased data throughput.
44	The computer-implemented method of Claim 31, wherein different radios, different antennas, and a channel difference are used for the first wireless protocol and the second wireless protocol for increased data throughput.	29	The computer-implemented method of claim 16, wherein different radios, different antennas, and a channel difference are used for the first wireless protocol and the second wireless protocol for increased data throughput.
45	A computer-implemented method, comprising: positioning one or more **multiple-input-multiple-output (MIMO)-**	30	A computer-implemented method, comprising: positioning one or more access points so that the one or more access

	capable access points so that the one or more **multiple-input-multiple-output (MIMO)-capable** access points provide a coverage dictated by a positioner of the one or more **multiple-input-multiple-output (MIMO)-capable** access points, each of the one or more **multiple-input-multiple-output (MIMO)-capable** access points including: a plurality of antennas; circuitry in communication with the antennas; and at least one radio in communication with the circuitry; selecting at least one channel based on one or more channel characteristics, for initiating a first transmission to a first portable wireless device and initiating a second transmission to a second portable wireless device, such that at least a portion of the first transmission occurs simultaneously with at least a portion of the second transmission		points provide a coverage dictated by a positioner of the one or more access points, each of the one or more access points including: a plurality of directional antennas; circuitry in communication with the directional antennas; and at least one radio in communication with the circuitry; selecting at least one channel based on one or more channel characteristics, for initiating a first transmission to a first multiple-input-multiple-output (MIMO)-capable portable wireless device and initiating a second transmission to a second multiple-input-multiple-output (MIMO)-capable portable wireless device, such that at least a portion of the first

	and both occur via a first wireless protocol; receiving first information from the first portable wireless device that is based on a first measurement performed by the first portable wireless device; receiving second information from the second portable wireless device that is based on a second measurement performed by the second portable wireless device; altering at least one aspect of the first transmission, based on at least one of the first information or the second information, so as to direct the first transmission more towards the		transmission occurs simultaneously with at least a portion of the second transmission and both occur via a first wireless protocol; receiving first information from the first multiple-input-multiple-output (MIMO)-capable portable wireless device that is based on a first measurement performed by the first multiple-input-multiple-output (MIMO)-capable portable wireless device; receiving second information from the second multiple-input-multiple-output (MIMO)-capable portable wireless device that is based on a second measurement performed by the second multiple-input-multiple-output (MIMO)-capable portable wireless device; altering at least one aspect of the first transmission in connection with a first multiple of the directional antennas, based on at least one of the first information or the second information, so as to direct the first

	first portable wireless device as compared to the second portable wireless device, thereby reducing interference between the first transmission and the second transmission when the at least portion of the first transmission occurs simultaneously with the at least portion of the second transmission; altering at least one aspect of the second transmission, based on at least one of the first information or the second information, so as to direct the second transmission more towards the second portable wireless device as compared to the first portable wireless device, thereby reducing the interference between the first transmission and the second transmission when the at least portion of the first transmission occurs		transmission more towards the first multiple-input-multiple-output (MIMO)-capable portable wireless device as compared to the second multiple-input-multiple-output (MIMO)-capable portable wireless device, thereby reducing interference between the first transmission and the second transmission when the at least portion of the first transmission occurs simultaneously with the at least portion of the second transmission; altering at least one aspect of the second transmission in connection with a second multiple of the directional antennas, based on at least one of the first information or the second information, so as to direct the second transmission more towards the second multiple-input-multiple-output (MIMO)-capable portable wireless device as compared to the first multiple-input-multiple-output (MIMO)-capable portable wireless device, thereby reducing the

	simultaneously with the at least portion of the second transmission; transmitting first data in connection with the first transmission to the first portable wireless device; transmitting second data in connection with the second transmission to the second portable wireless device; receiving third information from a third portable wireless device that is based on a third measurement performed by the third portable wireless device;		interference between the first transmission and the second transmission when the at least portion of the first transmission occurs simultaneously with the at least portion of the second transmission; transmitting first data in connection with the first transmission to the first multiple-input-multiple-output (MIMO)-capable portable wireless device, utilizing the first multiple of the directional antennas; transmitting second data in connection with the second transmission to the second multiple-input-multiple-output (MIMO)-capable portable wireless device, utilizing the second multiple of the directional antennas; receiving third information from a third multiple-input-multiple-output (MIMO)-capable portable wireless device that is based on a third measurement performed by the third

	altering at least one aspect of a third transmission, based on the third information, so as to direct the third transmission towards the third portable wireless device; and transmitting third data in connection with the third transmission to the third portable wireless device, via a second wireless protocol including a 802.11n protocol, where the first wireless protocol includes another 802.11 protocol other than the 802.11n protocol.		multiple-input-multiple-output (MIMO)-capable portable wireless device; altering at least one aspect of a third transmission in connection with a third multiple of the directional antennas, based on the third information, so as to direct the third transmission towards the third multiple-input-multiple-output (MIMO)-capable portable wireless device; and transmitting third data in connection with the third transmission to the third multiple-input-multiple-output (MIMO)-capable portable wireless device, utilizing the third multiple of the directional antennas, via a second wireless protocol including a 802.11n protocol, where the first wireless protocol includes another 802.11 protocol other than the 802.11n protocol.
46	The computer-implemented method of Claim 45, wherein the third transmission to the third portable wireless device is initiated via a	31	The computer-implemented method of claim 30, wherein the third transmission to the third multiple-input-multiple-output (MIMO)-capable

	particular channel that is different, in at least one respect, from the at least one channel, for preventing interference between the third transmission via the 802.11n protocol, and at least one of the first transmission or the second transmission via the another 802.11 protocol.		portable wireless device is initiated via a particular channel that is different, in at least one respect, from the at least one channel, for preventing interference between the third transmission via the 802.11n protocol, and at least one of the first transmission or the second transmission via the another 802.11 protocol.
47	The computer-implemented method of Claim 46, wherein a plurality of radios are utilized including a first radio configured to communicate via the another 802.11 protocol and a second radio configured to communicate via the 802.11n protocol, and different antennas are used for the another 802.11 protocol and the 802.11n protocol, so that sufficient resources are available to the 802.11n protocol and the another 802.11 protocol, when at least a portion of the third transmission occurs simultaneously	32	The computer-implemented method of claim 31, wherein a plurality of radios are utilized including a first radio configured to communicate via the another 802.11 protocol and a second radio configured to communicate via the 802.11n protocol, and different antennas are used for the another 802.11 protocol and the 802.11n protocol, so that sufficient resources are available to the 802.11n protocol and the another 802.11 protocol, when at least a portion of the third transmission occurs simultaneously

	with at least one of the first transmission or the second transmission.		with at least one of the first transmission or the second transmission.
48	The computer-implemented method of Claim 47, wherein the at least one channel includes multiple channels that, together, have a greater bandwidth than the particular channel.	33	The computer-implemented method of claim 32, wherein the at least one channel includes multiple channels that, together, have a greater bandwidth than the particular channel.
49	The computer-implemented method of Claim 45, wherein the at least one channel includes multiple channels including a first channel and a second channel, and the first transmission to the first portable wireless device is initiated via the first channel, and the second transmission to the second portable wireless device is initiated via the second channel.	34	The computer-implemented method of claim 30, wherein the at least one channel includes multiple channels including a first channel and a second channel, and the first transmission to the first multiple-input-multiple-output (MIMO)-capable portable wireless device is initiated via the first channel, and the second transmission to the second multiple-input-multiple-output (MIMO)-capable portable wireless device is initiated via the second channel.
50	The computer-implemented method of Claim 45, wherein the first transmission and the second	35	The computer-implemented method of claim 30, wherein the first transmission and the second

	transmission are both initiated on the at least one channel which includes the same single channel.		transmission are both initiated on the at least one channel which includes the same single channel.
51	The computer-implemented method of Claim 45, wherein the third transmission to the third portable wireless device is initiated via a particular channel that is different from the at least one channel.	36	The computer-implemented method of claim 30, wherein the third transmission to the third multiple-input-multiple-output (MIMO)-capable portable wireless device is initiated via a particular channel that is different from the at least one channel.
52	The computer-implemented method of Claim 45, wherein the third transmission to the third portable wireless device is initiated via a particular channel that is the same as the at least one channel.	37	The computer-implemented method of claim 30, wherein the third transmission to the third multiple-input-multiple-output (MIMO)-capable portable wireless device is initiated via a particular channel that is the same as the at least one channel.
53	The computer-implemented method of Claim 45, and further comprising: utilizing a plurality of radios including a first radio configured to communicate via the first wireless protocol and a second radio configured to communicate via the second wireless protocol.	32	The computer-implemented method of claim 31, wherein a plurality of radios are utilized including a first radio configured to communicate via the another 802.11 protocol and a second radio configured to communicate via the 802.11n protocol, and different

			antennas are used for the another 802.11 protocol and the 802.11n protocol, so that sufficient resources are available to the 802.11n protocol and the another 802.11 protocol, when at least a portion of the third transmission occurs simultaneously with at least one of the first transmission or the second transmission.
54	The computer-implemented method of Claim 45, and further comprising: utilizing a plurality of radios including a first radio configured to communicate via the another 802.11 protocol and a second radio configured to communicate via the 802.11n protocol, so that sufficient resources are available to the 802.11n protocol and the another 802.11 protocol, when at least a portion of the third transmission occurs simultaneously with at least one of the first transmission or the second transmission.	41	The computer-implemented method of claim 30, and further comprising: utilizing a plurality of radios including a first radio configured to communicate via the another 802.11 protocol and a second radio configured to communicate via the 802.11n protocol, so that sufficient resources are available to the 802.11n protocol and the another 802.11 protocol, when at least a portion of the third transmission occurs simultaneously with at least one of the first transmission or the second transmission.

55	The computer-implemented method of Claim 45, wherein the first portable wireless device includes a first multiple-input-multiple-output (MIMO)-capable portable wireless device, and the second portable wireless device includes a second multiple-input- multiple-output (MIMO)-capable portable wireless device.	30	initiating a first transmission to a first multiple-input-multiple-output (MIMO)-capable portable wireless device and initiating a second transmission to a second multiple-input-multiple-output (MIMO)-capable portable wireless device
56	The computer-implemented method of Claim 45, wherein the one or more **multiple-input-multiple-output (MIMO)-capable** access points include a plurality of the **multiple-input-multiple-output (MIMO)-capable** access points which are positioned so that the plurality of the **multiple-input-multiple-output (MIMO)-capable** access points collectively provide an overlap in the coverage as dictated by the positioner of the plurality of the **multiple- input-multiple-output (MIMO)-capable** access points.	43	The computer-implemented method of claim 30, wherein the one or more access points include a plurality of the access points which are positioned so that the plurality of the access points collectively provide an overlap in the coverage as dictated by the positioner of the plurality of the access points.

57	A computer-implemented method, comprising: providing access to a **multiple-input-multiple-output (MIMO)-capable** access point including: a plurality of antennas; circuitry in communication with the antennas; and at least one radio in communication with the circuitry; sending a first signal to a first portable wireless device; receiving a second signal from the first portable wireless device; based on the second signal, permitting data communication via the **multiple-input- multiple-output (MIMO)-capable** access point for the first portable wireless device; sending a third signal to a second portable wireless device;	44	A computer-implemented method, comprising: providing access to an access point including: a plurality of directional antennas; circuitry in communication with the directional antennas; and at least one radio in communication with the circuitry; sending a first signal to a first multiple-input-multiple-output (MIMO)-capable portable wireless device; receiving a second signal from the first multiple-input-multiple-output (MIMO)-capable portable wireless device; based on the second signal, permitting data communication via the access point for the first multiple-input-multiple-output (MIMO)-capable portable wireless device; sending a third signal to a second multiple-input-multiple-output (MIMO)-capable portable wireless device;

	receiving a fourth signal from the second portable wireless device; based on the fourth signal, permitting data communication via the **multiple-input- multiple-output (MIMO)-capable** access point for the second portable wireless device; selecting at least one channel based on one or more channel characteristics, for initiating a first transmission to the first portable wireless device and initiating a second transmission to the second portable wireless device, such that at least a portion of the first transmission occurs simultaneously with at least a portion of the second transmission and both occur via a first wireless protocol;		receiving a fourth signal from the second multiple-input-multiple-output (MIMO)-capable portable wireless device; based on the fourth signal, permitting data communication via the access point for the second multiple-input-multiple-output (MIMO)-capable portable wireless device; selecting at least one channel based on one or more channel characteristics, for initiating a first transmission to the first multiple-input-multiple-output (MIMO)-capable portable wireless device and initiating a second transmission to the second multiple-input-multiple-output (MIMO)-capable portable wireless device, such that at least a portion of the first transmission occurs simultaneously with at least a portion of the second transmission and both occur via a first wireless protocol; receiving first information from the first multiple-input-multiple-output

	receiving first information from the first portable wireless device that is based on a first measurement performed by the first portable wireless device; receiving second information from the second portable wireless device that is based on a second measurement performed by the second portable wireless device; altering at least one aspect of the first transmission, based on at least one of the first information or the second information, so as to direct the first transmission more towards the first portable wireless device as compared to the second portable wireless device, thereby reducing interference between the first transmission and the second		(MIMO)-capable portable wireless device that is based on a first measurement performed by the first multiple-input-multiple-output (MIMO)-capable portable wireless device; receiving second information from the second multiple-input-multiple-output (MIMO)-capable portable wireless device that is based on a second measurement performed by the second multiple-input-multiple-output (MIMO)-capable portable wireless device; altering at least one aspect of the first transmission in connection with a first multiple of the directional antennas, based on at least one of the first information or the second information, so as to direct the first transmission more towards the first multiple-input-multiple-output (MIMO)-capable portable wireless device as compared to the second multiple-input-multiple-output (MIMO)-capable portable wireless device, thereby

	transmission when the at least portion of the first transmission occurs simultaneously with the at least portion of the second transmission; altering at least one aspect of the second transmission, based on at least one of the first information or the second information, so as to direct the second transmission more towards the second portable wireless device as compared to the first portable wireless device, thereby reducing the interference between the first transmission and the second transmission when the at least portion of the first transmission occurs simultaneously with the at least portion of the second transmission; transmitting first data in connection with the first transmission to the first portable wireless device;		reducing interference between the first transmission and the second transmission when the at least portion of the first transmission occurs simultaneously with the at least portion of the second transmission; altering at least one aspect of the second transmission in connection with a second multiple of the directional antennas, based on at least one of the first information or the second information, so as to direct the second transmission more towards the second multiple-input-multiple-output (MIMO)-capable portable wireless device as compared to the first multiple-input-multiple-output (MIMO)-capable portable wireless device, thereby reducing the interference between the first transmission and the second transmission when the at least portion of the first transmission occurs simultaneously with the at least portion of the second transmission;

	transmitting second data in connection with the second transmission to the second portable wireless device; receiving third information from a third portable wireless device that is based on a third measurement performed by the third portable wireless device; altering at least one aspect of a third transmission, based on the third information, so as to direct the third		transmitting first data in connection with the first transmission to the first multiple-input-multiple-output (MIMO)-capable portable wireless device, utilizing the first multiple of the directional antennas; transmitting second data in connection with the second transmission to the second multiple-input-multiple-output (MIMO)-capable portable wireless device, utilizing the second multiple of the directional antennas; receiving third information from a third multiple-input-multiple-output (MIMO)-capable portable wireless device that is based on a third measurement performed by the third multiple-input-multiple-output (MIMO)-capable portable wireless device; altering at least one aspect of a third transmission in connection with a third multiple of the directional antennas, based on the third information, so as to direct the third

	transmission towards the third portable wireless device; and transmitting third data in connection with the third transmission to the third portable wireless device, via a second wireless protocol.		transmission towards the third multiple-input-multiple-output (MIMO)-capable portable wireless device; and transmitting third data in connection with the third transmission to the third multiple-input-multiple-output (MIMO)-capable portable wireless device, utilizing the third multiple of the directional antennas, including a 802.11n protocol, where the first wireless protocol includes another 802.11 protocol other than the 802.11n protocol.
58	The computer-implemented method of Claim 57, wherein the first signal, the second signal, the third signal, and the fourth signal, are communicated for authentication purposes.	58	The computer-implemented method of claim 44, wherein the first signal, the second signal, the third signal, and the fourth signal, are communicated for authentication purposes.
59	A computer-implemented method, comprising: positioning one or more **multiple-input-multiple-output (MIMO)-capable** access points so that the one or more **multiple-input-multiple-**	59	A computer-implemented method, comprising: positioning one or more access points so that the one or more access points provide a desired coverage,

	output (MIMO)-capable access points provide a desired coverage, each of the one or more **multiple-input-multiple-output (MIMO)-capable** access points including: a plurality of antennas; circuitry in communication with the antennas; and at least one radio in communication with the circuitry; causing communicative coupling between the one or more **multiple-input-multiple- output (MIMO)-capable** access points and a server; receiving a first signal from a first portable wireless device; based on the first signal, permitting data communication via the **multiple-input- multiple-output (MIMO)-capable** access point for the first portable wireless device; receiving a second signal from a second portable wireless device;		each of the one or more access points including: a plurality of directional antennas; circuitry in communication with the directional antennas; and at least one radio in communication with the circuitry; causing communicative coupling between the one or more access points and a server; receiving a first signal from a first multiple-input-multiple-output (MIMO)-capable portable wireless device; based on the first signal, permitting data communication via the access point for the first multiple-input-multiple-output (MIMO)-capable portable wireless device; receiving a second signal from a second multiple-input-multiple-output

	based on the second signal, permitting data communication via the **multiple-input- multiple-output (MIMO)-capable** access point for the second portable wireless device; selecting at least one channel based on one or more channel characteristics, for initiating a first transmission to the first portable wireless device and initiating a second transmission to the second portable wireless device, such that at least a portion of the first transmission occurs simultaneously with at least a portion of the second transmission and both occur via a first wireless protocol; receiving first information from the first portable wireless device that is based on a first measurement performed by the first portable wireless device;		(MIMO)-capable portable wireless device; based on the second signal, permitting data communication via the access point for the second multiple-input-multiple-output (MIMO)-capable portable wireless device; selecting at least one channel based on one or more channel characteristics, for initiating a first transmission to the first multiple-input-multiple-output (MIMO)-capable portable wireless device and initiating a second transmission to the second multiple-input-multiple-output (MIMO)-capable portable wireless device, such that at least a portion of the first transmission occurs simultaneously with at least a portion of the second transmission and both occur via a first wireless protocol; receiving first information from the first multiple-input-multiple-output (MIMO)-capable portable wireless device that is based on a first

	receiving second information from the second portable wireless device that is based on a second measurement performed by the second portable wireless device; altering at least one aspect of the first transmission, based on at least one of the first information or the second information, so as to direct the first transmission more towards the first portable wireless device as compared to the second portable wireless device, thereby reducing interference between the first transmission and the second transmission when the at least portion of the first transmission occurs simultaneously with the at least portion of the second transmission;		measurement performed by the first multiple-input-multiple-output (MIMO)-capable portable wireless device; receiving second information from the second multiple-input-multiple-output (MIMO)-capable portable wireless device that is based on a second measurement performed by the second multiple-input-multiple-output (MIMO)-capable portable wireless device; altering at least one aspect of the first transmission in connection with a first multiple of the directional antennas, based on at least one of the first information or the second information, so as to direct the first transmission more towards the first multiple-input-multiple-output (MIMO)-capable portable wireless device as compared to the second multiple-input-multiple-output (MIMO)-capable portable wireless device, thereby reducing interference between the first transmission and the second

	altering at least one aspect of the second transmission, based on at least one of the first information or the second information, so as to direct the second transmission more towards the second portable wireless device as compared to the first portable wireless device, thereby reducing the interference between the first transmission and the second transmission when the at least portion of the first transmission occurs simultaneously with the at least portion of the second transmission; transmitting first data in connection with the first transmission to the first portable wireless device;		transmission when the at least portion of the first transmission occurs simultaneously with the at least portion of the second transmission; altering at least one aspect of the second transmission in connection with a second multiple of the directional antennas, based on at least one of the first information or the second information, so as to direct the second transmission more towards the second multiple-input-multiple-output (MIMO)-capable portable wireless device as compared to the first multiple-input-multiple-output (MIMO)-capable portable wireless device, thereby reducing the interference between the first transmission and the second transmission when the at least portion of the first transmission occurs simultaneously with the at least portion of the second transmission; transmitting first data in connection with the first transmission

	transmitting second data in connection with the second transmission to the second portable wireless device; receiving third information from a third portable wireless device that is based on a third measurement performed by the third portable wireless device; altering at least one aspect of a third transmission, based on the third information, so as to direct the third transmission towards the third portable wireless device; and		to the first multiple-input-multiple-output (MIMO)-capable portable wireless device, utilizing the first multiple of the directional antennas; transmitting second data in connection with the second transmission to the second multiple-input-multiple-output (MIMO)-capable portable wireless device, utilizing the second multiple of the directional antennas; receiving third information from a third multiple-input-multiple-output (MIMO)-capable portable wireless device that is based on a third measurement performed by the third multiple-input-multiple-output (MIMO)-capable portable wireless device; altering at least one aspect of a third transmission in connection with a third multiple of the directional antennas, based on the third information, so as to direct the third transmission towards the third

	transmitting third data in connection with the third transmission to the third portable wireless device, via a second wireless protocol including a 802.11n protocol, where the first wireless protocol includes another 802.11 protocol other than the 802.11n protocol.		multiple-input-multiple-output (MIMO)-capable portable wireless device; and transmitting third data in connection with the third transmission to the third multiple-input-multiple-output (MIMO)-capable portable wireless device, utilizing the third multiple of the directional antennas, via a second wireless protocol including a 802.11n protocol, where the first wireless protocol includes another 802.11 protocol other than the 802.11n protocol.

(1) Regarding claim 31:

Claim 16 of US Patent 10,069,548 B2 discloses all subject matter of claim 31, and further discloses the access point comprises a plurality of antennas and transmitting and receiving from the first and second MIMO-capable portable wireless devices, but fails to explicitly disclose the access point is a multiple-input-multiple-output access point.

However, it is desirable to have the access point as a multiple-input-multiple-output access point because it improves the data rate. Therefore, it would have been obvious to one of ordinary skill in the art at the time when the invention was made to have the access point to be a multiple-input-multiple-output access point for the benefit of improving data rate.

(2) Regarding claims 32-44:

Claims 17-25, 16, and 27-29 discloses all subject matter of claims 32-44 respectively as shown in the above comparison.

(3) Regarding claim 45:

Claim 30 of US Patent 10,069,548 B2 discloses all subject matter of claim 45, and further discloses the access point comprises a plurality of antennas and transmitting and receiving from the first and second MIMO-capable portable wireless devices, but fails to explicitly disclose the access point is a multiple-input-multiple-output access point.

However, it is desirable to have the access point as a multiple-input-multiple-output access point because it improves the data rate. Therefore, it would have been obvious to one of ordinary skill in the art at the time when the invention was made to have the access point to be a multiple-input-multiple-output access point for the benefit of improving data rate.

(4) Regarding claims 46-56:

Claims 31-37, 32, 41, 30, and 43 discloses all subject matter of claims 46-56 respectively as shown in the above comparison.

(5) Regarding claim 57:

Claim 44 of US Patent 10,069,548 B2 discloses all subject matter of claim 57, and further discloses the access point comprises a plurality of antennas and transmitting and receiving from the first and second MIMO-capable portable wireless devices, but fails to explicitly disclose the access point is a multiple-input-multiple-output access point.

However, it is desirable to have the access point as a multiple-input-multiple-output access point because it improves the data rate. Therefore, it would have been obvious to one of ordinary skill in the art at the time when the invention was made to have the access point to be a multiple-input-multiple-output access point for the benefit of improving data rate.

(6) Regarding claim 58:

Claim 58 discloses all subject matter of claim 58 respectively as shown in the above comparison.

(7) Regarding claim 59:

Claim 58 of US Patent 10,069,548 B2 discloses all subject matter of claim 59, and further discloses the access point comprises a plurality of antennas and transmitting and receiving from the first and second MIMO-capable portable wireless devices, but fails to explicitly disclose the access point is a multiple-input-multiple-output access point.

However, it is desirable to have the access point as a multiple-input-multiple-output access point because it improves the data rate. Therefore, it would have been obvious to one of ordinary skill in the art at the time when the invention was made to have the access point to be a multiple-input-multiple-output access point for the benefit of improving data rate.

5. Claim 31 is rejected on the ground of nonstatutory double patenting as being unpatentable over claim 27 of U.S. Patent No.9,859,963 B2. Although the claims at

issue are not identical, they are not patentably distinct from each other because of the following comparison.

Claim	Instant Application	Claim	Patent 9,859,963 B2
31	A computer-implemented method, comprising: providing access to a **multiple-input-multiple-output (MIMO)-capable** access point including: a plurality of antennas; circuitry in communication with the antennas; and at least one radio in communication with the circuitry; selecting at least one channel based on one or more channel characteristics, for initiating a first transmission to a first portable wireless device and initiating a second transmission to a second portable wireless device, such that at least a portion of the first transmission occurs simultaneously with at least a portion of the second transmission and both occur via a first wireless protocol;	27/26/18	A method, comprising: providing access to an access point including: a plurality of directional antennas; circuitry in communication with the directional antennas; and at least one radio in communication with the circuitry; selecting at least one channel based on one or more channel characteristics, for initiating a first transmission to a first multiple-input-multiple-output (MIMO)-capable portable wireless device and initiating a second transmission to a second multiple-input-multiple-output (MIMO)-capable portable wireless device, such that at least a portion of the first transmission

	receiving first information from the first portable wireless device that is based on a first measurement performed by the first portable wireless device; receiving second information from the second portable wireless device that is based on a second measurement performed by the second portable wireless device; altering at least one aspect of the first transmission, based on at least one of the first information or the second information, so as to direct the first transmission more towards the first portable wireless device as compared to the second portable wireless device, thereby		occurs simultaneously with at least a portion of the second transmission and both occur via a first wireless protocol; receiving first information from the first multiple-input-multiple-output (MIMO)-capable portable wireless device that is based on a first measurement performed by the first multiple-input-multiple-output (MIMO)-capable portable wireless device; receiving second information from the second multiple-input-multiple-output (MIMO)-capable portable wireless device that is based on a second measurement performed by the second multiple-input-multiple-output (MIMO)-capable portable wireless device; altering at least one aspect of the first transmission in connection with a first multiple of the directional antennas, based on the first information and the second

	reducing interference between the first transmission and the second transmission when the at least portion of the first transmission occurs simultaneously with the at least portion of the second transmission; altering at least one aspect of the second transmission, based on at least one of the first information or the second information, so as to direct the second transmission more towards the second portable wireless device as compared to the first portable wireless device, thereby reducing the interference between the first transmission and the second transmission when the at least portion of the first transmission occurs simultaneously		information, so as to direct the first transmission more towards the first multiple-input-multiple-output (MIMO)-capable portable wireless device as compared to the second multiple-input-multiple-output (MIMO)-capable portable wireless device, thereby reducing interference between the first transmission and the second transmission when the at least portion of the first transmission occurs simultaneously with the at least portion of the second transmission; altering at least one aspect of the second transmission in connection with a second multiple of the directional antennas, based on the first information and the second information, so as to direct the second transmission more towards the second multiple-input-multiple-output (MIMO)-capable portable wireless device as compared to the

	with the at least portion of the second transmission; transmitting first data in connection with the first transmission to the first portable wireless device; transmitting second data in connection with the second transmission to the second portable wireless device;		first multiple-input-multiple-output (MIMO)-capable portable wireless device, thereby reducing the interference between the first transmission and the second transmission when the at least portion of the first transmission occurs simultaneously with the at least portion of the second transmission; transmitting first data in connection with the first transmission to the first multiple-input-multiple-output (MIMO)-capable portable wireless device, utilizing the first multiple of the directional antennas; and transmitting second data in connection with the second transmission to the second multiple-input-multiple-output (MIMO)-capable portable wireless device, utilizing the second multiple of the directional antennas.

	receiving third information from a third portable wireless device that is based on a third measurement performed by the third portable wireless device; altering at least one aspect of a third transmission, based on the third information, so as to direct the third transmission towards the third portable wireless device; and		The method of claim 18, wherein a third transmission is initiated to a third multiple-input-multiple-output (MIMO)-capable portable wireless device via a second wireless protocol, and further comprising: receiving third information from the third multiple-input-multiple-output (MIMO)-capable portable wireless device that is based on a third measurement performed by the third multiple-input-multiple-output (MIMO)-capable portable wireless device; altering at least one aspect of the third transmission in connection with a third multiple of the directional antennas, based on the third information, so as to direct the third transmission towards the third multiple-input-multiple-output (MIMO)-capable portable wireless device; and

	transmitting third data in connection with the third transmission to the third portable wireless device, via a second wireless protocol including a 802.11n protocol, where the first wireless protocol includes another 802.11 protocol other than the 802.11n protocol.		transmitting third data in connection with the third transmission to the third multiple-input-multiple-output (MIMO)-capable portable wireless device, utilizing the third multiple of the directional antennas. The method of claim 26, wherein the second wireless protocol includes a 802.11n protocol, and the first wireless protocol includes a different 802.11 protocol other than the 802.11n protocol, and further wherein different radios and different antennas are used for the first wireless protocol and the second wireless protocol for increased data throughput.

Regarding claim 31:

Claim 18 of US Patent 9859,963 B2 discloses all subject matter of claim 31, and further discloses the access point comprises a plurality of antennas and transmitting and receiving from the first and second MIMO-capable portable wireless devices, but

fails to explicitly disclose the access point is a multiple-input-multiple-output access point.

However, it is desirable to have the access point as a multiple-input-multiple-output access point because it improves the data rate. Therefore, it would have been obvious to one of ordinary skill in the art at the time when the invention was made to have the access point to be a multiple-input-multiple-output access point for the benefit of improving data rate.

6. Claims 31-38 and 43-44 are rejected on the ground of nonstatutory double patenting as being unpatentable over claim 16-25, and 27-29 of U.S. Patent No.10,063,297 B1. Although the claims at issue are not identical, they are not patentably distinct from each other because of the following comparison.

Claim	Instant Application	Claim	Patent 10,063,297 B1
31	A computer-implemented method, comprising: providing access to a **multiple-input-multiple-output (MIMO)-capable** access point including: a plurality of antennas; circuitry in communication with the antennas; and at least one radio in communication with the circuitry;	16	A computer-implemented method, comprising: providing access to an access point including: a plurality of directional antennas; circuitry in communication with the directional antennas; and at least one radio in communication with the circuitry;

	selecting at least one channel based on one or more channel characteristics, for initiating a first transmission to a first portable wireless device and initiating a second transmission to a second portable wireless device, such that at least a portion of the first transmission occurs simultaneously with at least a portion of the second transmission and both occur via a first wireless protocol; receiving first information from the first portable wireless device that is based on a first measurement performed by the first portable wireless device; receiving second information from the second portable wireless device that is based on a second		selecting at least one channel based on one or more channel characteristics, for initiating a first transmission to a first multiple-input-multiple-output (MIMO)-capable portable wireless device and initiating a second transmission to a second multiple-input-multiple-output (MIMO)-capable portable wireless device, such that at least a portion of the first transmission occurs simultaneously with at least a portion of the second transmission and both occur via a first wireless protocol; receiving first information from the first multiple-input-multiple-output (MIMO)-capable portable wireless device that is based on a first measurement performed by the first multiple-input-multiple-output (MIMO)-capable portable wireless device; receiving second information from the second multiple-input-multiple-output (MIMO)-capable portable wireless device that is based

	measurement performed by the second portable wireless device; altering at least one aspect of the first transmission, based on at least one of the first information or the second information, so as to direct the first transmission more towards the first portable wireless device as compared to the second portable wireless device, thereby reducing interference between the first transmission and the second transmission when the at least portion of the first transmission occurs simultaneously with the at least portion of the second transmission; altering at least one aspect of the second transmission, based on at least one of the first information or the		on a second measurement performed by the second multiple-input-multiple-output (MIMO)-capable portable wireless device; altering at least one aspect of the first transmission in connection with a first multiple of the directional antennas, based on at least one of the first information or the second information, so as to direct the first transmission more towards the first multiple-input-multiple-output (MIMO)-capable portable wireless device as compared to the second multiple-input-multiple-output (MIMO)-capable portable wireless device, thereby reducing interference between the first transmission and the second transmission when the at least portion of the first transmission occurs simultaneously with the at least portion of the second transmission; altering at least one aspect of the second transmission in connection with a second multiple of the

	second information, so as to direct the second transmission more towards the second portable wireless device as compared to the first portable wireless device, thereby reducing the interference between the first transmission and the second transmission when the at least portion of the first transmission occurs simultaneously with the at least portion of the second transmission; transmitting first data in connection with the first transmission to the first portable wireless device; transmitting second data in connection with the second		directional antennas, based on at least one of the first information or the second information, so as to direct the second transmission more towards the second multiple-input-multiple-output (MIMO)-capable portable wireless device as compared to the first multiple-input-multiple-output (MIMO)-capable portable wireless device, thereby reducing the interference between the first transmission and the second transmission when the at least portion of the first transmission occurs simultaneously with the at least portion of the second transmission; transmitting first data in connection with the first transmission to the first multiple-input-multiple-output (MIMO)-capable portable wireless device, utilizing the first multiple of the directional antennas; transmitting second data in connection with the second transmission to the second multiple-

	transmission to the second portable wireless device; receiving third information from a third portable wireless device that is based on a third measurement performed by the third portable wireless device; altering at least one aspect of a third transmission, based on the third information, so as to direct the third transmission towards the third portable wireless device; and transmitting third data in connection with the third transmission to the third portable wireless device, via a second wireless protocol including a 802.11n protocol, where the first wireless protocol includes		input-multiple-output (MIMO)-capable portable wireless device, utilizing the second multiple of the directional antennas; receiving third information from a third multiple-input-multiple-output (MIMO)-capable portable wireless device that is based on a third measurement performed by the third multiple-input-multiple-output (MIMO)-capable portable wireless device; altering at least one aspect of a third transmission in connection with a third multiple of the directional antennas, based on the third information, so as to direct the third transmission towards the third multiple-input-multiple-output (MIMO)-capable portable wireless device; transmitting third data in connection with the third transmission to the third multiple-input-multiple-output (MIMO)-capable portable wireless device, utilizing the third multiple of the directional antennas,

	another 802.11 protocol other than the 802.11n protocol.		via a second wireless protocol including a 802.11n protocol, where the first wireless protocol includes another 802.11 protocol other than the 802.11n protocol; and causing at least one file to be served from at least one file server via the access point.
32	The computer-implemented method of Claim 31, wherein the third transmission to the third portable wireless device is initiated via a particular channel that is different, in at least one respect, from the at least one channel, for preventing interference between the third transmission via the 802.11n protocol, and at least one of the first transmission or the second transmission via the another 802.11 protocol.	17	The computer-implemented method of claim 16, wherein the third transmission to the third multiple-input-multiple-output (MIMO)-capable portable wireless device is initiated via a particular channel that is different, in at least one respect, from the at least one channel, for preventing interference between the third transmission via the 802.11n protocol, and at least one of the first transmission or the second transmission via the another 802.11 protocol.
33	The computer-implemented method of Claim 32, wherein a plurality of radios are utilized including	18	The computer-implemented method of claim 17, wherein a plurality of radios are utilized including

	a first radio configured to communicate via the another 802.11 protocol and a second radio configured to communicate via the 802.11n protocol, and different antennas are used for the another 802.11 protocol and the 802.11n protocol, so that sufficient resources are available to the 802.11n protocol and the another 802.11 protocol, when at least a portion of the third transmission occurs simultaneously with at least one of the first transmission or the second transmission.		a first radio configured to communicate via the another 802.11 protocol and a second radio configured to communicate via the 802.11n protocol, and different antennas are used for the another 802.11 protocol and the 802.11n protocol, so that sufficient resources are available to the 802.11n protocol and the another 802.11 protocol, when at least a portion of the third transmission occurs simultaneously with at least one of the first transmission or the second transmission.
34	The computer-implemented method of Claim 33, wherein the at least one channel includes multiple channels that, together, have a greater bandwidth than the particular channel.	19	The computer-implemented method of claim 18, wherein the at least one channel includes multiple channels that, together, have a greater bandwidth than the particular channel.
35	The computer-implemented method of Claim 31, wherein the at least one channel includes multiple channels including a first channel and	21	The computer-implemented method of claim 16, wherein the access point is configured such that the at least one channel includes

	a second channel, and the first transmission to the first portable wireless device is initiated via the first channel, and the second transmission to the second portable wireless device is initiated via the second channel.		multiple channels including a first channel and a second channel, and the first transmission to the first multiple-input-multiple-output (MIMO)-capable portable wireless device is initiated via the first channel, and the second transmission to the second multiple-input-multiple-output (MIMO)-capable portable wireless device is initiated via the second channel.
36	The computer-implemented method of Claim 31, wherein the first transmission and the second transmission are both initiated on the at least one channel which includes the same single channel.	22	The computer-implemented method of claim 16, wherein the access point is configured such that the first transmission and the second transmission are both initiated on the at least one channel which includes the same single channel.
37	The computer-implemented method of Claim 31, wherein the third transmission to the third portable wireless device is initiated via a particular channel that is different from the at least one channel.	23	The computer-implemented method of claim 16, wherein the access point is configured such that the third transmission to the third multiple-input-multiple-output (MIMO)-capable portable wireless device is initiated via a particular channel that is

			different from the at least one channel.
38	The computer-implemented method of Claim 31, wherein the third transmission to the third portable wireless device is initiated via a particular channel that is the same as the at least one channel.	24	The computer-implemented method of claim 16, wherein the access point is configured such that the third transmission to the third multiple-input-multiple-output (MIMO)-capable portable wireless device is initiated via a particular channel that is the same as the at least one channel.
43	The computer-implemented method of Claim 31, wherein a **channel difference** is used for the 802.11n protocol and the another 802.11 protocol for increased data throughput.	29	The computer-implemented method of claim 16, wherein the access point is configured such that different radios, different antennas, and **a channel difference** are used for the first wireless protocol and the second wireless protocol for increased data throughput.
44	The computer-implemented method of Claim 31, wherein different radios, different antennas, and a channel difference are used for the first wireless protocol and the second wireless protocol for increased data throughput.		

(1) Regarding claim 31:

Claim 16 of US Patent 9859,963 B2 discloses all subject matter of claim 31, and further discloses the access point comprises a plurality of antennas and transmitting and receiving from the first and second MIMO-capable portable wireless devices, but fails to explicitly disclose the access point is a multiple-input-multiple-output access point.

However, it is desirable to have the access point as a multiple-input-multiple-output access point because it improves the data rate. Therefore, it would have been obvious to one of ordinary skill in the art at the time when the invention was made to have the access point to be a multiple-input-multiple-output access point for the benefit of improving data rate.

(2) Regarding claims 32-38 and 43-44:

Claims 17-19 21-24, and 29 of US Patent 9859,963 B2 discloses all subject matter of claims 32-38 and 43-44 as shown in the above comparison.

Allowable Subject Matter

7. Claim 60 is objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

Conclusion

8. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

Lin et al. (US 2005/0141495 A1) discloses a filling the space-time channels in SDMA.

Lastinger et al. (US 9,496,930 B2) discloses a methods and apparatus for overlapping MI MO physical sectors.

Lastinger et al. (US 9,496,931 B2) discloses a method and apparatus for overlapping MI MO physical sectors.

Lastinger et al. (US 7,274,944 B2) discloses a method and apparatus for high throughput multiple radio sectorized wireless ceil.

9. Any inquiry concerning this communication or earlier communications from the examiner should be directed to SIU M LEE whose telephone number is (571)270-1083. The examiner can normally be reached on M-T 8:30-7:00.

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, Chieh M Fan can be reached on 571-272-3042. 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.

/SIU M LEE/
Primary Examiner, Art Unit 2632
10/13/2018

Notice of References Cited	Application/Control No. 16/120,258	Applicant(s)/Patent Under Reexamination	
	Examiner SIU M LEE	Art Unit 2632	Page 1 of 1

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*	A	US-10069548-B2	09-2018	Lastinger; Roc	H04B7/0495	1/1
*	B	US-10063297-B1	08-2018	Lastinger; Roc	H04B7/0495	1/1
*	C	US-9859963-B2	01-2018	Lastinger; Roc	H04B7/0495	1/1
*	D	US-7274944-B2	09-2007	Lastinger; Roc	H01Q3/2605	455/464
*	E	US-20050141495-A1	06-2005	Lin, Xintian E.	H04B7/0617	370/389
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*	G	US-9496931-B2	11-2016	Lastinger; Roc	H04B7/0495	1/1
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	N					
	O					
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	R					
	S					
	T					

NON-PATENT DOCUMENTS

*		Include as applicable: Author, Title Date, Publisher, Edition or Volume, Pertinent Pages)
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*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.

Exhibit 1002
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Index of Claims	Application/Control No.	Applicant(s)/Patent Under Reexamination
	16/120,258	Lastinger et al.
	Examiner	Art Unit
	SIU M LEE	2632

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

CLAIMS

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

CLAIM		DATE								
Final	Original	10/14/2018								
	1	-								
	2	-								
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	4	-								
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	42	✓								

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Index of Claims	Application/Control No.	Applicant(s)/Patent Under Reexamination
	16/120,258	Lastinger et al.
	Examiner	**Art Unit**
	SIU M LEE	2632

CLAIM		DATE								
Final	Original	10/14/2018								
	43	✓								
	44	✓								
	45	✓								
	46	✓								
	47	✓								
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Search Notes	Application/Control No.	Applicant(s)/Patent Under Reexamination
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	Examiner	**Art Unit**
	SIU M LEE	2632

CPC - Searched*		
Symbol	**Date**	**Examiner**
H04B 7/0456, 024, 0495	10/14/2018	Siu M. Lee
H04B 17/15	10/14/2018	Siu M. Lee
H04W 84/12, 18	10/14/2018	Siu M. Lee
H04W 80/04	10/14/2018	Siu M. Lee

CPC Combination Sets - Searched*		
Symbol	**Date**	**Examiner**

US Classification - Searched*			
Class	**Subclass**	**Date**	**Examiner**
370	338 328	10/14/2018	Siu M. Lee
455	422.1, 424, 443, 452.2	10/14/2018	Siu M. Lee
375	259, 260, 267, 285, 295, 296, 299	10/14/2018	Siu M. Lee

* 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**
EAST	10/14/2018	Siu M. Lee
Inventor name search - Roc LASTINGER, John SPENIK, Brian WOODBURY	10/14/2018	Siu M. Lee
Applicant name search - Woodbury Wireless	10/14/2018	Siu M. Lee

Interference Search			
US Class/CPC Symbol	**US Subclass/CPC Group**	**Date**	**Examiner**

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	16/120,258	Lastinger et al.
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Doc code: IDS
Doc description: Information Disclosure Statement (IDS) Filed

PTO/SB/08a (03-15)
Approved for use through 07/31/2016. OMB 0651-0031
U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE
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INFORMATION DISCLOSURE STATEMENT BY APPLICANT (**Not for submission under 37 CFR 1.99**)		
	Application Number	
	Filing Date	
	First Named Inventor	Roc Lastinger
	Art Unit	
	Examiner Name	
	Attorney Docket Number	WBWL001H

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Examiner Initial*	Cite No	Publication Number	Kind Code[1]	Publication Date	Name of Patentee or Applicant of cited Document	Pages,Columns,Lines where Relevant Passages or Relevant Figures Appear
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	Application Number	
	Filing Date	
	First Named Inventor	Roc Lastinger
	Art Unit	
	Examiner Name	
	Attorney Docket Number	WBWL001H

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	Application Number	
	Filing Date	
	First Named Inventor	Roc Lastinger
	Art Unit	
	Examiner Name	
	Attorney Docket Number	WBWL001H

Examiner Initial*	Cite No	Foreign Document Number[3]	Country Code[2]	Kind Code[4]	Publication Date	Name of Patentee or Applicant of cited Document	Pages,Columns,Lines where Relevant Passages or Relevant Figures Appear	T[5]
	1	200235289	KR		2001-10-10	HIGHGAIN ANTENNA CO.,LTD.	1	

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	1	Blum et al., "On the Capacity of Cellular Systems with MIMO," proc. 2001 Fall IEEE Vehicuar Technology Conf., vol 2, pp 1220-1224, Atlantic City, NJ, Oct. 2001.	
	2	Xiaodong et al., "Handover Mechanism in Coordinated Multi-Point Transmission/Reception System," ZTE Corporate, ZTE Communications, 2010, no. 1	
	3	Catreux et al., "Simulation Results for an interference-limited multiple-input multiple-output cellular system," IEEE Communications Letter, Vol 4, no. 11, pp. 334-336, Nov. 2000	
	4	Dai et al., "Downlink capacity of interference-limited MIMO systems with joint detection," IEEE Transactions Wireless Communications, vol 3, no. 2, pp. 442-453, Mar. 2004	
	5	Goldsmith et al. , "Capacity limits of MIMO Channels," IEEE J Select, Areas Coomun., vol 21, no. 5, pp. 684-702, June 2003	
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INFORMATION DISCLOSURE STATEMENT BY APPLICANT (Not for submission under 37 CFR 1.99)		
	Application Number	
	Filing Date	
	First Named Inventor	Roc Lastinger
	Art Unit	
	Examiner Name	
	Attorney Docket Number	WBWL001H

	8	Wyner, "Shannon-theoretic approach to a Gaussian Cellular Multiple-access channel," IEEE Trans, on Inform. Theory, vol 40, no. 6, pp. 1713-1727, nov. 1994	
	9	Shamai et al., "Enhancing the cellular downlink capacity via co-processing at the transmission end," Proc. 2001 Spring IEEE Vehicular Technology Conf., pp. 1745-1749, Rhodes, Greece, May 2001.	
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	13	Troger et al., "Performance Assessment of Joint Transmission (JT) Multi-User Downlinks and Multi-Element Transmit Antennas", Smart Antennas, vol. 12, No. 5, Sep.-Oct. 2001, pp. 407-416. cited by other	
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	17	U.S. Patent Application No. 14/952,839 filed 2015-11-25	
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	Art Unit	
	Examiner Name	
	Attorney Docket Number	WBWL001H

	19	U.S. Patent Application No. 14/952,867 filed 2015-11-25	

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	Filing Date	
	First Named Inventor	Roc Lastinger
	Art Unit	
	Examiner Name	
	Attorney Docket Number	WBWL001H

CERTIFICATION STATEMENT

Please see 37 CFR 1.97 and 1.98 to make the appropriate selection(s):

That each item of information contained in the information disclosure statement was first cited in any communication from a foreign patent office in a counterpart foreign application not more than three months prior to the filing of the information disclosure statement. See 37 CFR 1.97(e)(1).

OR

☐ That no item of information contained in the information disclosure statement was cited in a communication from a foreign patent office in a counterpart foreign application, and, to the knowledge of the person signing the certification after making reasonable inquiry, no item of information contained in the information disclosure statement was known to any individual designated in 37 CFR 1.56(c) more than three months prior to the filing of the information disclosure statement. See 37 CFR 1.97(e)(2).

See attached certification statement.

The fee set forth in 37 CFR 1.17 (p) has been submitted herewith.

☒ A certification statement is not submitted herewith.

SIGNATURE

A signature of the applicant or representative is required in accordance with CFR 1.33, 10.18. Please see CFR 1.4(d) for the form of the signature.

Signature	/Thomas D. Fortenberry/	Date (YYYY-MM-DD)	2018-09-01
Name/Print	Thomas Fortenberry	Registration Number	56537

This collection of information is required by 37 CFR 1.97 and 1.98. 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 1 hour 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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EAST Search History

EAST Search History (Prior Art)

Ref #	Hits	Search Query	DBs	Default Operator	Plurals	Time Stamp
L1	16087	MU mimo	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	ADJ	ON	2018/10/13 22:35
L2	676	1 and directional antenna	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	ADJ	ON	2018/10/13 22:44
L3	15	2 and (@pd<="20060228" OR @ad<="20060228" OR @rlad<="20060228" OR @prad<="20060228")	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	ADJ	ON	2018/10/13 22:44
L4	8	10/749293	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	ADJ	ON	2018/10/13 23:32
L5	9	("2005/0141495").URPN.	USPAT	ADJ	ON	2018/10/13 23:33
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L12	3	(6 or 7 or 8 or 9 or 10 or 11) and mimo and protocol and "802.11n"	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	ADJ	ON	2018/10/14 00:23

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S1	20203	(H04B7/0456 or H04B17/15 or H04B7/024 or H04B7/0495).cpc.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	ADJ	ON	2017/07/17 11:46
S2	20203	(H04B7/0456 or H04B17/15 or H04B7/024 or H04B7/0495).cpc.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	ADJ	ON	2017/07/17 12:56
S3	7602	S2 and mimo	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	ADJ	ON	2017/07/17 12:56
S4	474	S3 and (@pd<="20060228" OR @ad<="20060228" OR @rlad<="20060228" OR @prad<="20060228")	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	ADJ	ON	2017/07/17 12:57
S5	134	S4 and directional antenna	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	ADJ	ON	2017/07/17 13:51
S6	7	14/952874	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	ADJ	ON	2017/07/17 17:42
S7	1	S6 and (protocol).clm.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	ADJ	ON	2017/07/17 18:05
S8	6	S6 and (third).clm.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	ADJ	ON	2017/07/17 18:05
S9	43	"38325250".FMID.	US-PGPUB; USPAT; FPRS	ADJ	ON	2017/07/17 18:10
S10	95	(("LASTINGER") near3 ("Roc")).INV.	US-PGPUB; USPAT;	ADJ	ON	2017/07/17 18:34

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			USOCR			
S11	78	(("SPENIK") near3 ("John")).INV.	US-PGPUB; USPAT; USOCR	ADJ	ON	2017/07/17 18:34
S12	75	(("WOODBURY") near3 ("Brian")).INV.	US-PGPUB; USPAT; USOCR	ADJ	ON	2017/07/17 18:34
S13	16	(Woodbury Wireless).as. or (Woodbury Wireless).aanm.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	ADJ	ON	2017/07/17 18:35
S14	58	(S10 or S11 or S12 or S13) and mimo and direction$2 antenna	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	ADJ	ON	2017/07/17 18:35
S15	15	S14 and (third).clm.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	ADJ	ON	2017/07/17 19:45
S16	1	15/406661 and radio	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	ADJ	ON	2017/07/18 08:44
S17	95	(("LASTINGER") near3 ("Roc")).INV.	US-PGPUB; USPAT; USOCR	ADJ	ON	2017/07/18 11:17
S18	78	(("SPENIK") near3 ("John")).INV.	US-PGPUB; USPAT; USOCR	ADJ	ON	2017/07/18 11:17
S19	75	(("WOODBURY") near3 ("Brian")).INV.	US-PGPUB; USPAT; USOCR	ADJ	ON	2017/07/18 11:17
S20	16	(Woodbury Wireless).as. or (Woodbury Wireless).aanm.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	ADJ	ON	2017/07/18 11:17
S21	58	(S17 or S18 or S19 or S20) and mimo and direction$2 antenna	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	ADJ	ON	2017/07/18 11:17
S22	6	14/952867	US-PGPUB; USPAT;	ADJ	ON	2017/07/18 12:09

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			USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB			
S23	139731	(H04B7/0456,024,0495 or H04B17/15 or H04W84/12,18 or H04W80/04).cpc.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	ADJ	ON	2017/07/18 12:55
S24	102161	(370/338,328 or 455/422.1,424,443,452.2 or 375/259,260,267,285,295,296,299).ccls.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	ADJ	ON	2017/07/18 12:59
S25	1283	(S23 or S24) and mimo and directional antenna	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	ADJ	ON	2017/07/18 13:01
S26	100	S25 and (adaptive with beamforming)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	ADJ	ON	2017/07/18 13:01
S27	45	S26 and (@pd<="20060228" OR @ad<="20060228" OR @rlad<="20060228" OR @prad<="20060228")	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	ADJ	ON	2017/07/18 13:01
S28	45	S27 not (S17 or S18 or S19 or S20)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	ADJ	ON	2017/07/18 13:02
S29	1366	mimo same direction$2 antenna	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	ADJ	ON	2017/07/18 13:28
S32	75	S29 and (adaptive with beamform$3)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	ADJ	ON	2017/07/18 13:29

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S33	70	S32 and protocol	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	ADJ	ON	2017/07/18 13:33
S34	38	S33 and (@pd<="20060228" OR @ad<="20060228" OR @rlad<="20060228" OR @prad<="20060228")	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	ADJ	ON	2017/07/18 13:34
S35	364	S29 and (@pd<="20060228" OR @ad<="20060228" OR @rlad<="20060228" OR @prad<="20060228")	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	ADJ	ON	2017/07/18 13:42
S36	230	S35 and protocol	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	ADJ	ON	2017/07/18 13:43
S37	28	S36 and ((receiv$3 or feedback) with information with measur$5)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	ADJ	ON	2017/07/18 13:44
S38	87	S29 and (overlap$4 with mimo)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	ADJ	ON	2017/07/18 14:34
S39	68	S38 and (@pd<="20060228" OR @ad<="20060228" OR @rlad<="20060228" OR @prad<="20060228")	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	ADJ	ON	2017/07/18 14:34
S40	0	"9496931".pn. and protocol.clm.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	ADJ	ON	2017/07/18 15:01
S41	1	"9496931".pn. and (select$3 with channel).clm.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO;	ADJ	ON	2017/07/18 15:04

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			DERWENT; IBM_TDB			
S42	1	"9496930".pn. and (select$3 with channel).clm.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	ADJ	ON	2017/07/18 15:13
S43	0	"9496931".pn. and (protocol).clm.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	ADJ	ON	2017/07/18 15:23
S44	1	"9496931".pn. and (select$3).clm.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	ADJ	ON	2017/07/18 15:24
S45	0	"9503163".pn. and (protocol).clm.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	ADJ	ON	2017/07/18 15:30
S46	1	"9503163".pn. and (select$3).clm.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	ADJ	ON	2017/07/18 15:30
S47	0	"8855089".pn. and (select$3).clm.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	ADJ	ON	2017/07/18 15:42
S48	0	"8855089".pn. and (protocol).clm.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	ADJ	ON	2017/07/18 15:48
S49	0	"8855089".pn. and (select$3 with channel).clm.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	ADJ	ON	2017/07/18 15:48
S50	2	"8855089".pn.	US-PGPUB; USPAT; USOCR;	ADJ	ON	2017/07/18 15:49

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			FPRS; EPO; JPO; DERWENT; IBM_TDB			
S51	3	"8345651".pn.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	ADJ	ON	2017/07/18 15:50
S65	1	"9503163".pn. and protocol	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	ADJ	ON	2017/07/19 21:36
S66	0	14/952874.pn. and protocol	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	ADJ	ON	2017/07/19 21:36
S67	7	14/952874 and protocol	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	ADJ	ON	2017/07/19 21:36
S68	5	S67 and (direct$3 with transmi$5).clm.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	ADJ	ON	2017/07/19 22:16
S84	23	((("9503163") or ("8855089") or ("8345651") or ("8009646")).PN.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2017/10/23 13:35
S85	0	S84 and (protocol).clm.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	ADJ	ON	2017/10/23 13:35
S86	1	S84 and (information with device).clm.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	ADJ	ON	2017/10/23 13:39
S103	3	15/406661	US-PGPUB;	ADJ	ON	2018/05/09

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			USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB			13:25
S104	0	"9859963".pn. and "802".clm.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	ADJ	ON	2018/05/09 13:42
S105	2	15/406661 and "802""".""11".clm.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	ADJ	ON	2018/05/09 13:42
S106	2	15/406661 and "802""."11?".clm.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	ADJ	ON	2018/05/09 13:43
S107	0	15/406661 and "802?11?".clm.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	ADJ	ON	2018/05/09 13:43
S108	2	15/406661 and ("802.11?" or "802.11").clm.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	ADJ	ON	2018/05/09 13:44
S109	3	15/406661 and ("802.11n" or "802.11").clm.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	ADJ	ON	2018/05/09 13:44
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S122	64	(S110 or S111 or S112 or S113 or S114 or S115 or S116 or S117 or S118 or S119 or S120 or S121) and mimo and directional antenna	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	ADJ	ON	2018/05/09 15:58
S123	32	S122 and "802.11"	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	ADJ	ON	2018/05/09 16:03
S124	5	S122 and "802.11n"	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	ADJ	ON	2018/05/09 16:03
S125	100	(("LASTINGER") near3 ("Roc")).INV.	US-PGPUB; USPAT; USOCR	ADJ	ON	2018/05/09 16:09
S126	80	(("SPENIK") near3 ("John")).INV.	US-PGPUB; USPAT; USOCR	ADJ	ON	2018/05/09 16:09
S127	80	(("WOODBURY") near3 ("Brian")).INV.	US-PGPUB; USPAT; USOCR	ADJ	ON	2018/05/09 16:10
S128	47	woodbury.as. or woodbury.aanm.	US-PGPUB; USPAT; USOCR	ADJ	ON	2018/05/09 16:10
S129	7	(S125 or S126 or S127 or S128) and mimo and directional antenna and "802.11n"	US-PGPUB; USPAT; USOCR	ADJ	ON	2018/05/09 16:10
S130	3	15/406661 and means	US-PGPUB; USPAT; USOCR	ADJ	ON	2018/05/09 16:27
S131	155354	(H04B7/0456,024,0495 or H04B17/15 or H04W84/12,18 or H04W80/04).cpc.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	ADJ	ON	2018/05/09 18:17

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S132	104268	(370/338,328 or 455/422.1,424,443,452.2 or 375/259,260,267,285,295,296,299).ccls.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	ADJ	ON	2018/05/09 18:17
S133	486	(S131 or S132) and mimo and directional antenna and "802.11n"	US-PGPUB; USPAT; USOCR	ADJ	ON	2018/05/09 18:18
S134	77	S133 and (@pd<="20060228" OR @ad<="20060228" OR @rlad<="20060228" OR @prad<="20060228")	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	ADJ	ON	2018/05/09 18:18
S135	2	S134 and (adaptive with beamforming)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	ADJ	ON	2018/05/09 18:18
S136	1242	("6" or "7") and mimo and directional antenna and "802.11n"	US-PGPUB; USPAT; USOCR	ADJ	ON	2018/07/14 17:17
S150	171444	(H04B7/0456,024,0495 or H04B17/15 or H04W84/12,18 or H04W80/04).cpc.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	ADJ	ON	2018/10/11 14:53
S151	106089	(370/338,328 or 455/422.1,424,443,452.2 or 375/259,260,267,285,295,296,299).ccls.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	ADJ	ON	2018/10/11 14:53
S152	1528	(S150 or S151) and mimo and directional antenna	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	ADJ	ON	2018/10/11 15:36
S153	103	S152 and (adaptive with beamforming) and (protocol or "802.11")	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	ADJ	ON	2018/10/11 15:36
S154	102	(("LASTINGER") near3 ("Roc")).INV.	US-PGPUB; USPAT; USOCR	ADJ	ON	2018/10/11 17:22
S155	82	(("SPENIK") near3 ("John")).INV.	US-PGPUB; USPAT;	ADJ	ON	2018/10/11 17:22

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			USOCR			
S156	82	(("WOODBURY") near3 ("Brian")).INV.	US-PGPUB; USPAT; USOCR	ADJ	ON	2018/10/11 17:23
S157	22	(Woodbury Wireless).as. or (Woodbury Wireless).aanm.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	ADJ	ON	2018/10/11 17:23
S158	64	(S154 or S155 or S156 or S157) and mimo and directional antenna	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	ADJ	ON	2018/10/11 17:23
S159	0	S158 and (adaptive with beamforming) and (protocol or "802.11")	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	ADJ	ON	2018/10/11 17:23
S160	58	S158 and (protocol or "802.11")	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	ADJ	ON	2018/10/11 17:23
S161	58	S160 not S153	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	ADJ	ON	2018/10/11 17:23
S162	4	"10069548".pn.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	ADJ	ON	2018/10/11 17:49
S163	1	"10069548".pn. and (protocol).clm.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	ADJ	ON	2018/10/11 18:30
S164	3	"9859963".pn.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	ADJ	ON	2018/10/12 17:30

S165	7	"10063297".pn.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	ADJ	ON	2018/10/12 18:29

EAST Search History (Interference)

Ref #	Hits	Search Query	DBs	Default Operator	Plurals	Time Stamp
S52	42070	(H04B7/0456,024,0495 or H04B17/15 or H04W84/12,18 or H04W80/04).cpc.	US-PGPUB; USPAT	ADJ	ON	2017/07/18 20:43
S53	68358	(370/338,328 or 455/422.1,424,443,452.2 or 375/259,260,267,285,295,296,299).ccls.	US-PGPUB; USPAT	ADJ	ON	2017/07/18 20:43
S54	180	(S52 and S53) and mimo and directional antenna	US-PGPUB; USPAT	ADJ	ON	2017/07/18 20:44
S55	65	S54 and (@pd<="20060228" OR @ad<="20060228" OR @rlad<="20060228" OR @prad<="20060228")	US-PGPUB; USPAT	ADJ	ON	2017/07/18 20:44
S56	61	S55 and protocol	US-PGPUB; USPAT	ADJ	ON	2017/07/18 20:44
S57	3832	mimo and directional antenna	US-PGPUB; USPAT	ADJ	ON	2017/07/18 21:39
S58	985	S57 and (antenna with protocol)	US-PGPUB; USPAT	ADJ	ON	2017/07/18 21:39
S59	8	S57 and (first protocol same second protocol)	US-PGPUB; USPAT	ADJ	ON	2017/07/18 21:40
S60	95	(("LASTINGER") near3 ("Roc")).INV.	US-PGPUB; USPAT	ADJ	ON	2017/07/18 21:43
S61	78	(("SPENIK") near3 ("John")).INV.	US-PGPUB; USPAT	ADJ	ON	2017/07/18 21:44
S62	75	(("WOODBURY") near3 ("Brian")).INV.	US-PGPUB; USPAT	ADJ	ON	2017/07/18 21:44
S63	10	(Woodbury Wireless).as. or (Woodbury Wireless).aanm.	US-PGPUB; USPAT	ADJ	ON	2017/07/18 21:44
S64	53	(S60 or S61 or S62 or S63) and mimo and direction$2 antenna	US-PGPUB; USPAT	ADJ	ON	2017/07/18 21:46
S69	193	MIMO and (overlap$4 with sector) and directional antenna	US-PGPUB; USPAT	ADJ	ON	2017/07/19 22:22
S70	78	S69 and (@pd<="20060228" OR @ad<="20060228" OR @rlad<="20060228" OR @prad<="20060228")	US-PGPUB; USPAT	ADJ	ON	2017/07/19 22:22
S71	96	(("LASTINGER") near3 ("Roc")).INV.	US-	ADJ	ON	2017/10/22

			PGPUB; USPAT			18:23
S72	78	(("SPENIK") near3 ("John")).INV.	US-PGPUB; USPAT	ADJ	ON	2017/10/22 18:23
S73	76	(("WOODBURY") near3 ("Brian")).INV.	US-PGPUB; USPAT	ADJ	ON	2017/10/22 18:23
S74	10	(Woodbury Wireless).as. or (Woodbury Wireless).aanm.	US-PGPUB; USPAT	ADJ	ON	2017/10/22 18:24
S75	18	(S71 or S72 or S73 or S74) and mimo and direction$2 antenna and (transmi$5 with simultaneous$2)	US-PGPUB; USPAT	ADJ	ON	2017/10/22 18:30
S76	2	(S71 or S72 or S73 or S74) and mimo and direction$2 antenna and (transmi$5 with simultaneous$2).clm.	US-PGPUB; USPAT	ADJ	ON	2017/10/22 18:31
S77	44043	(H04B7/0456,024,0495 or H04B17/15 or H04W84/12,18 or H04W80/04).cpc.	US-PGPUB; USPAT	ADJ	ON	2017/10/22 19:02
S78	68402	(370/338,328 or 455/422.1,424,443,452.2 or 375/259,260,267,285,295,296,299).ccls.	US-PGPUB; USPAT	ADJ	ON	2017/10/22 19:02
S79	659	(S77 or S78) and mimo and direction$2 antenna and (transmi$5 with simultaneous$2)	US-PGPUB; USPAT	ADJ	ON	2017/10/22 19:02
S80	191	S79 and (@pd<="20060228" OR @ad<="20060228" OR @rlad<="20060228" OR @prad<="20060228")	US-PGPUB; USPAT	ADJ	ON	2017/10/22 19:02
S81	155	S80 and protocol	US-PGPUB; USPAT	ADJ	ON	2017/10/22 19:03
S82	57	S81 and (feedback with antenna)	US-PGPUB; USPAT	ADJ	ON	2017/10/22 19:04
S83	73	(S80) and (interference with transmi$5 with simultaneous$2)	US-PGPUB; USPAT	ADJ	ON	2017/10/22 19:05
S87	44043	(H04B7/0456,024,0495 or H04B17/15 or H04W84/12,18 or H04W80/04).cpc.	US-PGPUB; USPAT	ADJ	ON	2017/10/23 09:55
S88	68402	(370/338,328 or 455/422.1,424,443,452.2 or 375/259,260,267,285,295,296,299).ccls.	US-PGPUB; USPAT	ADJ	ON	2017/10/23 09:55
S89	659	(S87 or S88) and mimo and direction$2 antenna and (transmi$5 with simultaneous$2)	US-PGPUB; USPAT	ADJ	ON	2017/10/23 09:55
S90	191	S89 and (@pd<="20060228" OR @ad<="20060228" OR @rlad<="20060228" OR @prad<="20060228")	US-PGPUB; USPAT	ADJ	ON	2017/10/23 09:55
S91	73	(S90) and (interference with transmi$5 with simultaneous$2)	US-PGPUB; USPAT	ADJ	ON	2017/10/23 09:55
S92	0	S91 and (adaptive with directional antenna) and (interference with directinal antenna)	US-PGPUB; USPAT	ADJ	ON	2017/10/23 09:55
S93	34	S91 and (adaptive with directional antenna)	US-	ADJ	ON	2017/10/23

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			PGPUB; USPAT			10:02
S94	15	(10/880387 or 10/869201) and (feedback or (information with device))	US-PGPUB; USPAT	ADJ	ON	2017/10/23 11:31
S95	13413	(directional antenna) and (@pd<="20060228" OR @ad<="20060228" OR @rlad<="20060228" OR @prad<="20060228")	US-PGPUB; USPAT	ADJ	ON	2017/10/23 11:40
S96	174	S95 and ((feedback or (information with device)) with (alter$3 or adjust$4 or chang$3) with antenna)	US-PGPUB; USPAT	ADJ	ON	2017/10/23 11:45
S97	4	adjust$4 with directional antenna with ((reduc$3 or mitigat$3) near3 interference)	US-PGPUB; USPAT	ADJ	ON	2017/10/23 13:06
S98	0	(adapt$3 or adjust$4) with directional antenna with ((reduc$3 or mitigat$3) near3 interference) with beamform$3	US-PGPUB; USPAT	ADJ	ON	2017/10/23 16:19
S99	41	(adapt$3 or adjust$4) with directional antenna with beamform$3	US-PGPUB; USPAT	ADJ	ON	2017/10/23 16:19
S100	8	S99 and (@pd<="20060228" OR @ad<="20060228" OR @rlad<="20060228" OR @prad<="20060228")	US-PGPUB; USPAT	ADJ	ON	2017/10/23 16:19
S101	159	(adapt$3 or adjust$4) with beamform$3 with interference with (device or UE or terminal or user equipment)	US-PGPUB; USPAT	ADJ	ON	2017/10/23 16:32
S102	26	S101 and (@pd<="20060228" OR @ad<="20060228" OR @rlad<="20060228" OR @prad<="20060228")	US-PGPUB; USPAT	ADJ	ON	2017/10/23 16:32
S137	100	(("LASTINGER") near3 ("Roc")).INV.	US-PGPUB; USPAT	ADJ	ON	2018/07/14 17:08
S138	80	(("SPENIK") near3 ("John")).INV.	US-PGPUB; USPAT	ADJ	ON	2018/07/14 17:08
S139	80	(("WOODBURY") near3 ("Brian")).INV.	US-PGPUB; USPAT	ADJ	ON	2018/07/14 17:08
S140	47	woodbury.as. or woodbury.aanm.	US-PGPUB; USPAT	ADJ	ON	2018/07/14 17:08
S141	7	(S137 or S138 or S139 or S140) and mimo and directional antenna and "802.11n"	US-PGPUB; USPAT	ADJ	ON	2018/07/14 17:08
S142	50413	(H04B7/0456,024,0495 or H04B17/15 or H04W84/12,18 or H04W80/04).cpc.	US-PGPUB; USPAT	ADJ	ON	2018/07/14 17:17
S143	68429	(370/338,328 or 455/422.1,424,443,452.2 or 375/259,260,267,285,295,296,299).ccls.	US-PGPUB; USPAT	ADJ	ON	2018/07/14 17:17
S144	522	(S142 or S143) and mimo and directional antenna and "802.11n"	US-PGPUB; USPAT	ADJ	ON	2018/07/14 17:17
S145	80	S144 and (@pd<="20060228" OR @ad<="20060228" OR @rlad<="20060228" OR @prad<="20060228")	US-PGPUB; USPAT	ADJ	ON	2018/07/14 17:18

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S146	18	S145 and (beamform$3 or beam?form$3)	US-PGPUB; USPAT	ADJ	ON	2018/07/14 17:19
S147	575	(beamform$3 or beam?form$3) and mimo and directional antenna and "802.11n"	US-PGPUB; USPAT	ADJ	ON	2018/07/14 18:10
S148	30	S147 and (@pd< = "20060228" OR @ad< = "20060228" OR @rlad< = "20060228" OR @prad< = "20060228")	US-PGPUB; USPAT	ADJ	ON	2018/07/14 18:10
S149	12	S148 not S146	US-PGPUB; USPAT	ADJ	ON	2018/07/14 18:10

10/ 14/ 2018 12:30:30 AM
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Doc code: IDS
Doc description: Information Disclosure Statement (IDS) Filed

PTO/SB/08a (03-15)
Approved for use through 07/31/2016. OMB 0651-0031
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INFORMATION DISCLOSURE STATEMENT BY APPLICANT (**Not for submission under 37 CFR 1.99**)		
	Application Number	
	Filing Date	
	First Named Inventor	Roc Lastinger
	Art Unit	
	Examiner Name	
	Attorney Docket Number	WBWL001H

U.S.PATENTS Remove

Examiner Initial*	Cite No	Patent Number	Kind Code[1]	Issue Date	Name of Patentee or Applicant of cited Document	Pages,Columns,Lines where Relevant Passages or Relevant Figures Appear
	1	9100964		2015-08-04	Fong et al.	
	2	9071403		2015-06-30	Novak et al.	
	3	9049610		2015-06-02	Yi et al.	
	4	9025581		2015-05-05	Ram et al.	
	5	9055545		2015-06-09	Black et al.	
	6	9036515		2015-05-19	Novak et al.	
	7	8964912		2015-02-24	Cairns et al.	
	8	8942082		2015-01-27	Shattil	

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	9	8909226		2014-12-09	Zhang et al.	
	10	8848765		2014-09-30	Lamba et al.	
	11	8830816		2014-09-09	Ma et al.	
	12	8842581		2014-09-23	Hottinen	
	13	8780957		2014-07-15	Kim et al.	
	14	8781399		2014-07-15	Medlock et al.	
	15	8724480		2014-05-13	Yi et al.	
	16	8706116		2014-04-22	Tomoe et al.	
	17	8681684		2014-03-25	Dohler et al.	
	18	8675509		2014-03-18	Sampath et al.	
	19	8654689		2014-02-18	McCloud et al.	

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	Attorney Docket Number	WBWL001H

	20	8654648		2014-02-18	Yi et al.	
	21	8619713		2013-12-31	Ma et al.	
	22	8611305		2013-12-17	Black et al.	
	23	8572250		2013-10-29	Rinne et al.	
	24	8571132		2013-10-29	Khandekar et al.	
	25	8594252		2013-11-26	Black et al.	
	26	8582441		2013-11-12	Yi et al.	
	27	8515352		2013-08-20	Medlock et al.	
	28	8547951		2013-10-01	Ji et al.	
	29	8514863		2013-08-20	Yi et al.	
	30	8477803		2013-07-02	Kent et al.	

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	31	8442009		2013-05-14	Senarath et al.	
	32	8437761		2013-05-07	Senarath et al.	
	33	8428636		2013-04-23	Baker et al.	
	34	8446892		2013-05-21	Ji et al.	
	35	8441918		2013-05-14	Ma et al.	
	36	8457263		2013-06-04	Lamba et al.	
	37	8446879		2013-05-21	Ma et al.	
	38	8442051		2013-05-14	Yi et al.	
	39	8437760		2013-05-07	Senarath et al.	
	40	8400922		2013-03-19	Yi et al.	
	41	8391338		2013-03-05	Lamba et al.	

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	42	8340072		2012-12-25	Ma et al.	
	43	8355321		2013-01-15	Yi et al.	
	44	8331324		2012-12-11	Ma et al.	
	45	8312142		2012-11-13	Rinne et al.	
	46	8295884		2012-10-23	Trivedi et al.	
	47	8254259		2012-08-28	Yi et al.	
	48	8279836		2012-10-02	Ma et al.	
	49	8265675		2012-09-11	Matsumoto et al.	
	50	8249024		2012-08-21	Ma et al.	
	51	8238342		2012-08-07	Yi et al.	
	52	8213292		2012-07-03	Ma et al.	

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	Examiner Name	
	Attorney Docket Number	WBWL001H

	53	8194776		2012-06-05	Jalali et al.	
	54	8165094		2012-04-24	Ma et al.	
	55	8121177		2012-02-21	Narayan et al.	
	56	8085814		2011-12-27	Ma et al.	
	57	8098683		2012-01-17	Kent et al.	
	58	8090006		2012-01-03	Narayan et al.	
	59	8023466		2011-09-20	Ma et al.	
	60	8018975		2011-09-13	Ma et al.	
	61	8018904		2011-09-13	Hamalainen et al.	
	62	8050178		2011-11-01	Yi et al.	
	63	8036129		2011-10-11	Yi et al.	

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	64	8045988		2011-10-25	Sutivong et al.	
	65	7990841		2011-08-02	Walton et al.	
	66	8005128		2011-08-23	Lamba et al.	
	67	7978608		2011-07-12	Yi et al.	
	68	7995512		2011-08-09	Kim et al.	
	69	7979072		2011-07-12	Senarath et al.	
	70	7929921		2011-04-19	Love et al.	
	71	7962826		2011-06-14	Sutivong et al.	
	72	7961696		2011-06-14	Ma et al.	
	73	7924949		2011-04-12	Larsson	
	74	7924879		2011-04-12	Yi et al.	

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	76	7864735		2011-01-04	Ma et al.	
	77	7876840		2011-01-25	Tong et al.	
	78	7860502		2010-12-28	Kim et al.	
	79	7808937		2010-10-05	McCloud et al.	
	80	7813441		2010-10-12	Jalali et al.	
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	83	7769078		2010-08-03	Cairns et al.	
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	87	7773578		2010-08-10	Liu	
	88	7768979		2010-08-03	Sutivong et al.	
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	90	7706477		2010-04-27	Larsson	
	91	7664193		2010-02-16	Jalali et al.	
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	111	7317750		2008-01-08	Shattil	
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	113	7233810		2007-06-19	Medlock et al.	
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	22	20150229573	A1	2015-08-13	YI et al.	
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	25	20150016297	A1	2015-01-15	Lamba et al.	
	26	20140341323	A1	2014-11-20	McCloud et al.	
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	173	20030123425	A1	2003-07-03	Walton et al.	
	174	20030128705	A1	2003-07-10	Yi et al.	

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	Examiner Name	
	Attorney Docket Number	WBWL001H

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	1	Notice of Allowance from U.S. Application No. 12/020,932, dated May 16, 2008	
	2	Notice of Allowance from U.S. Application No. 12/021,278, dated September 11, 2009	
	3	Notice of Allowance from U.S. Application No. 12/134,122, dated October 22, 2010	
	4	Non-Final Office Action from U.S. Application No. 12/134,122, dated May 24, 2010	
	5	Notice of Allowance from U.S. Application No. 12/134,959, dated August 10, 2010	
	6	Non-Final Office Action from U.S. Application No. 12/134,959, dated February 24, 2010	
	7	Notice of Allowance from U.S. Application No. 13/118,386, dated November 9, 2012	
	8	Non-Final Office Action from U.S. Application No. 13/118,386, dated May 3, 2012	
	9	Notice of Allowance from U.S. Application No. 13/192,181, dated September 25, 2012	

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	10	Non-Final Office Action from U.S. Application No. 13/192,181, dated June 1, 2012	
	11	Non-Final Office Action from U.S. Application No. 13/192,181, dated February 22, 2012	
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	13	Notice of Allowance from U.S. Application No. 13/218,185, dated June 12, 2012	
	14	Non-Final Office Action from U.S. Application No. 13/218,185, dated March 28, 2012	
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	16	Non-Final Office Action from U.S. Application No. 13/348,523, dated January 2, 2014	
	17	Notice of Allowance from U.S. Application No. 13/566,986, dated March 4, 2013	
	18	Non-Final Office Action from U.S. Application No. 13/566,986, dated November 1, 2012	

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CERTIFICATION STATEMENT

Please see 37 CFR 1.97 and 1.98 to make the appropriate selection(s):

That each item of information contained in the information disclosure statement was first cited in any communication from a foreign patent office in a counterpart foreign application not more than three months prior to the filing of the information disclosure statement. See 37 CFR 1.97(e)(1).

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See attached certification statement.

The fee set forth in 37 CFR 1.17 (p) has been submitted herewith.

☒ A certification statement is not submitted herewith.

SIGNATURE

A signature of the applicant or representative is required in accordance with CFR 1.33, 10.18. Please see CFR 1.4(d) for the form of the signature.

Signature	/Thomas D. Fortenberry/	Date (YYYY-MM-DD)	2018-09-01
Name/Print	Thomas Fortenberry	Registration Number	56537

This collection of information is required by 37 CFR 1.97 and 1.98. 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 1 hour 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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Doc code: IDS
Doc description: Information Disclosure Statement (IDS) Filed

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Examiner Name	
Attorney Docket Number	WBWL001H

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Examiner Initial*	Cite No	Patent Number	Kind Code[1]	Issue Date	Name of Patentee or Applicant of cited Document	Pages,Columns,Lines where Relevant Passages or Relevant Figures Appear
	1	7302278		2007-11-27	Lastinger et al.	
	2	7359675		2008-04-15	Lastinger et al.	
	3	7308270		2007-12-11	Lastinger et al.	
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	7	7348930		2008-03-25	Lastinger et al.	
	8	7489282		2009-02-10	Lastinger et al.	

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	9	7400860		2008-07-15	Lastinger et al.	
	10	7595756		2009-09-29	Lastinger et al.	
	11	7599699		2009-10-06	Lastinger et al.	
	12	8009646		2011-08-30	Lastinger et al.	
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	20	8270383		2012-09-18	Lastinger et al.	
	21	8855089		2014-10-07	Lastinger et al.	
	22	8428039		2013-04-23	Lastinger et al.	
	23	4144496		1979-03-13	Cunningham et al.	
	24	5771449		1998-06-23	Blasing et al.	
	25	6104935		2000-08-15	Smith et al.	
	26	6229486		2001-05-08	Krile	
	27	6272337		2001-08-07	Mount et al.	
	28	6278723		2001-08-21	Meihofer et al.	
	29	6304762		2001-10-16	Myers et al.	
	30	6400955		2002-06-04	Kawabata et al.	

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	31	6405058		2002-06-11	Bobier	
	32	6421542		2002-07-16	Sandler et al.	
	33	6463301		2002-10-08	Bevan et al.	
	34	6470195		2002-10-22	Meyer	
	35	6486832		2002-11-26	Abramov et al.	
	36	6505045		2003-01-07	Hills et al.	
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	38	6560443		2003-05-06	Vaisanen et al.	
	39	6690657		2004-02-10	Lau et al.	
	40	5113525		1992-05-12	Andoh	
	41	5161249		1992-11-03	Meche et al.	

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	42	6118767		2000-09-12	Shen et al.	
	43	6246674		2001-06-12	Feuerstein et al.	
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	45	6542736		2003-04-01	Parkvall et al.	
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	47	6047175		2000-04-04	Trompower	
	48	6388999		2002-05-14	Gorsuch et al.	
	49	3317912		1963-07-01	Kelleher	
	50	4825222		1989-04-25	Butcher	
	51	5818385		1998-10-06	Bartholomew	
	52	5969689		1999-10-19	Martek et al.	

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	53	6070090		2000-05-30	Feuerstein	
	54	2272312		1942-02-01	Tunick	
	55	3681770		1972-08-01	Alford	
	56	4101901		1978-07-18	Kommrusch	
	57	6069591		2000-05-30	Smith	
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	59	3803625		1974-04-09	Nemit	
	60	4128740		1978-12-05	Graziano	
	61	5265263		1993-11-23	Ramsdale et al.	
	62	5276907		1994-01-04	Meidan	
	63	5307507		1994-04-26	Kanai	

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	64	5365571		1994-11-15	Rha et al.	
	65	5491833		1996-02-13	Hamabe	
	66	5548813		1996-08-20	Charas et al.	
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	69	5613200		1997-03-18	Hamabe	
	70	5649292		1997-07-15	Doner	
	71	5684491		1997-11-04	Newman et al.	
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	75	5960349		1999-09-28	Chheda et al.	
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	77	6128497		2000-10-03	Faruque	
	78	6154654		2000-11-28	Mao	
	79	6178328		2001-01-23	Tang et al.	
	80	6360107		2002-03-19	Lin et al.	
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	86	6487414		2002-11-26	Tanay et al.	
	87	6497599		2002-12-24	Johnson et al.	
	88	6522885		2003-02-18	Tang et al.	
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	90	6615047		2003-09-02	Yasooka et al.	
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	98	7069009		2006-06-27	Li et al.	
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	100	7202824		2007-04-10	Sanelli et al.	
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	105	7373176		2008-05-13	Chotkowski et al.	
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	108	6930991		2005-08-16	Ozluturk	
	109	4475010		1984-10-02	Huensch et al.	
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	123	4736453		1988-04-05	Schloemer	
	124	4829554		1989-05-09	Barnes et al.	
	125	5134709		1992-07-28	Bi et al.	
	126	5396649		1995-03-07	Hamabe	
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	130	5491837		1996-02-13	Haartsen	
	131	5507008		1996-04-09	Kanai et al.	
	132	5574977		1996-11-12	Joseph et al.	
	133	5590399		1996-12-31	Matsumoto et al.	
	134	5697059		1997-12-09	Carney	
	135	5722043		1998-02-24	Rappaport et al.	
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	141	5809423		1998-09-15	Benveniste	
	142	5828948		1998-10-27	Almgren et al.	
	143	5887263		1999-03-23	Ishii	
	144	5896573		1999-04-20	Yang et al.	
	145	5926763		1999-07-20	Greene, Sr. et al.	
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	33	Restriction Requirement from U.S. Application No. 11/160,551, dated June 29, 2006	
	34	Notice of Allowance from U.S. Application No. 11/160,937, dated November 20, 2007	
	35	Restriction Requirement from U.S. Application No. 11/160,937, dated August 23, 2007	
	36	Notice of Allowance from U.S. Application No. 11/275,605, dated November 19, 2007	
	37	Non-Final Office Action from U.S. Application No. 11/275,605, dated October 2, 2007	

ALL REFERENCES CONSIDERED EXCEPT WHERE LINED THROUGH. /S.M.L/

INFORMATION DISCLOSURE STATEMENT BY APPLICANT (Not for submission under 37 CFR 1.99)		
	Application Number	
	Filing Date	
	First Named Inventor	Roc Lastinger
	Art Unit	
	Examiner Name	
	Attorney Docket Number	WBWL001H

	38	Notice of Allowance from U.S. Application No. 11/275,619, dated November 24, 2008	
	39	Non-Final Office Action from U.S. Application No. 11/275,619, dated April 30, 2008	
	40	Notice of Allowance from U.S. Application No. 11/420,605, dated April 2, 2008	
	41	Notice of Allowance from U.S. Application No. 11/584,730, dated August 6, 2009	
	42	Ex Parte Quayle from U.S. Application No. 11/584,730, dated May 28, 2015	
	43	Notice of Allowance from U.S. Application No. 11/586,178, dated July 17, 2009	
	44	Non-Final Office Action from U.S. Application No. 11/586,178, dated April 15, 2009	
	45	Final Office Action from U.S. Application No. 11/586,178, dated November 21, 2008	
	46	Non-Final Office Action from U.S. Application No. 11/586,178, dated June 9, 2008	
	47	Notice of Allowance from U.S. Application No. 11/709,431, dated July 18, 2011	
	48	Notice of Allowance from U.S. Application No. 11/709,431, dated July 23, 2010	

ALL REFERENCES CONSIDERED EXCEPT WHERE LINED THROUGH. /S.M.L/

INFORMATION DISCLOSURE STATEMENT BY APPLICANT (Not for submission under 37 CFR 1.99)		
	Application Number	
	Filing Date	
	First Named Inventor	Roc Lastinger
	Art Unit	
	Examiner Name	
	Attorney Docket Number	WBWL001H

If you wish to add additional non-patent literature document citation information please click the Add button Add

EXAMINER SIGNATURE

Examiner Signature	/SIU M LEE/	Date Considered	10/11/2018

*EXAMINER: Initial if reference considered, whether or not citation is in conformance with MPEP 609. Draw line through a citation if not in conformance and not considered. Include copy of this form with next communication to applicant.

[1] See Kind Codes of USPTO Patent Documents at www.USPTO.GOV or MPEP 901.04. [2] Enter office that issued the document, by the two-letter code (WIPO Standard ST.3). [3] For Japanese patent documents, the indication of the year of the reign of the Emperor must precede the serial number of the patent document. [4] Kind of document by the appropriate symbols as indicated on the document under WIPO Standard ST.16 if possible. [5] Applicant is to place a check mark here if English language translation is attached.

ALL REFERENCES CONSIDERED EXCEPT WHERE LINED THROUGH. /S.M.L/

INFORMATION DISCLOSURE STATEMENT BY APPLICANT (Not for submission under 37 CFR 1.99)		
	Application Number	
	Filing Date	
	First Named Inventor	Roc Lastinger
	Art Unit	
	Examiner Name	
	Attorney Docket Number	WBWL001H

CERTIFICATION STATEMENT

Please see 37 CFR 1.97 and 1.98 to make the appropriate selection(s):

That each item of information contained in the information disclosure statement was first cited in any communication from a foreign patent office in a counterpart foreign application not more than three months prior to the filing of the information disclosure statement. See 37 CFR 1.97(e)(1).

OR

☐ That no item of information contained in the information disclosure statement was cited in a communication from a foreign patent office in a counterpart foreign application, and, to the knowledge of the person signing the certification after making reasonable inquiry, no item of information contained in the information disclosure statement was known to any individual designated in 37 CFR 1.56(c) more than three months prior to the filing of the information disclosure statement. See 37 CFR 1.97(e)(2).

See attached certification statement.

The fee set forth in 37 CFR 1.17 (p) has been submitted herewith.

☒ A certification statement is not submitted herewith.

SIGNATURE

A signature of the applicant or representative is required in accordance with CFR 1.33, 10.18. Please see CFR 1.4(d) for the form of the signature.

Signature	/Thomas D. Fortenberry/	Date (YYYY-MM-DD)	2018-09-01
Name/Print	Thomas Fortenberry	Registration Number	56537

This collection of information is required by 37 CFR 1.97 and 1.98. 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 1 hour 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.**

ALL REFERENCES CONSIDERED EXCEPT WHERE LINED THROUGH. /S.M.L/

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 record s.

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 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.

ALL REFERENCES CONSIDERED EXCEPT WHERE LINED THROUGH. /S.M.L/

Exhibit 1002
Nokia v. Woodbury Wireless Inc.
Page 000272

Bibliographic Data

Application No: 16/120,258

Foreign Priority claimed: ○ Yes ◉ No

35 USC 119 (a-d) conditions met: ☐ Yes ☑ No ☐ Met After Allowance

Verified and Acknowledged: /SIU M LEE/ (Examiner's Signature) | (Initials)

Title: MIMO Methods and Systems

FILING or 371(c) DATE	CLASS	GROUP ART UNIT	ATTORNEY DOCKET NO.
09/01/2018	375	2632	WBWL001H
RULE			

APPLICANTS

Woodbury Wireless LLC, Pflugerville, TX, UNITED STATES

INVENTORS

Roc Lastinger Cave Creek, AZ, UNITED STATES

John Spenik Scottsdale, AZ, UNITED STATES

Brian C. Woodbury Gilbert, AZ, UNITED STATES

CONTINUING DATA

This application is a CON of 15824010 11/28/2017 PAT 10069548

15824010 is a CON of 15406661 01/13/2017 PAT 9859963

15406661 is a CON of 14952874 11/25/2015 PAT 9584197

14952874 is a CON of 14476628 09/03/2014 PAT 9503163

14476628 is a CON of 13348523 01/11/2012 PAT 8855089

13348523 is a CON of 13118386 05/28/2011 PAT 8345651

13118386 is a CON of 11709431 02/21/2007 PAT 8009646

11709431 has PRO of 60743376 02/28/2006

FOREIGN APPLICATIONS

IF REQUIRED, FOREIGN LICENSE GRANTED**

09/19/2018

**** SMALL ENTITY ****

STATE OR COUNTRY

UNITED STATES

ADDRESS

Thomas D. Fortenberry, Attorney at Law

P.O. Box 2099

Woodville, TX 75979
UNITED STATES

FILING FEE RECEIVED

$3,585

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.
16/120,258	09/01/2018	Roc Lastinger	WBWL001H	3304

112117 7590 10/15/2018
Thomas D. Fortenberry, Attorney at Law
P.O. Box 2099
Woodville, TX 75979

EXAMINER
LEE, SIU M

ART UNIT	PAPER NUMBER
2632	

NOTIFICATION DATE	DELIVERY MODE
10/15/2018	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):

tom@tflawoffices.com
eofficeaction@appcoll.com

Exhibit 1002
Nokia v. Woodbury Wireless Inc.
Page 000275

UNITED STATES PATENT AND TRADEMARK OFFICE

Commissioner for Patents
United States Patent and Trademark Office
P.O. Box 1450
Alexandria, VA 22313-1450
www.uspto.gov

Doc Code:
TRACK1.GRANT

Decision Granting Request for Prioritized Examination (Track I or After RCE)	Application No.:16/120,258

1. THE REQUEST FILED September 1, 2018 IS **GRANTED.**

The above-identified application has met the requirements for prioritized examination
A. ☒ for an original nonprovisional application (Track I).
B. ☐ for an application undergoing continued examination (RCE).

2. **The above-identified application will undergo prioritized examination.** The application will be accorded special status throughout its entire course of prosecution until one of the following occurs:

A. filing a **petition for extension of time** to extend the time period for filing a reply;
B. filing an **amendment to amend the application to contain more than four independent claims, more than thirty total claims**, or a multiple dependent claim;
C. filing a **request for continued examination**;
D. filing a notice of appeal;
E. filing a request for suspension of action;
F. mailing of a notice of allowance;
G. mailing of a final Office action;
H. completion of examination as defined in 37 CFR 41.102; or
I. abandonment of the application.

Telephone inquiries with regard to this decision should be directed to Kimberly Inabinet at 571-272-4618.

/Kimberly Inabinet/ Paralegal Specialist, Office of Petitions

Office of Petitions: Decision Count Sheet

Mailing Month: 10

Application No.: 16120258

16120258

For US serial numbers: enter number only, no slashes or commas. Ex: 10123456
For PCT: enter "51+single digit of year of filing+last 5 numbers", Ex. for PCT/US05/12345, enter 51512345

Deciding Official: Kimberly Inabinet

Count (1) - Palm Credit 16120258

Decision: GRANT

FINANCE WORK NEEDED
☐ Select Check Box for YES

GRANT

Decision Type: 643 - Track One request

643

Notes:

Count (2)

Decision: n/a

FINANCE WORK NEEDED
☐ Select Check Box for YES

Decision Type: NONE

Notes:

Count (3)

Decision: n/a

FINANCE WORK NEEDED
☐ Select Check Box for YES

Decision Type: NONE

Notes:

Initials of Approving Official (if required)

If more than 3 decisions, attach 2nd count sheet & mark this box ☐

Printed on: 10/9/2018

Office of Petitions Internal Document - Ver. 5.0

Office of Petitions: Routing Sheet



Application No. 16120258

This application is being forwarded to your office for further processing. A decision has been rendered on a petition filed in this application, as indicated below. For details of this decision, please see the document PET.OP.DEC filed on the same date as this document.

- [X] **GRANTED**
- [ ] **DISMISSED**
- [ ] **DENIED**

Exhibit 1002
Nokia v. Woodbury Wireless Inc.
Page 000278

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
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.

PATENT APPLICATION FEE DETERMINATION RECORD Substitute for Form PTO-875	Application or Docket Number 16/120,258	Filing Date 09/01/2018	☐ 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 $50 =	
INDEPENDENT CLAIMS (37 CFR 1.16(h))	minus 3 =	*		x $230 =	
☐ 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	10/04/2018	(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))	* 30	Minus	** 30	= 0		x $50 =	0
	Independent (37 CFR 1.16(h))	* 4	Minus	*** 4	= 0		x $230 =	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 $0 =	
	Independent (37 CFR 1.16(h))	*	Minus	***	=		x $0 =	
	☐ 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.	SLIE
** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 20, enter "20".	monique benjamin
*** 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.	

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.

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	GRP ART UNIT	FIL FEE REC'D	ATTY.DOCKET.NO	TOT CLAIMS	IND CLAIMS
16/120,258	09/01/2018	2414	1515	WBWL001H	30	4

CONFIRMATION NO. 3304

FILING RECEIPT

112117
Thomas D. Fortenberry, Attorney at Law
P.O. Box 2099
Woodville, TX 75979

OC000000102436272

Date Mailed: 09/21/2018

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)

Roc Lastinger, Cave Creek, AZ;
John Spenik, Scottsdale, AZ, Deceased;
Brian C. Woodbury, Gilbert, AZ;

Applicant(s)

Woodbury Wireless LLC, Pflugerville, TX;

Power of Attorney: The patent practitioners associated with Customer Number 112117

Domestic Priority data as claimed by applicant

This application is a CON of 15/824,010 11/28/2017 PAT 10069548
which is a CON of 15/406,661 01/13/2017 PAT 9859963
which is a CON of 14/952,874 11/25/2015 PAT 9584197
which is a CON of 14/476,628 09/03/2014 PAT 9503163
which is a CON of 13/348,523 01/11/2012 PAT 8855089
which is a CON of 13/118,386 05/28/2011 PAT 8345651
which is a CON of 11/709,431 02/21/2007 PAT 8009646
which claims benefit of 60/743,376 02/28/2006

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

Exhibit 1002
Nokia v. Woodbury Wireless Inc.
Page 000280

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: 09/19/2018
The country code and number of your priority application, to be used for filing abroad under the Paris Convention, is **US 16/120,258**
Projected Publication Date: 12/27/2018
Non-Publication Request: No
Early Publication Request: No
**** SMALL ENTITY ****
Title

MIMO Methods and Systems

Preliminary Class

370

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,

Exhibit 1002
Nokia v. Woodbury Wireless Inc.
Page 000281

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.

Exhibit 1002
Nokia v. Woodbury Wireless Inc.
Page 000283

PATENT APPLICATION FEE DETERMINATION RECORD

Substitute for Form PTO-875

Application or Docket Number: 16/120,258

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	75		N/A	
SEARCH FEE (37 CFR 1.16(k), (i), or (m))	N/A	N/A	N/A	330		N/A	
EXAMINATION FEE (37 CFR 1.16(o), (p), or (q))	N/A	N/A	N/A	380		N/A	
TOTAL CLAIMS (37 CFR 1.16(i))	30 minus 20 =	* 10	x 50 =	500	OR		
INDEPENDENT CLAIMS (37 CFR 1.16(h))	4 minus 3 =	* 1	x 230 =	230			
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	1515		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 =	
	Independent (37 CFR 1.16(h))	*	Minus	***	=	x =		OR	x =	
	Application Size Fee (37 CFR 1.16(s))									
	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 =	
	Independent (37 CFR 1.16(h))	*	Minus	***	=	x =		OR	x =	
	Application Size Fee (37 CFR 1.16(s))									
	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.

Electronic Acknowledgement Receipt

EFS ID:	33746098
Application Number:	16120258
International Application Number:	
Confirmation Number:	3304
Title of Invention:	MIMO Methods and Systems
First Named Inventor/Applicant Name:	Roc Lastinger
Customer Number:	112117
Filer:	THOMAS DONALD FORTENBERRY
Filer Authorized By:	
Attorney Docket Number:	WBWL001H
Receipt Date:	17-SEP-2018
Filing Date:	
Time Stamp:	18:38:37
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	Preliminary Amendment	20180917_WBWL001H_Preliminary_Amendment.pdf	86198 063092f677a6ecebdadcd132f5eb95797d41f98b	no	18

Warnings:

Information:	
Total Files Size (in bytes):	86198

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.

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Application of:	Confirmation No.: 3304
Roc Lastinger	Examiner:
Application No.: 16/120,258	Art Unit: 2414
File Date: 09-01-2018	Docket No.: WBWL001H
Title: MIMO Methods and Systems	Date: 09/17/2018

PRELIMINARY AMENDMENT

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

Examiner:

Prior to substantive examination, please consider the following believed to place the claims in condition for allowance.

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Amendments to the Claims:

This listing of claims replaces all prior versions and listings of claims in the application:

1.-30. (Cancelled)

31. (New) A computer-implemented method, comprising:

providing access to a multiple-input-multiple-output (MIMO)-capable access point including:

a plurality of antennas;

circuitry in communication with the antennas; and

at least one radio in communication with the circuitry;

selecting at least one channel based on one or more channel characteristics, for initiating a first transmission to a first portable wireless device and initiating a second transmission to a second portable wireless device, such that at least a portion of the first transmission occurs simultaneously with at least a portion of the second transmission and both occur via a first wireless protocol;

receiving first information from the first portable wireless device that is based on a first measurement performed by the first portable wireless device;

receiving second information from the second portable wireless device that is based on a second measurement performed by the second portable wireless device;

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altering at least one aspect of the first transmission, based on at least one of the first information or the second information, so as to direct the first transmission more towards the first portable wireless device as compared to the second portable wireless device, thereby reducing interference between the first transmission and the second transmission when the at least portion of the first transmission occurs simultaneously with the at least portion of the second transmission;

altering at least one aspect of the second transmission, based on at least one of the first information or the second information, so as to direct the second transmission more towards the second portable wireless device as compared to the first portable wireless device, thereby reducing the interference between the first transmission and the second transmission when the at least portion of the first transmission occurs simultaneously with the at least portion of the second transmission;

transmitting first data in connection with the first transmission to the first portable wireless device;

transmitting second data in connection with the second transmission to the second portable wireless device;

receiving third information from a third portable wireless device that is based on a third measurement performed by the third portable wireless device;

altering at least one aspect of a third transmission, based on the third information, so as to direct the third transmission towards the third portable wireless device; and

transmitting third data in connection with the third transmission to the third portable wireless device, via a second wireless protocol including a 802.11n protocol, where the first wireless protocol includes another 802.11 protocol other than the 802.11n protocol.

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32. (New) The computer-implemented method of Claim 31, wherein the third transmission to the third portable wireless device is initiated via a particular channel that is different, in at least one respect, from the at least one channel, for preventing interference between the third transmission via the 802.11n protocol, and at least one of the first transmission or the second transmission via the another 802.11 protocol.

33. (New) The computer-implemented method of Claim 32, wherein a plurality of radios are utilized including a first radio configured to communicate via the another 802.11 protocol and a second radio configured to communicate via the 802.11n protocol, and different antennas are used for the another 802.11 protocol and the 802.11n protocol, so that sufficient resources are available to the 802.11n protocol and the another 802.11 protocol, when at least a portion of the third transmission occurs simultaneously with at least one of the first transmission or the second transmission.

34. (New) The computer-implemented method of Claim 33, wherein the at least one channel includes multiple channels that, together, have a greater bandwidth than the particular channel.

35. (New) The computer-implemented method of Claim 31, wherein the at least one channel includes multiple channels including a first channel and a second channel, and the first transmission to the first portable wireless device is initiated via the first channel, and the second transmission to the second portable wireless device is initiated via the second channel.

36. (New) The computer-implemented method of Claim 31, wherein the first transmission and the second transmission are both initiated on the at least one channel which includes the same single channel.

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37. (New) The computer-implemented method of Claim 31, wherein the third transmission to the third portable wireless device is initiated via a particular channel that is different from the at least one channel.

38. (New) The computer-implemented method of Claim 31, wherein the third transmission to the third portable wireless device is initiated via a particular channel that is the same as the at least one channel.

39. (New) The computer-implemented method of Claim 31, wherein the first transmission occurs simultaneously with the second transmission with both the first transmission and the second transmission using all of the antennas.

40. (New) The computer-implemented method of Claim 31, wherein the first transmission occurs simultaneously with the second transmission with both the first transmission and the second transmission using different subsets of the antennas.

41. (New) The computer-implemented method of Claim 31, wherein the multiple-input-multiple-output (MIMO)-capable access point includes a multiple-user multiple-input-multiple-output (MU-MIMO)-capable access point.

42. (New) The computer-implemented method of Claim 31, and further comprising: utilizing a plurality of radios including a first radio configured to communicate via the another 802.11 protocol and a second radio configured to communicate via the 802.11n protocol, so that sufficient resources are available to the 802.11n protocol and the another 802.11 protocol, when at least a portion of the third transmission occurs simultaneously with at least one of the first transmission or the second transmission.

43. (New) The computer-implemented method of Claim 31, wherein a channel difference is used for the 802.11n protocol and the another 802.11 protocol for increased data throughput.

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44. (New) The computer-implemented method of Claim 31, wherein different radios, different antennas, and a channel difference are used for the first wireless protocol and the second wireless protocol for increased data throughput.

45. (New) A computer-implemented method, comprising:

positioning one or more multiple-input-multiple-output (MIMO)-capable access points so that the one or more multiple-input-multiple-output (MIMO)-capable access points provide a coverage dictated by a positioner of the one or more multiple-input-multiple-output (MIMO)-capable access points, each of the one or more multiple-input-multiple-output (MIMO)-capable access points including:

a plurality of antennas;

circuitry in communication with the antennas; and

at least one radio in communication with the circuitry;

selecting at least one channel based on one or more channel characteristics, for initiating a first transmission to a first portable wireless device and initiating a second transmission to a second portable wireless device, such that at least a portion of the first transmission occurs simultaneously with at least a portion of the second transmission and both occur via a first wireless protocol;

receiving first information from the first portable wireless device that is based on a first measurement performed by the first portable wireless device;

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receiving second information from the second portable wireless device that is based on a second measurement performed by the second portable wireless device;

altering at least one aspect of the first transmission, based on at least one of the first information or the second information, so as to direct the first transmission more towards the first portable wireless device as compared to the second portable wireless device, thereby reducing interference between the first transmission and the second transmission when the at least portion of the first transmission occurs simultaneously with the at least portion of the second transmission;

altering at least one aspect of the second transmission, based on at least one of the first information or the second information, so as to direct the second transmission more towards the second portable wireless device as compared to the first portable wireless device, thereby reducing the interference between the first transmission and the second transmission when the at least portion of the first transmission occurs simultaneously with the at least portion of the second transmission;

transmitting first data in connection with the first transmission to the first portable wireless device;

transmitting second data in connection with the second transmission to the second portable wireless device;

receiving third information from a third portable wireless device that is based on a third measurement performed by the third portable wireless device;

altering at least one aspect of a third transmission, based on the third information, so as to direct the third transmission towards the third portable wireless device; and

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transmitting third data in connection with the third transmission to the third portable wireless device, via a second wireless protocol including a 802.11n protocol, where the first wireless protocol includes another 802.11 protocol other than the 802.11n protocol.

46. (New) The computer-implemented method of Claim 45, wherein the third transmission to the third portable wireless device is initiated via a particular channel that is different, in at least one respect, from the at least one channel, for preventing interference between the third transmission via the 802.11n protocol, and at least one of the first transmission or the second transmission via the another 802.11 protocol.

47. (New) The computer-implemented method of Claim 46, wherein a plurality of radios are utilized including a first radio configured to communicate via the another 802.11 protocol and a second radio configured to communicate via the 802.11n protocol, and different antennas are used for the another 802.11 protocol and the 802.11n protocol, so that sufficient resources are available to the 802.11n protocol and the another 802.11 protocol, when at least a portion of the third transmission occurs simultaneously with at least one of the first transmission or the second transmission.

48. (New) The computer-implemented method of Claim 47, wherein the at least one channel includes multiple channels that, together, have a greater bandwidth than the particular channel.

49. (New) The computer-implemented method of Claim 45, wherein the at least one channel includes multiple channels including a first channel and a second channel, and the first transmission to the first portable wireless device is initiated via the first channel, and the second transmission to the second portable wireless device is initiated via the second channel.

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50. (New) The computer-implemented method of Claim 45, wherein the first transmission and the second transmission are both initiated on the at least one channel which includes the same single channel.

51. (New) The computer-implemented method of Claim 45, wherein the third transmission to the third portable wireless device is initiated via a particular channel that is different from the at least one channel.

52. (New) The computer-implemented method of Claim 45, wherein the third transmission to the third portable wireless device is initiated via a particular channel that is the same as the at least one channel.

53. (New) The computer-implemented method of Claim 45, and further comprising: utilizing a plurality of radios including a first radio configured to communicate via the first wireless protocol and a second radio configured to communicate via the second wireless protocol.

54. (New) The computer-implemented method of Claim 45, and further comprising: utilizing a plurality of radios including a first radio configured to communicate via the another 802.11 protocol and a second radio configured to communicate via the 802.11n protocol, so that sufficient resources are available to the 802.11n protocol and the another 802.11 protocol, when at least a portion of the third transmission occurs simultaneously with at least one of the first transmission or the second transmission.

55. (New) The computer-implemented method of Claim 45, wherein the first portable wireless device includes a first multiple-input-multiple-output (MIMO)-capable portable wireless device, and the second portable wireless device includes a second multiple-input-multiple-output (MIMO)-capable portable wireless device.

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56. (New) The computer-implemented method of Claim 45, wherein the one or more multiple-input-multiple-output (MIMO)-capable access points include a plurality of the multiple-input-multiple-output (MIMO)-capable access points which are positioned so that the plurality of the multiple-input-multiple-output (MIMO)-capable access points collectively provide an overlap in the coverage as dictated by the positioner of the plurality of the multiple-input-multiple-output (MIMO)-capable access points.

57. (New) A computer-implemented method, comprising:

providing access to a multiple-input-multiple-output (MIMO)-capable access point including:

a plurality of antennas;

circuitry in communication with the antennas; and

at least one radio in communication with the circuitry;

sending a first signal to a first portable wireless device;

receiving a second signal from the first portable wireless device;

based on the second signal, permitting data communication via the multiple-input-multiple-output (MIMO)-capable access point for the first portable wireless device;

sending a third signal to a second portable wireless device;

receiving a fourth signal from the second portable wireless device;

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based on the fourth signal, permitting data communication via the multiple-input-multiple-output (MIMO)-capable access point for the second portable wireless device;

selecting at least one channel based on one or more channel characteristics, for initiating a first transmission to the first portable wireless device and initiating a second transmission to the second portable wireless device, such that at least a portion of the first transmission occurs simultaneously with at least a portion of the second transmission and both occur via a first wireless protocol;

receiving first information from the first portable wireless device that is based on a first measurement performed by the first portable wireless device;

receiving second information from the second portable wireless device that is based on a second measurement performed by the second portable wireless device;

altering at least one aspect of the first transmission, based on at least one of the first information or the second information, so as to direct the first transmission more towards the first portable wireless device as compared to the second portable wireless device, thereby reducing interference between the first transmission and the second transmission when the at least portion of the first transmission occurs simultaneously with the at least portion of the second transmission;

altering at least one aspect of the second transmission, based on at least one of the first information or the second information, so as to direct the second transmission more towards the second portable wireless device as compared to the first portable wireless device, thereby reducing the interference between the first transmission and the second transmission when the at least portion of the first transmission occurs simultaneously with the at least portion of the second transmission;

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transmitting first data in connection with the first transmission to the first portable wireless device;

transmitting second data in connection with the second transmission to the second portable wireless device;

receiving third information from a third portable wireless device that is based on a third measurement performed by the third portable wireless device;

altering at least one aspect of a third transmission, based on the third information, so as to direct the third transmission towards the third portable wireless device; and

transmitting third data in connection with the third transmission to the third portable wireless device, via a second wireless protocol.

58. (New) The computer-implemented method of Claim 57, wherein the first signal, the second signal, the third signal, and the fourth signal, are communicated for authentication purposes.

59. (New) A computer-implemented method, comprising:

positioning one or more multiple-input-multiple-output (MIMO)-capable access points so that the one or more multiple-input-multiple-output (MIMO)-capable access points provide a desired coverage, each of the one or more multiple-input-multiple-output (MIMO)-capable access points including:

a plurality of antennas;

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circuitry in communication with the antennas; and

at least one radio in communication with the circuitry;

causing communicative coupling between the one or more multiple-input-multiple-output (MIMO)-capable access points and a server;

receiving a first signal from a first portable wireless device;

based on the first signal, permitting data communication via the multiple-input-multiple-output (MIMO)-capable access point for the first portable wireless device;

receiving a second signal from a second portable wireless device;

based on the second signal, permitting data communication via the multiple-input-multiple-output (MIMO)-capable access point for the second portable wireless device;

selecting at least one channel based on one or more channel characteristics, for initiating a first transmission to the first portable wireless device and initiating a second transmission to the second portable wireless device, such that at least a portion of the first transmission occurs simultaneously with at least a portion of the second transmission and both occur via a first wireless protocol;

receiving first information from the first portable wireless device that is based on a first measurement performed by the first portable wireless device;

receiving second information from the second portable wireless device that is based on a second measurement performed by the second portable wireless device;

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altering at least one aspect of the first transmission, based on at least one of the first information or the second information, so as to direct the first transmission more towards the first portable wireless device as compared to the second portable wireless device, thereby reducing interference between the first transmission and the second transmission when the at least portion of the first transmission occurs simultaneously with the at least portion of the second transmission;

altering at least one aspect of the second transmission, based on at least one of the first information or the second information, so as to direct the second transmission more towards the second portable wireless device as compared to the first portable wireless device, thereby reducing the interference between the first transmission and the second transmission when the at least portion of the first transmission occurs simultaneously with the at least portion of the second transmission;

transmitting first data in connection with the first transmission to the first portable wireless device;

transmitting second data in connection with the second transmission to the second portable wireless device;

receiving third information from a third portable wireless device that is based on a third measurement performed by the third portable wireless device;

altering at least one aspect of a third transmission, based on the third information, so as to direct the third transmission towards the third portable wireless device; and

transmitting third data in connection with the third transmission to the third portable wireless device, via a second wireless protocol including a 802.11n protocol, where the first wireless protocol includes another 802.11 protocol other than the 802.11n protocol.

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60. (New) The computer-implemented method of Claim 59, wherein at least one of:

said circuitry includes at least one of: a switch, at least one phased array, a controller, or a processor;

said circuitry includes radio chain circuitry;

said other 802.11 protocol is a variant of the 802.11n protocol;

said other 802.11 protocol is an advancement over the 802.11n protocol;

said channel characteristics include at least one of a data throughput, a signal-to-noise ratio, a reduced signal error, a reduced data error, a reduced retransmission request, a reduced interference, a rejection of multipath signal, a higher transmission rate, or a signal strength;

a difference in channels are used for the first wireless protocol and the second wireless protocol for increased data throughput, and the difference involves data throughput;

an entirety of the first transmission occurs simultaneously with an entirety of the second transmission;

said first transmission occurs simultaneously with the second transmission with both the first transmission and the second transmission using all of the antennas;

said antennas are MIMO antennas;

said antennas are fixed in direction;

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said antennas are varied in direction via beamforming;

said antennas are directional by virtue of being capable of changing direction via beamforming;

said antennas exhibit temporal diversity;

said antennas include directional antennas;

said antennas include omnidirectional antennas;

said antennas include directional antennas that are omnidirectional;

said antennas include directional antennas that have omnidirectional capabilities;

said antennas include directional antennas that are less than omnidirectional;

said at least one radio includes a single radio;

said first, second, and/or third information include a measurement of a signal-to-noise ratio;

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said first data, the second data, and the third each include different data;

said antennas have associated therewith a MIMO virtual sector including an area where a MIMO physical sector is to operate;

said first portable wireless device includes a first multiple-input-multiple-output (MIMO)-capable portable wireless device;

said second portable wireless device includes a second multiple-input-multiple-output (MIMO)-capable portable wireless device;

said third portable wireless device includes a third multiple-input-multiple-output (MIMO)-capable portable wireless device;

said antennas form MIMO virtual sectors that are capable of being selected to provide MIMO physical sectors; or

said first portable wireless device includes at least one of a mobile device, a client, a computer, or a hand-held device.

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Remarks:

It should be noted that no claims are intended to be construed under 35 U.S.C. 112, paragraph 6.

Respectfully submitted,

Date: September 17, 2018

By: /Thomas D. Fortenberry/

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Page 000304

Doc Code: TRACK1.REQ
Document Description: TrackOne Request

PTO/AIA/424 (04-14)

CERTIFICATION AND REQUEST FOR PRIORITIZED EXAMINATION UNDER 37 CFR 1.102(e) (Page 1 of 1)

First Named Inventor:	Roc Lastinger	Nonprovisional Application Number (if known):	
Title of Invention:	MIMO Methods and Systems		

APPLICANT HEREBY CERTIFIES THE FOLLOWING AND REQUESTS PRIORITIZED EXAMINATION FOR THE ABOVE-IDENTIFIED APPLICATION.

1. The processing fee set forth in 37 CFR 1.17(i)(1) and the prioritized examination fee set forth in 37 CFR 1.17(c) have been filed with the request. The publication fee requirement is met because that fee, set forth in 37 CFR 1.18(d), is currently $0. The basic filing fee, search fee, and examination fee are filed with the request or have been already been paid. I understand that any required excess claims fees or application size fee must be paid for the application.

2. I understand that the application may not contain, or be amended to contain, more than four independent claims, more than thirty total claims, or any multiple dependent claims, and that any request for an extension of time will cause an outstanding Track I request to be dismissed.

3. The applicable box is checked below:

I. ☑ Original Application (Track One) - Prioritized Examination under § 1.102(e)(1)

i. (a) The application is an original nonprovisional utility application filed under 35 U.S.C. 111(a). This certification and request is being filed with the utility application via EFS-Web.

---OR---

(b) The application is an original nonprovisional plant application filed under 35 U.S.C. 111(a). This certification and request is being filed with the plant application in paper.

ii. An executed inventor's oath or declaration under 37 CFR 1.63 or 37 CFR 1.64 for each inventor, **or** the application data sheet meeting the conditions specified in 37 CFR 1.53(f)(3)(i) is filed with the application.

II. ☐ Request for Continued Examination - Prioritized Examination under § 1.102(e)(2)

i. A request for continued examination has been filed with, or prior to, this form.
ii. If the application is a utility application, this certification and request is being filed via EFS-Web.
iii. The application is an original nonprovisional utility application filed under 35 U.S.C. 111(a), or is a national stage entry under 35 U.S.C. 371.
iv. This certification and request is being filed prior to the mailing of a first Office action responsive to the request for continued examination.
v. No prior request for continued examination has been granted prioritized examination status under 37 CFR 1.102(e)(2).

Signature /Thomas D. Fortenberry/	Date 9/1/2018
Name (Print/Typed) Thomas D. Fortenberry	Practitioner Registration Number 56537

Note: *This form must be signed in accordance with 37 CFR 1.33. See 37 CFR 1.4(d) for signature requirements and certifications. Submit multiple forms if more than one signature is required.**

☑ *Total of 1 forms are submitted.

Electronic Patent Application Fee Transmittal

Application Number:	
Filing Date:	
Title of Invention:	MIMO Methods and Systems
First Named Inventor/Applicant Name:	Roc Lastinger
Filer:	THOMAS DONALD FORTENBERRY
Attorney Docket Number:	WBWL001H

Filed as Small Entity

Filing Fees for Track I Prioritized Examination - Nonprovisional Application under 35 USC 111(a)

Description	Fee Code	Quantity	Amount	Sub-Total in USD($)
Basic Filing:				
UTILITY FILING FEE (ELECTRONIC FILING)	4011	1	75	75
UTILITY SEARCH FEE	2111	1	330	330
UTILITY EXAMINATION FEE	2311	1	380	380
REQUEST FOR PRIORITIZED EXAMINATION	2817	1	2000	2000
Pages:				
Claims:				
CLAIMS IN EXCESS OF 20	2202	10	50	500
INDEPENDENT CLAIMS IN EXCESS OF 3	2201	1	230	230

Description	Fee Code	Quantity	Amount	Sub-Total in USD($)
Miscellaneous-Filing:				
PUBL. FEE- EARLY, VOLUNTARY, OR NORMAL	1504	1	0	0
PROCESSING FEE, EXCEPT PROV. APPLS.	2830	1	70	70
Petition:				
Patent-Appeals-and-Interference:				
Post-Allowance-and-Post-Issuance:				
Extension-of-Time:				
Miscellaneous:				
		Total in USD ($)		**3585**

Electronic Acknowledgement Receipt

EFS ID:	33609465
Application Number:	16120258
International Application Number:	
Confirmation Number:	3304
Title of Invention:	MIMO Methods and Systems
First Named Inventor/Applicant Name:	Roc Lastinger
Customer Number:	112117
Filer:	THOMAS DONALD FORTENBERRY
Filer Authorized By:	
Attorney Docket Number:	WBWL001H
Receipt Date:	01-SEP-2018
Filing Date:	
Time Stamp:	23:22:48
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	yes
Payment Type	CARD
Payment was successfully received in RAM	$3585
RAM confirmation Number	090418INTEFSW23250800
Deposit Account	504964
Authorized User	Thomas Fortenberry
The Director of the USPTO is hereby authorized to charge indicated fees and credit any overpayment as follows: 37 CFR 1.16 (National application filing, search, and examination fees) 37 CFR 1.17 (Patent application and reexamination processing fees)	

37 CFR 1.19 (Document supply fees)

37 CFR 1.20 (Post Issuance fees)

37 CFR 1.21 (Miscellaneous fees and charges)

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Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1	Oath or Declaration filed	20180901_WBWL001_Oaths.pdf	1776452 2d4e15d94d90aa02ba7fed22ef8d13d22b179e2e	no	5
Warnings:					
Information:					
2	Power of Attorney	20180901_WBWL001_POA.PDF	88460 32123a40272cb517426e437ad3b0192216fde24e	no	1
Warnings:					
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3	Application Data Sheet	20180901_WBWL001H_ADS.pdf	1256778 1494863d3d13235d12f4d76cea5422a8a1f8f460	no	9
Warnings:					
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4	Drawings-only black and white line drawings	20180901_WBWL001H_Drawings.pdf	1353647 020f5b296249679c195c7805b9c85fe2f21c721d	no	8
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5	Information Disclosure Statement (IDS) Form (SB08)	20180901_WBWL001H_IDS_1of3_082718.pdf	1044445 70f555d4977a0aeff04423b78c9437c3a852e71a	no	39
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6	Information Disclosure Statement (IDS) Form (SB08)	20180901_WBWL001H_IDS_2of3_082718.pdf	1041987 6e5c22e4cfd72c295d7f687db6eed1d2d1a61485	no	33
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7	Information Disclosure Statement (IDS) Form (SB08)	20180901_WBWL001H_IDS_3of3_082718.pdf	1037096 9897422bf5e9c68816cec3d60c9354025c2c5ed5	no	7
Warnings:					
Information:					
8		20180901_WBWL001H_spec.pdf	144881 3efb16ddbb8fab4aca14f9156699424 9b4140a93	yes	36

	Multipart Description/PDF files in .zip description		
	Document Description	**Start**	**End**
	Specification	1	19
	Claims	20	35
	Abstract	36	36

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9	TrackOne Request	20180901_WBWL001H_Track1.pdf	136171 34877167630e5c49048d88195c6c14b6b9fdb222	no	1
Warnings:					
Information:					
10	Fee Worksheet (SB06)	fee-info.pdf	42901 79ccf986657279ef45988bda32a0270ba166b897	no	2
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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.

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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 Overlapping MIMO Physical Sectors

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 14/476,628 filed on 09/03/2014.

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:

Petitioner/applicant is cautioned to avoid submitting personal information in documents filed in a patent application that may contribute to identity theft. Personal information such as social security numbers, bank account numbers, or credit card numbers (other than a check or credit card authorization form PTO-2038 submitted for payment purposes) is never required by the USPTO to support a petition or an application. If this type of personal information is included in documents submitted to the USPTO, petitioners/applicants should consider redacting such personal information from the documents before submitting them to the USPTO. Petitioner/applicant is advised that the record of a patent application is available to the public after publication of the application (unless a non-publication request in compliance with 37 CFR 1.213(a) is made in the application) or issuance of a patent. Furthermore, the record from an abandoned application may also be available to the public if the application is referenced in a published application or an issued patent (see 37 CFR 1.14). Checks and credit card authorization forms PTO-2038 submitted for payment purposes are not retained in the application file and therefore are not publicly available.

LEGAL NAME OF INVENTOR

Inventor: Roc Lastinger Date (Optional): 09/03/2014

Signature: Roc Lastinger

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

This collection of information is required by 35 U.S.C. 115 and 37 CFR 1.63. 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 1 minute 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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☐ The attached application, or

☒ United States application or PCT international application number 14/476,628

filed on 09/03/2014.

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.

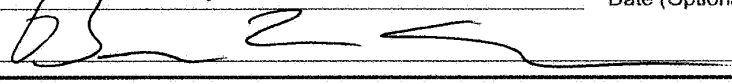
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WARNING:

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LEGAL NAME OF INVENTOR

Inventor: Brian C. Woodbury Date (Optional): 09/03/2014

Signature: 

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

This collection of information is required by 35 U.S.C. 115 and 37 CFR 1.63. 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 1 minute 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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SUBSTITUTE STATEMENT IN LIEU OF AN OATH OR DECLARATION FOR UTILITY OR DESIGN PATENT APPLICATION (35 U.S.C. 115(d) AND 37 CFR 1.64)

Title of Invention	METHODS AND APPARATUS FOR OVERLAPPING MIMO PHYSICAL SECTORS

This statement is directed to:

☒ The attached application,

OR

☐ United States application or PCT international application number _____ filed on _____.

LEGAL NAME of inventor to whom this substitute statement applies:

(*E.g.*, Given Name (first and middle (if any)) and Family Name or Surname)

John Spenik

Residence (except for a deceased or legally incapacitated inventor):

City	State	Country

Mailing Address (except for a deceased or legally incapacitated inventor):

City	State	Zip	Country

I believe the above-named inventor or joint inventor to be the original inventor or an original joint inventor of a claimed invention in the application.

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

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

Relationship to the inventor to whom this substitute statement applies:

- ☐ Legal Representative (for deceased or legally incapacitated inventor only),
- ☒ Assignee,
- ☐ Person to whom the inventor is under an obligation to assign,
- ☐ Person who otherwise shows a sufficient proprietary interest in the matter (petition under 37 CFR 1.46 is required), or
- ☐ Joint Inventor.

This collection of information is required by 35 U.S.C. 115 and 37 CFR 1.63. 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 1 minute 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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SUBSTITUTE STATEMENT

Circumstances permitting execution of this substitute statement:

- [x] Inventor is deceased,
- [ ] Inventor is under legal incapacity,
- [ ] Inventor cannot be found or reached after diligent effort, or
- [ ] Inventor has refused to execute the oath or declaration under 37 CFR 1.63.

If there are joint inventors, please check the appropriate box below:

- [x] An application data sheet under 37 CFR 1.76 (PTO/AIA/14 or equivalent) naming the entire inventive entity has been or is currently submitted.

OR

- [ ] An application data sheet under 37 CFR 1.76 (PTO/AIA/14 or equivalent) has not been submitted. Thus, a Substitute Statement Supplemental Sheet (PTO/AIA/11 or equivalent) naming the entire inventive entity and providing inventor information is attached. See 37 CFR 1.64(b).

WARNING:

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PERSON EXECUTING THIS SUBSTITUTE STATEMENT:

Name: Brian C. Woodbury | Date (Optional):

Signature:

APPLICANT NAME AND TITLE OF PERSON EXECUTING THIS SUBSTITUTE STATEMENT:

If the applicant is a juristic entity, list the applicant name and the title of the signer:

Applicant Name: Woodbury Wireless, LLC

Title of Person Executing This Substitute Statement: Managing Member

The signer, whose title is supplied above, is authorized to act on behalf of the applicant.

Residence of the signer (unless provided in an application data sheet, PTO/AIA/14 or equivalent):

City Pflugerville | State TX | Country US

Mailing Address of the signer (unless provided in an application data sheet, PTO/AIA/14 or equivalent)

1003 Rocky Creek Drive

City Pflugerville | State TX | Zip 78660 | Country US

Note: Use an additional PTO/AIA/02 form for each inventor who is deceased, legally incapacitated, cannot be found or reached after diligent effort, or has refused to execute the oath or declaration under 37 CFR 1.63.

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SUBSTITUTE STATEMENT

Circumstances permitting execution of this substitute statement:

- [x] Inventor is deceased,
- [ ] Inventor is under legal incapacity,
- [ ] Inventor cannot be found or reached after diligent effort, or
- [ ] Inventor has refused to execute the oath or declaration under 37 CFR 1.63.

If there are joint inventors, please check the appropriate box below:

- [x] An application data sheet under 37 CFR 1.76 (PTO/AIA/14 or equivalent) naming the entire inventive entity has been or is currently submitted.

OR

- [ ] An application data sheet under 37 CFR 1.76 (PTO/AIA/14 or equivalent) has not been submitted. Thus, a Substitute Statement Supplemental Sheet (PTO/AIA/11 or equivalent) naming the entire inventive entity and providing inventor information is attached. See 37 CFR 1.64(b).

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PERSON EXECUTING THIS SUBSTITUTE STATEMENT:

Name: Reinhard Graf	Date (Optional):
Signature:	

APPLICANT NAME AND TITLE OF PERSON EXECUTING THIS SUBSTITUTE STATEMENT:

If the applicant is a juristic entity, list the applicant name and the title of the signer:

Applicant Name: Helvetia IP AG

Title of Person Executing This Substitute Statement: Trustee

The signer, whose title is supplied above, is authorized to act on behalf of the applicant.

Residence of the signer (unless provided in an application data sheet, PTO/AIA/14 or equivalent):

City Lachen	State Schwyz	Country Switzerland

Mailing Address of the signer (unless provided in an application data sheet, PTO/AIA/14 or equivalent)

City	State	Zip	Country

Note: Use an additional PTO/AIA/02 form for each inventor who is deceased, legally incapacitated, cannot be found or reached after diligent effort, or has refused to execute the oath or declaration under 37 CFR 1.63.

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Page 000316

Doc code: IDS
Doc description: Information Disclosure Statement (IDS) Filed

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	Application Number	
	Filing Date	
	First Named Inventor	Roc Lastinger
	Art Unit	
	Examiner Name	
	Attorney Docket Number	WBWL001H

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	1	20030131124	A1	2003-07-10	Yi et al.	
	2	20030125040	A1	2003-07-03	Walton et al.	
	3	20030072255	A1	2003-04-17	Ma et al.	
	4	20030043887	A1	2003-03-06	Hudson	
	5	20020193146	A1	2002-12-19	Wallace et al.	

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	First Named Inventor	Roc Lastinger
	Art Unit	
	Examiner Name	
	Attorney Docket Number	WBWL001H

	6	20030013451	A1	2003-01-16	Walton	
	7	20020168945	A1	2002-11-14	Hwang et al.	
	8	20020173302	A1	2002-11-21	Baker et al.	
	9	20020154705	A1	2002-10-24	Walton et al.	
	10	20020119799	A1	2002-08-29	Moulsley et al.	
	11	20020094834	A1	2002-07-18	Baker et al.	
	12	20020067309	A1	2002-06-06	Baker et al.	
	13	20020062472	A1	2002-05-23	Medlock et al.	
	14	20020039884	A1	2002-04-04	Raynes et al.	
	15	20010033622	A1	2001-10-25	Jongren et al.	

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	First Named Inventor	Roc Lastinger
	Art Unit	
	Examiner Name	
	Attorney Docket Number	WBWL001H

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	1	200235289	KR		2001-10-10	HIGHGAIN ANTENNA CO.,LTD.	1	

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	1	Blum et al., "On the Capacity of Cellular Systems with MIMO," proc. 2001 Fall IEEE Vehicuar Technology Conf., vol 2, pp 1220-1224, Atlantic City, NJ, Oct. 2001.	
	2	Xiaodong et al., "Handover Mechanism in Coordinated Multi-Point Transmission/Reception System," ZTE Corporate, ZTE Communications, 2010, no. 1	
	3	Catreux et al., "Simulation Results for an interference-limited multiple-input multiple-output cellular system," IEEE Communications Letter, Vol 4, no. 11, pp. 334-336, Nov. 2000	
	4	Dai et al., "Downlink capacity of interference-limited MIMO systems with joint detection," IEEE Transactions Wireless Communications, vol 3, no. 2, pp. 442-453, Mar. 2004	
	5	Goldsmith et al. , "Capacity limits of MIMO Channels," IEEE J Select, Areas Coomun., vol 21, no. 5, pp. 684-702, June 2003	
	6	Jafar et al., "PhantomNet: Exploring Optimal Multicellular Multiple antenna systems," Proc. 2002 Fall IEEE Vehicular Technology Conf. (VTC), vol 1. pp. 261-265, Vanvouber, Canada, Sept. 2002	
	7	Spencer et al., "Capacity and downlink transmission algorithms for a multi-user MIMO Channel," Conference record of the Thirty-Second Asilomar Conference on Signals, systems, and Computers, vol 2, pp. 1384-1388, Nov. 2002.	

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Nokia v. Woodbury Wireless Inc.
Page 000319

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	Application Number	
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	Attorney Docket Number	WBWL001H

	8	Wyner, "Shannon-theoretic approach to a Gaussian Cellular Multiple-access channel," IEEE Trans, on Inform. Theory, vol 40, no. 6, pp. 1713-1727, nov. 1994	
	9	Shamai et al., "Enhancing the cellular downlink capacity via co-processing at the transmission end," Proc. 2001 Spring IEEE Vehicular Technology Conf., pp. 1745-1749, Rhodes, Greece, May 2001.	
	10	Baier et al, "Joint transmission (JT), an alternative rationale for the downlink of Time Division CDMA using multi-element transmit antennas," pp. 1-5. cited by examiner .	
	11	Meuer et al, "Joint transmission; advantageous downlink concept for CDMA mobile radio systems using time division duplexing", pp. 900-901, May 2000. cited by other .	
	12	Meuer et al, "Synthesis of joint detection and joint transmission in CDMA downlinks", Electronics Letters, Jul. 5, 2001, vol. 37, No. 14. cited by other .	
	13	Troger et al., "Performance Assessment of Joint Transmission (JT) Multi-User Downlinks and Multi-Element Transmit Antennas", Smart Antennas, vol. 12, No. 5, Sep.-Oct. 2001, pp. 407-416. cited by other	
	14	Costa, "Writing on Dirty Paper," IEEE Transactions on Information Theory, vol. 29 no. 3, pp. 439-441, May 1983	
	15	Jafar et al., "Transmitter Optimization for miltiple antenna cellular systems," Proc, 2002 IEEE International Syposium on Information Theory, pp. 50, 30 June - 5 July 2002.	
	16	Molisch, "MIMO systems with antenna selection-an overview," Proc. Radio and Wireless Conference, 2003, RAWCON 03, pp. 167-170 Aug 2003	
	17	U.S. Patent Application No. 14/952,839 filed 2015-11-25	
	18	U.S. Patent Application No. 14/952,850 filed 2015-11-25	

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	Application Number	
	Filing Date	
	First Named Inventor	Roc Lastinger
	Art Unit	
	Examiner Name	
	Attorney Docket Number	WBWL001H

	19	U.S. Patent Application No. 14/952,867 filed 2015-11-25	

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Examiner Signature		Date Considered	

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	Application Number	
	Filing Date	
	First Named Inventor	Roc Lastinger
	Art Unit	
	Examiner Name	
	Attorney Docket Number	WBWL001H

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That each item of information contained in the information disclosure statement was first cited in any communication from a foreign patent office in a counterpart foreign application not more than three months prior to the filing of the information disclosure statement. See 37 CFR 1.97(e)(1).

OR

☐ That no item of information contained in the information disclosure statement was cited in a communication from a foreign patent office in a counterpart foreign application, and, to the knowledge of the person signing the certification after making reasonable inquiry, no item of information contained in the information disclosure statement was known to any individual designated in 37 CFR 1.56(c) more than three months prior to the filing of the information disclosure statement. See 37 CFR 1.97(e)(2).

See attached certification statement.

The fee set forth in 37 CFR 1.17 (p) has been submitted herewith.

☒ A certification statement is not submitted herewith.

SIGNATURE

A signature of the applicant or representative is required in accordance with CFR 1.33, 10.18. Please see CFR 1.4(d) for the form of the signature.

Signature	/Thomas D. Fortenberry/	Date (YYYY-MM-DD)	2018-09-01
Name/Print	Thomas Fortenberry	Registration Number	56537

This collection of information is required by 37 CFR 1.97 and 1.98. 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 1 hour 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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MIMO Methods and Systems

CROSS-REFERENCE TO RELATED APPLICATIONS

[0001] This application is a continuation of and claims priority from U.S. Patent Application Ser. No. 15/824,010 filed November 28, 2017; which is a continuation of U.S. Patent Application Ser. No. 15/406,661 filed January 13, 2017, now U.S. Pat. No. 9,859,963; which is a continuation of U.S. Patent Application Ser. No. 14/952,874 filed November 25, 2015, now U.S. Pat. No. 9,584,197; which is a continuation of U.S. Patent Application Ser. No. 14/476,628 filed September 3, 2014, now U.S. Pat. No. 9,503,163; which is a continuation of U.S. Patent Application Ser. No. 13/348,523 filed January 11, 2012, now U.S. Pat. No. 8,855,089; which is a continuation of U.S. Patent Application Ser. No. 13/118,386 filed May 28, 2011, now U.S. Pat. No. 8,345,651; which is a continuation of U.S. Patent Application Ser. No. 11/709,431 filed Feb. 21, 2007, now U.S. Pat. No. 8,009,646; which claims priority under 35 U.S.C. sctn.119(e) from U.S. Provisional Patent Application Ser. No. 60/743,376 filed Feb. 28, 2006, each of the aforementioned applications is herein incorporated by reference.

FIELD OF THE INVENTION

[0002] Embodiments of the present invention relate to wireless communication using Multiple Input Multiple Output ("MIMO") antennas and methods of operation.

BACKGROUND OF THE INVENTION

[0003] Wireless devices find uses in a variety of applications for example, providing communication between computers, wireless cells, clients, hand-held devices, mobile devices, and file servers. Wireless devices with Multiple Input Multiple Output ("MIMO") antennas benefit from spatial diversity and redundant signals. Noise sources may interfere with wireless devices that use MIMO antennas. Wireless communication using devices having MIMO antennas may substantially benefit from selecting a MIMO physical sector and/or a MIMO virtual sector to improve performance.

SUMMARY OF THE INVENTION

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[0004] A system, method, and computer program product is provided to select at least one channel based on one or more channel characteristics and initiate a first transmission to a first multiple-input-multiple-output (MIMO)-capable portable wireless device, and further initiate a second transmission to a second multiple-input-multiple-output (MIMO)-capable portable wireless device, such that at least a portion of the first transmission occurs simultaneously with at least a portion of the second transmission and both occur via a first wireless protocol; and is further configured to initiate a third transmission to a third multiple-input-multiple-output (MIMO)-capable portable wireless device via a second wireless protocol including a 802.11n protocol, where the first wireless protocol includes another 802.11 protocol other than the 802.11n protocol.

BRIEF DESCRIPTION OF THE DRAWING

[0005] Embodiments of the present invention will now be further described with reference to the drawing, wherein like designations denote like elements, and:

[0006] FIG. 1 is a diagram of an exemplary wireless device according to the various aspects of the present invention;

[0010] FIG. 2 is a diagram of exemplary physical sectors;

[0011] FIG. 3 is a diagram of exemplary physical sectors that form exemplary MIMO physical sectors;

[0012] FIG. 4 is a diagram of exemplary MIMO virtual sectors;

[0013] FIG. 5 is a diagram of an exemplary MIMO virtual sector;

[0014] FIG. 6 is a diagram of exemplary MIMO virtual sectors;

[0015] FIG. 7 is a diagram of exemplary alternate method for diagrammatically indicating physical sectors, MIMO physical sectors, and MIMO virtual sectors;

[0016] FIG. 8 is a diagram of communication between exemplary wireless devices in the presence of noise sources;

[0017] FIG. 9 is a diagram of an exemplary wireless device having three radios and three antennas for each radio;

[0018] FIG. 10 is a diagram of exemplary physical sectors that form exemplary MIMO physical sectors;

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[0019] FIG. 11 is a diagram of an exemplary wireless device having two radio groups, each group having two radios and two antennas for each radio;

[0020] FIG. 12 is a diagram of exemplary physical sectors that substantially overlap to form exemplary MIMO physical sectors;

[0021] FIG. 13 is a diagram of exemplary physical sectors that partial overlap to form exemplary MIMO virtual sectors;

[0022] FIG. 14 is a diagram of exemplary physical sectors that partial overlap to form exemplary MIMO virtual sectors;

[0023] FIG. 15 is a diagram of exemplary physical sectors that partial overlap to form exemplary MIMO virtual sectors;

[0024] FIG. 16 is a diagram of exemplary physical sectors that substantially overlap to form exemplary MIMO physical sectors and exemplary MIMO physical sectors that partially overlap to form exemplary MIMO physical sectors;

[0025] FIG. 17 is a diagram of communication between exemplary wireless devices in the presence of noise sources;

[0026] FIG. 18 is a diagram of communication between exemplary wireless devices in the presence of exemplary noise sources;

[0027] FIG. 19 is a diagram of a method for forming MIMO physical sectors; and

[0028] FIG. 20 is a diagram of a method for forming MIMO physical sectors.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

[0029] Wireless devices use antennas to transmit and receive radio signals. Noise sources, such as other wireless devices including wireless devices that transmit on the same channel, may interfere with wireless communication. Conventional wireless devices use a variety of techniques to reduce the detrimental effect of noise on communication for example, dividing the area of coverage into sectors, using directional antenna, and using multiple antennas to provide redundancy and spatial diversity.

[0030] An improved wireless device, according to the various aspects of the present invention includes directional antennas positioned in such a way that the physical sectors of the antennas of the wireless device overlap and the antennas selected for communication are the

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antennas whose physical sectors overlap in an area in a manner that permits the antennas to operate as a Multiple Input Multiple Output ("MIMO") antenna.

[0031] The wireless device, according to the various aspects of the present invention may select for communication any suitable combination of directional antennas that operate as a MIMO antenna and are oriented in a desired direction of communication. Furthermore, the wireless device may assign any available channel to the antennas to improve performance.

[0032] A wireless device, according to the various aspects of the present invention includes, for example, wireless cells, access points, wireless clients, mobile computers, and handheld devices.

[0033] The term "physical sector" is understood to mean the area of coverage in which an antenna transmits and receives signals. The size and shape of a physical sector depends on a variety of factors for example, the type of antenna, atmospheric conditions, presence of noise sources, and physical surroundings. Physical sectors 58, 60 and 62 represent the two-dimensional shape of idealized physical sectors of directional antennas. Physical sectors 58, 60 and 62 do not overlap in FIG 2. Physical sectors 58, 60 and 62 substantially overlap in FIG. 3. Physical sectors 58, 60 and 62 partially overlap in FIGs. 4 and 5.

[0034] The term "MIMO antenna" is understood to mean at least two antennas that each transmits and/or receives signals on the same channel in the area where the physical sectors of the antennas overlap. Antennas may be positioned in such a way that their physical sectors overlap. Antennas whose physical sectors overlap in the same area may be configured to operate as a MIMO antenna in that area. Each individual antenna of a MIMO antenna operates on the same channel (e.g., frequency, encoding, or other method of dividing the radio spectrum for communication). A MIMO antenna provides, *inter alia*, spatial diversity between the antennas, redundancy, and temporal diversity to reduce the effects of noise on transmission and reception. Reducing the effects of noise permits a wireless device to communicate more reliability.

[0035] Antennas that form a MIMO antenna may be oriented to use different signal polarization for example, horizontal, vertical, and circular. Antennas that form a MIMO antenna may be physically separated to provide spatial diversity.

[0036] MIMO physical sectors are formed to provide communication with increased immunity to noise within the area of the MIMO physical sector. The term "MIMO physical

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sector" means the area where the physical sectors of the antennas that operate as a MIMO antenna overlap.

[0037] In an exemplary embodiment, referring to FIG. 3, physical sectors 58, 60, and 62 substantially overlap to form MIMO physical sector 82. Physical sectors 66, 68, and 70 substantially overlap to form a MIMO physical sector 84. In this embodiment, each MIMO physical sector has an angle of coverage of about 90 degrees. In another embodiment, referring to FIG. 6, each one physical sector 58, 60, and 62 and each one physical sector 66, 68, and 70 has an angle of coverage of about 180 degrees, thus the resulting MIMO physical sectors 82 and 84 have an angle of coverage of about 180 degrees. FIG. 7 represents an alternate method for diagrammatically representing physical sectors and MIMO physical sectors. Physical sectors 58 – 62 respectively have about a 180 degree angle of coverage and the center of each physical sector is oriented at approximately 90 degrees (straight up on the page). Each physical sector 58 – 62 extends from wireless device 10 to the furthest extent reached by the respective antennas even though FIG. 7 shows gaps between the physical sectors for clarity. The MIMO physical sectors 82 and 84 of FIGs. 6 and 7 are equivalent; however, the diagrammatical representation of FIG. 7 provides greater clarity. Thus, MIMO physical sectors 82 and 84 respectively include three substantially overlapping physical sectors 58 – 62 and 66 – 70.

[0038] The physical sectors of the antennas that form a MIMO antenna are not limited to being substantially overlapping. When physical sectors only partially overlap, the MIMO physical sector is the area where the physical sectors of the antennas that form the MIMO antenna overlap. Referring to FIGs. 4 and 5, the antennas associated with physical sectors 58 – 62 transmit and receive using the same channel. Area 94 is the area where physical sectors 58, 60, and 62 overlap, thus area 94 is a MIMO physical sector. The antennas associated with physical sectors 58 – 62 operate as a MIMO antenna in area 94. The MIMO physical sector formed by physical sectors 66 – 70 is also shown in FIG. 4 as MIMO physical sector 82.

[0039] MIMO physical sectors may be formed in a variety of ways. In one exemplary method for forming a MIMO physical sector, referring to FIG. 19, antennas are selected to operate as a MIMO antenna then the antennas are positioned in such a way that the physical sectors of the antennas overlap. In another exemplary method for forming a MIMO physical sector, referring to FIG. 20, a plurality of antennas are positioned in such a way that the physical sectors of at least some of the antennas at least partially overlap then at least two antennas are

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selected to operate as a MIMO antenna in the area where their physical sectors overlap to form a MIMO physical sector. The plurality of antennas may be positioned in such a way that the various MIMO physical sectors that are formed are oriented in different directions. At least two antennas may be selected to operate as a MIMO antenna in accordance with the orientation of the MIMO physical sector formed by the physical sectors of the selected antennas. The orientation of some MIMO physical sectors may provide increased performance over the orientation of other MIMO physical sectors. Furthermore, the antennas that form the MIMO antenna may be assigned any available channel. Accordingly, the selected antennas, thus the MIMO physical sector, may be assigned to a channel that provides improved performance.

[0040] The term "MIMO virtual sector" means the area where the physical sectors of antennas that may operate as a MIMO antenna overlap. Referring to FIG. 13, physical sectors 58 – 62 and 66 – 70 each have an angle of coverage of about 180 degrees respectively. The antennas associated with physical sectors 58 – 62 and 66 – 70 are positioned in such a way that in area 150, physical sectors 58, 68, and 70 overlap. In area 152, physical sectors 58, 60, and 70 overlap and so forth for areas 154 – 160. Each one area 150 – 160 comprises a MIMO virtual sector because the antennas whose physical sectors overlap in the area may operate as a MIMO antenna. If the antennas associated with physical sectors 58, 68, and 70 are selected to form a MIMO antenna, then area 150 operates as a MIMO physical sector. If the antennas associated with physical sectors 58, 60, and 70 are selected to form a MIMO antenna, then area 152 operates as a MIMO physical sector and so forth for the other areas. Before antennas are selected to form a MIMO physical sector, areas 150 – 160 are MIMO virtual sectors. When antennas are selected to form a MIMO antenna, the area where the physical sectors of the selected antennas overlap become a MIMO physical sector while the other areas remain MIMO virtual sectors. A MIMO physical sector may also be referred to as a selected MIMO virtual sector or an active MIMO virtual sector. Any criteria may be used to select a MIMO virtual sector for communication.

[0041] The method of positioning antennas to form MIMO virtual sectors then selecting antennas to operate as a MIMO antenna permits the wireless device to respond to changes in, *inter alia*, performance, noise sources, and the environment by communicating through the MIMO physical sector that provides increased performance.

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[0042] Positioning antennas to form MIMO virtual sectors permits a wireless device with fixed antenna positions to select from a variety of MIMO virtual sectors to communicate using the MIMO physical sector that provides a desired level of performance. When the performance of the selected MIMO physical sector deteriorates due to, *inter alia*, noise sources or environmental conditions, the wireless device can select different antennas to operate as a MIMO antenna, thereby selecting a different MIMO virtual sector to operate as a MIMO physical sector where the different MIMO physical sector provides increased performance.

[0043] MIMO physical sectors permits a wireless device to communicate with increased performance. MIMO virtual sectors permits a wireless device to select an area to transmit and receive in accordance with the MIMO virtual sector that provides a desired level of performance. A wireless device having multiple MIMO virtual sectors may select between the various MIMO virtual sectors. A wireless device may select the MIMO virtual sector that provides an increased level of performance. Positioning the antennas of a wireless device to form MIMO virtual sectors that are oriented in different directions permits the wireless device to select a MIMO physical sector based on the orientation of the virtual sector with relation to the position of noise sources.

[0044] Performance may be measure by, *inter alia*, throughput, data throughput, signal-to-noise ratio, reduced signal error, reduced data errors, reduced retransmission requests, reduced interference, rejection of multipath signals, higher transmission rates, and signal strength.

[0045] A MIMO system includes radios and antennas that may be configured to form MIMO antennas, MIMO physical sectors, and MIMO virtual sectors. A MIMO system may form a MIMO antenna using any suitable combination of radios and antennas. A MIMO system may select any suitable MIMO physical sector for communication. A MIMO system may have any suitable number of MIMO virtual sectors and/or selected MIMO virtual sectors. The MIMO system may position its MIMO physical sectors at any orientation. The MIMO physical sectors of a MIMO system may overlap other MIMO physical sectors of the same MIMO system. Overlapping MIMO physical sectors of the same MIMO system may be assigned different channels.

[0046] A MIMO system has at least two radios and at least two antennas where at least two radios and two antennas form a MIMO antenna. In another exemplary embodiment, referring to FIG. 1, a MIMO system has three radios with two antennas interfacing with each one radio.

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Three antennas, one antenna from each radio, may operate as a MIMO antenna, thereby resulting in a MIMO system having two MIMO antennas.

[0047] The present invention may employ various types of radios using any type of communication protocol and operating at any frequency and/or with any number of channels suitable for the application. The present invention may use any variety of antennas or groups of antennas for any purpose for example, transmission, reception, noise reduction, and multipath detection. Antennas may be positioned in any manner for example, their physical sectors may be overlapping and non-overlapping. Radios and antennas may operate as a MIMO system, MIMO antennas, MIMO physical sectors, and MIMO virtual sectors. Any type of algorithm and/or processor may be used to enable radios and/or antennas to form and operate as MIMO antennas. Antennas may be selected for communication according to any criteria such as for example, data throughput, signal strength, signal quality, and signal-to-noise ratio.

[0048] In one embodiment, the antennas of the wireless device are positioned to form non-overlapping MIMO physical sectors and one of the non-overlapping MIMO physical sectors is selected for communication with other wireless devices. In another embodiment, the antennas of the wireless device are positioned to form overlapping MIMO virtual sectors and some of the MIMO virtual sectors are selected for communication with other wireless devices.

[0049] The antennas that form a MIMO antenna may be used in any manner to transmit and/or receive signals for example, any number of antennas that operate as the MIMO antenna may transmit only, receive only, and transmit and receive signals.

[0050] In an exemplary embodiment, referring to FIG. 1, antennas 34, 36, and 38, with their associated radios, form a MIMO antenna in which each antenna 34, 36, and 38 transmits and receives the same signals. In another embodiment, antennas 34 – 38 form a MIMO antenna in which antenna 34 transmits, antenna 36 receives only, and antenna 38 transmits and receives. Different MIMO antenna configurations may provide different communication characteristics. For example, a configuration where all antennas of the MIMO antenna transmit and receive the same information may provide increased error correction. A configuration where antennas transmit and/or receive different information may provide increased data throughput. In an configuration where each antenna of the MIMO antenna receives some version of the same signal, the information content of the various signal versions received by the antennas of the MIMO antenna may be highly similar and/or less similar depending on environmental conditions

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for example, the presence of noise sources, multipath reflections, and spatial diversity of the antennas. Advanced algorithms may be used to process the signal received by each antenna that form the MIMO antenna to construct a resultant receive signal that contains as much of the receive signal information as can be extracted. The antennas of a MIMO antenna may be configured to receive signals from a common source by positioning the antennas such that their physical sectors overlap.

[0051] The number of antennas used to form a MIMO physical sector and the overlap of the physical sectors of the antennas may affect performance. For example, referring to FIGs. 1 and 5, area 90 receives coverage from only physical sector 62, thus communications within area 90 are transmitted and received by only antenna 38. Likewise, area 98 receives coverage only from physical sector 60 and antenna 36. Even when antennas 36 and 38 are selected to operate as a MIMO antennas, areas 90 and 98 are not MIMO physical sectors because only one antenna operates in the area. When only one antenna of the antennas selected to operate as a MIMO antenna transmits and receives in an area, the performance may not be as high as in the areas where the physical sectors of the antennas overlap to form a MIMO physical sector. Areas 92 and 96 receive coverage from physical sectors 58, 62 and 58, 60 respectively. Areas 92 and 96 are MIMO physical sectors because at least two antennas operate as a MIMO antenna in the areas. Communication using at least two antennas of the antennas selected to operate as a MIMO antenna may improve performance. Area 94, a MIMO physical sector formed by the overlap of the physical sectors of three antennas, receives coverage from physical sectors 58, 60 and 62 and their related antennas 34 – 38. Antennas 34 – 38 operate as a MIMO antenna, thus reception and/or transmission through all three antennas in area 94 may provide higher performance than reception and/or transmission through areas 90 – 92 and 96 – 98. The MIMO physical sector in area 94 is most likely to provide improved performance because all antennas of the MIMO antenna communicate in area 94.

[0052] MIMO physical sectors formed using directional antennas may use conventional antenna select methods to reduce interference from noise sources. For example, referring to FIGs. 1 and 8, wireless device 10 comprises processor 12, radios 18 – 22, RF switches 26 – 30, and antennas 34 – 38 and 42 – 46 where two antennas interfacing with each one RF switch respectively. Antennas 34 – 38 and 42 – 46 operate as a first MIMO antenna and a second MIMO antenna respectively. Radios 18 – 22 use the 802.11a/b/g/n communication protocols.

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Antenna physical sectors 58 – 62, associated with antennas 34 – 38 respectively, substantially overlap to form MIMO physical sector 82. Antenna physical sectors 66 – 70, associated with antennas 42 – 46 respectively, substantially overlap to form MIMO physical sector 84. In this embodiment, each radio is set to the same channel. The physical sectors and the MIMO physical sectors 82 – 84 extend farther than shown in FIG. 8 to enable wireless device 10 to communicate with wireless device 102 and receive interference from noise sources 106 and 108. Wireless device 10 uses RF switches 26 – 30 to select between antennas 34 – 38 and 42 – 46. In this embodiment, the RF switches select between one of two groups of antennas; either antennas 34 – 38 or antennas 42 – 46 are selected, thus only one MIMO physical sector, either 82 or 84, is active at any given time. In the embodiment and the scenario described in FIG. 8, wireless device 10 selects MIMO antennas physical sector 84 to reduce interference from noise sources 106 and 108 while communicating with wireless device 102. Wireless device 104 of FIG. 8 may also be implemented using MIMO physical sectors similar to those of wireless device 10. Wireless device 104 may select the MIMO physical sector that provides the best performance while communicating with wireless device 102 and reduces interference from noise source 110.

[0053] In another embodiment of a MIMO system, referring to FIG. 9, wireless device 10 comprises a processor 12, three radios 18 – 22, three RF switches 26 – 30, and three antennas interfacing with each RF switch. Antennas 34 – 38, 42 – 46, and 50 – 54 may have any angle of coverage, be oriented in any direction, form MIMO antennas, and form MIMO virtual sectors in any manner. In an exemplary embodiment, referring to FIG. 10, each antenna 34 – 38, 42 – 46, and 50 – 54 has an angle of coverage of about 120 degrees. Antennas 34 – 38 are oriented so that their associated physical sectors, 58 – 62 respectively, substantially overlap to form MIMO physical sector 82. Antennas 42 – 46 are oriented so that their associated physical sectors, 66 – 70 respectively, substantially overlap to form MIMO physical sector 84. Antennas 50 – 54 are oriented so that their associated physical sectors, 74 – 78 respectively, substantially overlap to form MIMO physical sector 86. Physical sectors 58 – 62, 66 – 70, and 74 – 78 are oriented such that the center of MIMO physical sectors 82, 84, and 86 are respectively oriented at about 60, 180, and 300 degrees respectively. In this embodiment, the MIMO physical sectors do not substantial overlap. Each radio is set to the same channel, thus the MIMO physical sectors 82 – 86 each use the same channel. The wireless device embodiment of FIGs. 9 and 10 may also be

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used to reduce interference with noise sources by selected one of the three MIMO physical sectors for communication.

[0054] In another embodiment, not shown, wireless device 10 comprises a processor, four radios, an RF switch interfacing with each one radio, and four directional antennas interfacing with each one RF switch. Each antenna has an angle of coverage of about 90 degrees. The physical sectors of one antenna from each RF switch substantially overlap to form a MIMO physical sector resulting in a MIMO system having four MIMO virtual sectors. Each MIMO physical sector receives coverage from each one of the four radios. The physical sectors of the antennas are oriented in such a way that the MIMO physical sectors do not overlap and the MIMO physical sectors provide a combined angle of coverage of about 360 degrees. All radios are set to the same channel.

[0055] In another embodiment, not shown, wireless device 10 comprises a processor, two radios interfacing with the processor, an RF switch interfacing with each one of the radios, and three directional antennas interfacing with each one RF switch. Each antenna has an angle of coverage of about 120 degrees. The physical sectors of one antenna from each one RF switch substantially overlap to form a MIMO physical sector resulting in a MIMO system having three MIMO virtual sectors. Each MIMO physical sector receives coverage from each one of the two radios. The physical sectors of the antenna are oriented in such a way that the MIMO physical sectors do not overlap and the MIMO physical sectors provide a combined angle of coverage of about 360 degrees. All radios are set to the same channel.

[0056] In another embodiment, not shown, wireless device 10 comprises a processor, two radios interfacing with the processor, an RF switch interfacing with each one of the radios, and "N" directional antennas interfacing with each one RF switch. Each antenna has an angle of coverage of about 360 degrees divided by N. Two antennas, one from each RF switch, form a MIMO antenna, thereby forming N MIMO antennas. The physical sectors of the antennas that form each MIMO antenna substantially overlap to form N MIMO physical sectors. The MIMO physical sectors are oriented in such a way that the MIMO physical sectors do not substantially overlap, thereby providing a combined angle of coverage of about 360 degrees. All radios are set to the same channel.

[0057] Radios, antennas, and MIMO physical sectors are not limited to using a single channel for communication or to forming MIMO physical sectors that are substantially non-

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overlapping. Radios may be grouped to provide MIMO physical sectors that use different channels. MIMO physical sectors that communicate on different channels may be positioned to overlap. Overlapping MIMO physical sectors that use different channels may simultaneously communicate less mutual interference.

[0058] In one embodiment, referring to FIG. 11, wireless device 10 comprises a process 12, controllers 14, 16 interfaces with processor 10, two radios 18, 20 interface with controller 14 thereby forming a first radio group, two radios 22, 24 interface with controller 16 thereby forming a second radio group, an RF switch 26, 28, 30, 32 interfaces with radio 18, 20, 22, 24 respectively, antennas 34 – 48 interface with the RF switches in such a manner that two antennas interface with each one RF switch. The antennas may form MIMO antennas any manner; however, forming MIMO antennas using antennas from the same group enables MIMO physical sectors from different groups to operate on different channels.

[0059] In one embodiment, antennas 34 and 36 form a first MIMO antenna. Antennas 42 and 44 form a second MIMO antenna. The first and second MIMO antennas belong to the first radio group. Antennas 38 and 40 form a third MIMO antenna. Antennas 46 and 48 form a fourth MIMO antenna. The third and fourth MIMO antennas belong to the second radio group. In another embodiment, antennas 34 – 40 form a first MIMO antenna and antennas 42 – 48 form a second MIMO antenna.

[0060] The antennas and their respective physical sectors may have any angle of coverage and be oriented in any direction. The antennas of the various groups may form MIMO antennas in any manner. The resulting MIMO physical sectors may be overlapping or non-overlapping. In an exemplary embodiment, antennas 34, 36, 38, 40, 42, 44, 46, and 48 and their respective physical sectors 58, 60, 62, 64, 66, 68, 70, and 72 each have an angle of coverage of about 180 degrees. Referring to FIGs. 11 and 12, physical sector 58 substantially overlaps physical sector 60 to form MIMO physical sector 82. Physical sectors 62 and 64 substantially overlap, 66 and 68 substantially overlap, and 70 and 72 substantially overlap to form MIMO physical sectors 84, 86, and 88 respectively. The center of the angles of coverage of antennas 34, 36 and 38, 40 are oriented at about 90 degrees (e.g., up the page), thus MIMO physical sectors 82 and 84 overlap. The center of the angles of coverage of antennas 42, 44 and 46, 48 are oriented at about 270 degrees (e.g., down the page), thus MIMO physical sectors 86 and 88 substantially overlap. Radios 18 and 20 belong to the first radio group and radios 22 and 24 belong to the second radio

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group. Assigning channel C1 to the first radio group and channel C2 to the second radio group results in MIMO physical sectors 82 and 86 using channel C1 and MIMO physical sectors 84 and 88 using channel C2. Thus, the channel assignment, the antenna orientation, and the MIMO antenna configurations provide overlapping MIMO physical sectors that use different channels. Referring to FIG. 12, MIMO physical sector 82 is assigned to C1, MIMO physical sector 84 is assigned to C2, and MIMO physical sector 82 substantially overlaps MIMO physical sector 84. Because MIMO physical sectors 82 and 84 are assigned different channels, they may communicate with different wireless devices simultaneously with less mutual interference. MIMO physical sectors formed using antennas from different radio groups enables the MIMO physical sectors to overlap, be assigned different channels, and communicate simultaneously. MIMO antennas of the same radio group use the same channel. Interference between MIMO physical sectors formed using antennas from the same group may be reduced by, for example, positioning the MIMO physical sectors in such a way that they do not overlap and communicating using only one MIMO physical sector from the same group at any one time.

[0061] In another embodiment, referring to FIG. 11, each one antenna 34 – 48 has a physical sector with an angle of coverage of about 90 degrees. Antennas are organized, as described above, to form four MIMO antennas. Antenna physical sectors are positioned such that the center of the angle of coverage for antennas pairs 34 and 36, 38 and 40, 42 and 44, and 46 and 48 and their respective physical sectors are oriented at 45, 135, 225, and 315 degrees respectively. Channel C1 is assigned to the first group radios and channel C2 is assigned to the second group radios. The resulting four MIMO physical sectors are positioned to not substantially overlap and adjacent MIMO physical sectors are assigned a different channel. One MIMO physical sector from the first radio group and one MIMO physical sector from the second radio group may operate simultaneously.

[0062] The antennas of wireless device 10 may be oriented to form MIMO virtual sectors. MIMO virtual sectors may have any angle of coverage and be oriented in any manner. A MIMO virtual sector may be selected for communication to decrease interference. In one embodiment, referring to FIGs. 1 and 13, antennas 34 – 38 and 42 – 46 have an angle of coverage of about 180 degrees. Antennas 34, 36, 38, 42, 44, 46 and the center of the angle of coverage of their respective physical sectors 58, 60, 62, 66, 68, 70 are oriented at 90, 150, 210, 270, 300, and 30 degrees respectively. The area between 0 and 60 degrees, marked as area 150 in FIG. 13, is

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covered by physical sectors 58, 68, and 70. Antennas 34, 44, and 46 may function together as a MIMO antenna to transmit signals to and receive signals from any wireless device within area 150. Areas 152, 154, 156, 158, and 160 are respectively positioned between about 60 – 120 degrees, about 120 – 180 degrees, about 180 – 240 degrees, about 240 – 300 degrees, and about 300 – 0 degrees and are serviced respectively by antennas 34, 36, and 46; 34, 36 and 38; 42, 36 and 38; 42, 44 and 38; and 42, 44 and 46. Each one area 150 – 160 comprises a MIMO virtual sector.

[0063] In an exemplary embodiment, referring to FIGs. 1 and 13, area 150 operates as a MIMO physical sector by forming a MIMO antenna using antennas 34, 44, and 46. Area 152 operates as a MIMO physical sector by forming a MIMO antenna using antennas 34, 36, and 46, and so forth for areas 154 – 160. In this embodiment, areas 158 and 160 may not be combined to operate as a MIMO physical sector because area 158 requires antennas 42, 44, and 38 to form a MIMO antenna while area 160 requires antennas 42, 44, and 46 to form a MIMO antenna. Because RF switch 30 selects only one antenna at a time, MIMO physical sectors, for this embodiment, are limited to any combination of any one antenna associated with each RF switch. In this embodiment, wireless device 10 may select and communicate through any one MIMO virtual sector at any given time. The method of selecting the MIMO virtual sector consists of setting the RF switches to select the antennas that service the desired MIMO virtual sector. In another embodiment, an RF switch with its associated antennas may be replaced by a phased array. Antenna elements of each phased array may form MIMO antennas.

[0064] Antennas may be oriented in any manner to form MIMO virtual sectors of any size. In an exemplary embodiment, referring to FIG. 13, each MIMO virtual sector 150 – 160 has an angle of coverage of about 60 degrees. In another embodiment, referring to FIG. 14, MIMO virtual sectors 150, 152, 154, 156, 158, and 160 lie between 0 – 30 degrees, 30 – 60 degrees, 60 – 180 degrees, 180 – 210 degrees, 210 – 240 degrees, and 240 – 0 degrees respectively. In another embodiment, referring to FIG. 15, each MIMO virtual sector has an angle of coverage of about 40 degrees. MIMO virtual sectors 150 – 166 lie between 0 – 40 degrees, 40 – 80 degrees, 80 – 120 degrees, 120 – 160 degrees, 160 – 200 degrees, 200 – 240 degrees, 240 – 280 degrees, 280 – 320 degrees, and 320 – 0 degrees respectively. In another embodiment, referring to FIGs. 11 and 18, each MIMO virtual sector has an angle of coverage of about 90 degrees. Channel C1 is assigned to the first group radios and channel C2 is assigned to the second group radios.

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Antenna pairs 34 and 36, 38 and 40, 42 and 44, and 46 and 48 respectively form MIMO antennas. MIMO virtual sectors formed by antennas 34, 36 and 42, 44 extend from 0 – 180 and 180 - 0 degrees respectively and are assigned channel C1. MIMO virtual sectors formed by antennas 38, 40 and 46, 48 extend from 90 – 270 and 270 - 90 degrees respectively and are assigned channel C2. The MIMO virtual sectors are positioned to form areas 150 – 156 which each receive coverage from two MIMO virtual sectors that operate on different channels.

[0065] A wireless device may select and communicate through a MIMO virtual sector to improve performance. A wireless device may use any criteria for selecting a MIMO virtual sector for communication such as, for example, the presence of noise sources, noise source channels used, signal-to-strength ratio, direction of primary data flow, signal quality, signal strength, and data throughput.

[0066] In one embodiment, referring to FIGs. 9 and 17, wireless device 10 desires to communicate with wireless device 102. Wireless device 10 successively enables each antenna combination that forms each MIMO virtual sector 150 – 160. Through each MIMO virtual sector, wireless device 10 measures its ability to communicate with wireless device 102. Through at least MIMO virtual sector 150, wireless device 10 detects the presence of noise source 110. Through at least MIMO virtual sectors 154 and 156, wireless device 10 detects the presence of noise sources 106 and 108 respectively. While communicating with wireless device 102, wireless device 10 may reduce interference from noise sources 106 and 108 by selecting and communicating through MIMO virtual sector 150. In the embodiment of wireless device 10 shown in FIGs. 1 and 17, areas adjacent to the selected MIMO virtual sector have at least one antenna in common, thus selecting a MIMO virtual sector does not disable all communication in other sectors, but communication within the selected MIMO virtual sector may provide increased performance than adjacent areas because it transmits and/or receives using all the antennas that form the MIMO antenna.

[0067] Referring still to FIGs. 1 and 17, wireless device 10 may reduce interference from noise source 110 by selecting a channel that is different from the channel used by noise source 110. In the event that wireless device 102 cannot switch to a channel that is not used by noise source 110, communication with wireless device 102 may proceed using MIMO virtual sector 150 if it provides a desired level of performance. A wireless device may select any MIMO virtual sector that provides a desired level of performance. In this embodiment, wireless device

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10 may select MIMO virtual sector 152 to communicate with wireless device 102. Wireless device 10 may detect less interference from noise source 110 through MIMO virtual sector 152 than it detects through MIMO virtual sector 150, but wireless device 10 may also receive a less desirable signal from wireless cell 102. In the event that wireless device 10 desires to communicate with wireless device 104 and noise sources 106, 108, and 110 all operate on the same channel as wireless device 104, wireless cell 10 may reduce interference from the noise sources by selecting MIMO virtual sector 160 for communicating with wireless device 104. A wireless device may select and use any MIMO virtual sector for any duration of time. A wireless device may switch from using one MIMO virtual sector to using any other MIMO virtual sector at any time and for any purpose. In an exemplary embodiment, referring to FIG. 17, wireless device 10 switches between MIMO virtual sectors 150 and 160 to communicate with wireless devices 102 and 104 respectively. Additionally, a wireless device may transmit through one MIMO virtual sector and receive through a different MIMO virtual sector. In another embodiment, referring to FIGs. 11 and 18, wireless device 10 may select the MIMO virtual sector that provides a desired level of communication for each area. Additionally, wireless device 10 may communicate with two wireless devices 104 and 120, both in area 156, simultaneously on different channels; for example, wireless device 104 communicates using channel C1 while wireless device 120 communicates using channel C2.

[0068] Unless contrary to physical possibility, the inventor envisions the methods and systems described herein: (i) may be performed in any sequence and/or combination; and (ii) the components of respective embodiments combined in any manner.

[0069] This application incorporates by reference U.S. provisional application serial number 60/484,800 filed on July 3, 2003; U.S. provisional application serial number 60/493,663 filed on August 8, 2003; U.S. provisional application serial number 60/692,490 filed on June 21, 2005; U.S. utility application serial number 10/869,201 filed on June 15, 2004 and issued under U.S. Pat. No: 7,302,278; and U.S. utility application serial number 10/880,387 filed on June 29, 2004 and issued under U.S. Pat. No: 7,359,675, in their entirety for the teachings taught therein.

[0070] The wireless cell can ask the advanced client to measure and report communication statistics such as, but not limited to, bit error rate, signal-to-noise ratio, dropped bits, signal strength, number of retransmission requests or any other environmental or communication

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parameter. Each antenna and antenna controller functions independently of the other antennas and controllers.

[0071] The antenna controller sets the beam width, beam azimuth, beam steering, gain of the antenna and any other parameter available on adjustable antennas. The antennas are also capable of high-speed switching. The controllable characteristics of the antenna are dynamically modifiable. The antenna beam can steer directly at one receiving client during transmission then pointed at a second client when transmission to the second client begins. The beam width of the antenna can be increased or decreased as necessary; however, it is preferable to not increase the beam width to provide antenna coverage beyond the width of a sector. If the beam width is adjusted to provide coverage wider than a sector, the radio signal may interfere with adjacent or opposing sectors or wireless cells or detect clients not associated with the sector or wireless cell. The processor is responsible for tracking the antenna characteristics best suited to service each client in the sector covered by the antenna and to set the antenna controller to the parameters best suite for the particular client when communicating with the client. The use of an adjustable antenna, an antenna controller and a processor capable of controlling the antenna controller is not limited to the six-sector embodiment of a wireless network, but can also be used in a four-sector wireless cell or other wireless cell types. Preferably, the beam width would not exceed the width of the sector of the wireless cell in which it is used.

[0072] MIMO antennas may use any combination of spatial, polarization, or angle antenna diversity. The MIMO antenna array may be fixed or adaptive for either transmit, receive, or both. When receiving, the MIMO antenna may use, for example, a maximum ratio combiner, an optimal linear combiner, selection diversity, or any combination of these methods or other methods for combining the signals from multiple antennas into a single signal. When transmitting, the MIMO antenna may use any type of encoding including, for example, OFDM, space-time-codes, or weighting of the antenna signals in the array to accomplish beam steering.

[0073] During transmission or reception, all or any subset of antennas in the MIMO array may be used or selection diversity may be used to limit the number of antennas used.

[0074] Antenna diversity may be used in the transmit path, in the receive path, or in both transmit and receive paths. The signal from each antenna, transmitted or received, may or may not be weighted.

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[0075] Servicing a physical sector with a MIMO antenna means that all antennas in the MIMO array use the channel assigned to the physical sector. Signal attenuation may be added after each antenna, after the signal combiner, or in the signal processor that manipulates the incoming signals.

[0076] Although MIMO antennas are arrays of antennas, any antenna array may be used as a single antenna or a MIMO antenna may be used. For example, a directional antenna with about 120-degree angle of coverage may be replaced by an antenna array that provides similar coverage. The array may be fixed or adaptive. Adaptive arrays may use adaptive array weights to transmit directional beams within the angle and area of coverage to send a stronger signal to a desired client. During reception, an adaptive array may use array weights to direct a beam substantially towards the transmitting client and substantially null out any sources of interference.

[0077] The processor, in exemplary embodiments, in addition to getting receive data from and sending transmit data to the radios, may also send instructions to control the radios such as, for example, instructing a radio to change channels or getting control information from the radios. In exemplary embodiments, the processor may also be capable of, for example, varying attenuation, controlling any or all RF switches, maintaining route tables, maintaining client specific information, and handing off mobile clients.

[0078] In an exemplary embodiment, the processor may also control, for example, the attenuation or RF switches on a transmit or receive basis, a per client basis, a fixed period basis, and on a per demand basis.

[0079] Some embodiments may have a network connection that may enable the wireless cell to communicate with a wired network. Some embodiments may have local storage to store, for example, transmit and receive date, relay data, video or audio data, environmental conditions data, and any other type of data required to service clients, function as a network, handoff or receive mobile clients, and forward information.

[0080] When receiving, the MIMO antenna may use, for example, a maximum ratio combiner, an optimal linear combiner, selection diversity, or any combination of these methods or other methods for combining the signals from multiple antennas into a single signal.

[0081] Assume for this example that the communication protocol uses packetized data and that the clients must transmit RTS and await a CTS before transmitting a single packet. It is

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possible to switch a client, or multiple clients, from a packet-based communication protocol to a data stream protocol to increase the efficiency of long data transfers between clients.

[0082] Another aspect of the invention is the use of multiple directional antennas, at least one radio, at least one attenuator and other electronic devices such as RF switches, packet switches, antenna sharing devices and other electronic and electrical components to generate various embodiments of wireless cells and wireless networks with differing characteristics and capabilities.

[0083] Although there have been described preferred embodiments of this novel invention, many variations and modifications are possible and the embodiments described herein are not limited by the specific disclosure above, but rather should be limited only by the scope of the appended claims.

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CLAIMS

1. A computer-implemented method, comprising:

providing access to an access point including:

a plurality of antennas;

circuitry in communication with the antennas; and

at least one radio in communication with the circuitry;

selecting at least one channel based on one or more channel characteristics, for initiating a first transmission to a first multiple-input-multiple-output (MIMO)-capable portable wireless device and initiating a second transmission to a second multiple-input-multiple-output (MIMO)-capable portable wireless device, such that at least a portion of the first transmission occurs simultaneously with at least a portion of the second transmission and both occur via a first wireless protocol;

receiving first information from the first multiple-input-multiple-output (MIMO)-capable portable wireless device that is based on a first measurement performed by the first multiple-input-multiple-output (MIMO)-capable portable wireless device;

receiving second information from the second multiple-input-multiple-output (MIMO)-capable portable wireless device that is based on a second measurement performed by the second multiple-input-multiple-output (MIMO)-capable portable wireless device;

altering at least one aspect of the first transmission in connection with a first multiple of the antennas, based on at least one of the first information or the second information, so as to direct the first transmission more towards the first multiple-input-multiple-output (MIMO)-capable portable wireless device as compared to the second multiple-input-multiple-output

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(MIMO)-capable portable wireless device, thereby reducing interference between the first transmission and the second transmission when the at least portion of the first transmission occurs simultaneously with the at least portion of the second transmission;

altering at least one aspect of the second transmission in connection with a second multiple of the antennas, based on at least one of the first information or the second information, so as to direct the second transmission more towards the second multiple-input-multiple-output (MIMO)-capable portable wireless device as compared to the first multiple-input-multiple-output (MIMO)-capable portable wireless device, thereby reducing the interference between the first transmission and the second transmission when the at least portion of the first transmission occurs simultaneously with the at least portion of the second transmission;

transmitting first data in connection with the first transmission to the first multiple-input-multiple-output (MIMO)-capable portable wireless device, utilizing the first multiple of the antennas;

transmitting second data in connection with the second transmission to the second multiple-input-multiple-output (MIMO)-capable portable wireless device, utilizing the second multiple of the antennas;

receiving third information from a third multiple-input-multiple-output (MIMO)-capable portable wireless device that is based on a third measurement performed by the third multiple-input-multiple-output (MIMO)-capable portable wireless device;

altering at least one aspect of a third transmission in connection with a third multiple of the antennas, based on the third information, so as to direct the third transmission towards the third multiple-input-multiple-output (MIMO)-capable portable wireless device; and

transmitting third data in connection with the third transmission to the third multiple-input-multiple-output (MIMO)-capable portable wireless device, utilizing the third multiple of

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the antennas, via a second wireless protocol including a 802.11n protocol, where the first wireless protocol includes another 802.11 protocol other than the 802.11n protocol.

2. The computer-implemented method of Claim 1, wherein the third transmission to the third multiple-input-multiple-output (MIMO)-capable portable wireless device is initiated via a particular channel that is different, in at least one respect, from the at least one channel, for preventing interference between the third transmission via the 802.11n protocol, and at least one of the first transmission or the second transmission via the another 802.11 protocol.

3. The computer-implemented method of Claim 2, wherein a plurality of radios are utilized including a first radio configured to communicate via the another 802.11 protocol and a second radio configured to communicate via the 802.11n protocol, and different antennas are used for the another 802.11 protocol and the 802.11n protocol, so that sufficient resources are available to the 802.11n protocol and the another 802.11 protocol, when at least a portion of the third transmission occurs simultaneously with at least one of the first transmission or the second transmission.

4. The computer-implemented method of Claim 3, wherein the at least one channel includes multiple channels that, together, have a greater bandwidth than the particular channel.

5. The computer-implemented method of Claim 1, wherein the at least one channel includes multiple channels including a first channel and a second channel, and the first transmission to the first multiple-input-multiple-output (MIMO)-capable portable wireless device is initiated via the first channel, and the second transmission to the second multiple-input-multiple-output (MIMO)-capable portable wireless device is initiated via the second channel.

6. The computer-implemented method of Claim 1, wherein the first transmission and the second transmission are both initiated on the at least one channel which includes the same single channel.

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7. The computer-implemented method of Claim 1, wherein the third transmission to the third multiple-input-multiple-output (MIMO)-capable portable wireless device is initiated via a particular channel that is different from the at least one channel.

8. The computer-implemented method of Claim 1, wherein the third transmission to the third multiple-input-multiple-output (MIMO)-capable portable wireless device is initiated via a particular channel that is the same as the at least one channel.

9. The computer-implemented method of Claim 1, wherein the first transmission occurs simultaneously with the second transmission with both the first transmission and the second transmission using all of the antennas.

10. The computer-implemented method of Claim 1, wherein the first multiple of the antennas and the second multiple of the antennas each share at least one of the antennas.

11. The computer-implemented method of Claim 1, wherein the first multiple of the antennas and the second multiple of the antennas are the same antennas.

12. The computer-implemented method of Claim 1, and further comprising: utilizing a plurality of radios including a first radio configured to communicate via the another 802.11 protocol and a second radio configured to communicate via the 802.11n protocol, so that sufficient resources are available to the 802.11n protocol and the another 802.11 protocol, when at least a portion of the third transmission occurs simultaneously with at least one of the first transmission or the second transmission.

13. The computer-implemented method of Claim 1, wherein a channel difference is used for the 802.11n protocol and the another 802.11 protocol for increased data throughput.

14. The computer-implemented method of Claim 1, wherein different radios, different antennas, and a channel difference are used for the first wireless protocol and the second wireless protocol for increased data throughput.

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15. A computer-implemented method, comprising:

positioning one or more access points so that the one or more access points provide a coverage dictated by a positioner of the one or more access points, each of the one or more access points including:

a plurality of antennas;

circuitry in communication with the antennas; and

at least one radio in communication with the circuitry;

selecting at least one channel based on one or more channel characteristics, for initiating a first transmission to a first multiple-input-multiple-output (MIMO)-capable portable wireless device and initiating a second transmission to a second multiple-input-multiple-output (MIMO)-capable portable wireless device, such that at least a portion of the first transmission occurs simultaneously with at least a portion of the second transmission and both occur via a first wireless protocol;

receiving first information from the first multiple-input-multiple-output (MIMO)-capable portable wireless device that is based on a first measurement performed by the first multiple-input-multiple-output (MIMO)-capable portable wireless device;

receiving second information from the second multiple-input-multiple-output (MIMO)-capable portable wireless device that is based on a second measurement performed by the second multiple-input-multiple-output (MIMO)-capable portable wireless device;

altering at least one aspect of the first transmission, based on at least one of the first information or the second information, so as to direct the first transmission more towards the first multiple-input-multiple-output (MIMO)-capable portable wireless device as compared to the

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second multiple-input-multiple-output (MIMO)-capable portable wireless device, thereby reducing interference between the first transmission and the second transmission when the at least portion of the first transmission occurs simultaneously with the at least portion of the second transmission;

altering at least one aspect of the second transmission, based on at least one of the first information or the second information, so as to direct the second transmission more towards the second multiple-input-multiple-output (MIMO)-capable portable wireless device as compared to the first multiple-input-multiple-output (MIMO)-capable portable wireless device, thereby reducing the interference between the first transmission and the second transmission when the at least portion of the first transmission occurs simultaneously with the at least portion of the second transmission;

transmitting first data in connection with the first transmission to the first multiple-input-multiple-output (MIMO)-capable portable wireless device;

transmitting second data in connection with the second transmission to the second multiple-input-multiple-output (MIMO)-capable portable wireless device;

receiving third information from a third multiple-input-multiple-output (MIMO)-capable portable wireless device that is based on a third measurement performed by the third multiple-input-multiple-output (MIMO)-capable portable wireless device;

altering at least one aspect of a third transmission, based on the third information, so as to direct the third transmission towards the third multiple-input-multiple-output (MIMO)-capable portable wireless device; and

transmitting third data in connection with the third transmission to the third multiple-input-multiple-output (MIMO)-capable portable wireless device, via a second wireless protocol including a 802.11n protocol, where the first wireless protocol includes another 802.11 protocol other than the 802.11n protocol.

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16. The computer-implemented method of Claim 15, wherein the third transmission to the third multiple-input-multiple-output (MIMO)-capable portable wireless device is initiated via a particular channel that is different, in at least one respect, from the at least one channel, for preventing interference between the third transmission via the 802.11n protocol, and at least one of the first transmission or the second transmission via the another 802.11 protocol.

17. The computer-implemented method of Claim 16, wherein a plurality of radios are utilized including a first radio configured to communicate via the another 802.11 protocol and a second radio configured to communicate via the 802.11n protocol, and different antennas are used for the another 802.11 protocol and the 802.11n protocol, so that sufficient resources are available to the 802.11n protocol and the another 802.11 protocol, when at least a portion of the third transmission occurs simultaneously with at least one of the first transmission or the second transmission.

18. The computer-implemented method of Claim 17, wherein the at least one channel includes multiple channels that, together, have a greater bandwidth than the particular channel.

19. The computer-implemented method of Claim 15, wherein the at least one channel includes multiple channels including a first channel and a second channel, and the first transmission to the first multiple-input-multiple-output (MIMO)-capable portable wireless device is initiated via the first channel, and the second transmission to the second multiple-input-multiple-output (MIMO)-capable portable wireless device is initiated via the second channel.

20. The computer-implemented method of Claim 15, wherein the first transmission and the second transmission are both initiated on the at least one channel which includes the same single channel.

21. The computer-implemented method of Claim 15, wherein the third transmission to the third multiple-input-multiple-output (MIMO)-capable portable wireless device is initiated via a particular channel that is different from the at least one channel.

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22. The computer-implemented method of Claim 15, wherein the third transmission to the third multiple-input-multiple-output (MIMO)-capable portable wireless device is initiated via a particular channel that is the same as the at least one channel.

23. The computer-implemented method of Claim 15, and further comprising: utilizing a plurality of radios including a first radio configured to communicate via the first wireless protocol and a second radio configured to communicate via the second wireless protocol.

24. The computer-implemented method of Claim 15, and further comprising: utilizing a plurality of radios including a first radio configured to communicate via the another 802.11 protocol and a second radio configured to communicate via the 802.11n protocol, so that sufficient resources are available to the 802.11n protocol and the another 802.11 protocol, when at least a portion of the third transmission occurs simultaneously with at least one of the first transmission or the second transmission.

25. The computer-implemented method of Claim 15, wherein the first transmission occurs simultaneously with the second transmission with both the first transmission and the second transmission using all of the antennas.

26. The computer-implemented method of Claim 15, wherein the one or more access points include a plurality of the access points which are positioned so that the plurality of the access points collectively provide an overlap in the coverage as dictated by the positioner of the plurality of the access points.

27. A computer-implemented method, comprising:

providing access to an access point including:

a plurality of antennas;

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circuitry in communication with the antennas; and

at least one radio in communication with the circuitry;

sending a first signal to a first multiple-input-multiple-output (MIMO)-capable portable wireless device;

receiving a second signal from the first multiple-input-multiple-output (MIMO)-capable portable wireless device;

based on the second signal, permitting data communication via the access point for the first multiple-input-multiple-output (MIMO)-capable portable wireless device;

sending a third signal to a second multiple-input-multiple-output (MIMO)-capable portable wireless device;

receiving a fourth signal from the second multiple-input-multiple-output (MIMO)-capable portable wireless device;

based on the fourth signal, permitting data communication via the access point for the second multiple-input-multiple-output (MIMO)-capable portable wireless device;

selecting at least one channel based on one or more channel characteristics, for initiating a first transmission to the first multiple-input-multiple-output (MIMO)-capable portable wireless device and initiating a second transmission to the second multiple-input-multiple-output (MIMO)-capable portable wireless device, such that at least a portion of the first transmission occurs simultaneously with at least a portion of the second transmission and both occur via a first wireless protocol;

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receiving first information from the first multiple-input-multiple-output (MIMO)-capable portable wireless device that is based on a first measurement performed by the first multiple-input-multiple-output (MIMO)-capable portable wireless device;

receiving second information from the second multiple-input-multiple-output (MIMO)-capable portable wireless device that is based on a second measurement performed by the second multiple-input-multiple-output (MIMO)-capable portable wireless device;

altering at least one aspect of the first transmission, based on at least one of the first information or the second information, so as to direct the first transmission more towards the first multiple-input-multiple-output (MIMO)-capable portable wireless device as compared to the second multiple-input-multiple-output (MIMO)-capable portable wireless device, thereby reducing interference between the first transmission and the second transmission when the at least portion of the first transmission occurs simultaneously with the at least portion of the second transmission;

altering at least one aspect of the second transmission, based on at least one of the first information or the second information, so as to direct the second transmission more towards the second multiple-input-multiple-output (MIMO)-capable portable wireless device as compared to the first multiple-input-multiple-output (MIMO)-capable portable wireless device, thereby reducing the interference between the first transmission and the second transmission when the at least portion of the first transmission occurs simultaneously with the at least portion of the second transmission;

transmitting first data in connection with the first transmission to the first multiple-input-multiple-output (MIMO)-capable portable wireless device;

transmitting second data in connection with the second transmission to the second multiple-input-multiple-output (MIMO)-capable portable wireless device;

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receiving third information from a third multiple-input-multiple-output (MIMO)-capable portable wireless device that is based on a third measurement performed by the third multiple-input-multiple-output (MIMO)-capable portable wireless device;

altering at least one aspect of a third transmission, based on the third information, so as to direct the third transmission towards the third multiple-input-multiple-output (MIMO)-capable portable wireless device; and

transmitting third data in connection with the third transmission to the third multiple-input-multiple-output (MIMO)-capable portable wireless device, via a second wireless protocol.

28. The computer-implemented method of Claim 27, wherein the first signal, the second signal, the third signal, and the fourth signal, are communicated for authentication purposes.

29. A computer-implemented method, comprising:

positioning one or more access points so that the one or more access points provide a desired coverage, each of the one or more access points including:

a plurality of antennas;

circuitry in communication with the antennas; and

at least one radio in communication with the circuitry;

causing communicative coupling between the one or more access points and a server;

receiving a first signal from a first multiple-input-multiple-output (MIMO)-capable portable wireless device;

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based on the first signal, permitting data communication via the access point for the first multiple-input-multiple-output (MIMO)-capable portable wireless device;

receiving a second signal from a second multiple-input-multiple-output (MIMO)-capable portable wireless device;

based on the second signal, permitting data communication via the access point for the second multiple-input-multiple-output (MIMO)-capable portable wireless device;

selecting at least one channel based on one or more channel characteristics, for initiating a first transmission to the first multiple-input-multiple-output (MIMO)-capable portable wireless device and initiating a second transmission to the second multiple-input-multiple-output (MIMO)-capable portable wireless device, such that at least a portion of the first transmission occurs simultaneously with at least a portion of the second transmission and both occur via a first wireless protocol;

receiving first information from the first multiple-input-multiple-output (MIMO)-capable portable wireless device that is based on a first measurement performed by the first multiple-input-multiple-output (MIMO)-capable portable wireless device;

receiving second information from the second multiple-input-multiple-output (MIMO)-capable portable wireless device that is based on a second measurement performed by the second multiple-input-multiple-output (MIMO)-capable portable wireless device;

altering at least one aspect of the first transmission in connection with a first multiple of the antennas, based on at least one of the first information or the second information, so as to direct the first transmission more towards the first multiple-input-multiple-output (MIMO)-capable portable wireless device as compared to the second multiple-input-multiple-output (MIMO)-capable portable wireless device, thereby reducing interference between the first transmission and the second transmission when the at least portion of the first transmission occurs simultaneously with the at least portion of the second transmission;

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altering at least one aspect of the second transmission in connection with a second multiple of the antennas, based on at least one of the first information or the second information, so as to direct the second transmission more towards the second multiple-input-multiple-output (MIMO)-capable portable wireless device as compared to the first multiple-input-multiple-output (MIMO)-capable portable wireless device, thereby reducing the interference between the first transmission and the second transmission when the at least portion of the first transmission occurs simultaneously with the at least portion of the second transmission;

transmitting first data in connection with the first transmission to the first multiple-input-multiple-output (MIMO)-capable portable wireless device, utilizing the first multiple of the antennas;

transmitting second data in connection with the second transmission to the second multiple-input-multiple-output (MIMO)-capable portable wireless device, utilizing the second multiple of the antennas;

receiving third information from a third multiple-input-multiple-output (MIMO)-capable portable wireless device that is based on a third measurement performed by the third multiple-input-multiple-output (MIMO)-capable portable wireless device;

altering at least one aspect of a third transmission in connection with a third multiple of the antennas, based on the third information, so as to direct the third transmission towards the third multiple-input-multiple-output (MIMO)-capable portable wireless device; and

transmitting third data in connection with the third transmission to the third multiple-input-multiple-output (MIMO)-capable portable wireless device, utilizing the third multiple of the antennas, via a second wireless protocol including a 802.11n protocol, where the first wireless protocol includes another 802.11 protocol other than the 802.11n protocol.

30. The computer-implemented method of Claim 29, wherein at least one of:

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said circuitry includes at least one of: a switch, at least one phased array, a controller, or a processor;

said circuitry includes radio chain circuitry;

said other 802.11 protocol is a variant of the 802.11n protocol;

said other 802.11 protocol is an advancement over the 802.11n protocol;

said channel characteristics include at least one of a data throughput, a signal-to-noise ratio, a reduced signal error, a reduced data error, a reduced retransmission request, a reduced interference, a rejection of multipath signal, a higher transmission rate, or a signal strength;

a difference in channels are used for the first wireless protocol and the second wireless protocol for increased data throughput, and the difference involves data throughput;

an entirety of the first transmission occurs simultaneously with an entirety of the second transmission;

said first transmission occurs simultaneously with the second transmission with both the first transmission and the second transmission using all of the antennas;

said antennas are MIMO antennas;

said antennas are fixed in direction;

said antennas are varied in direction via beamforming;

said antennas are directional by virtue of being capable of changing direction via beamforming;

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said antennas exhibit temporal diversity;

said antennas include directional antennas;

said antennas include omnidirectional antennas;

said antennas include directional antennas that are omnidirectional;

said antennas include directional antennas that have omnidirectional capabilities;

said antennas include directional antennas that are less than omnidirectional;

said at least one radio includes a single radio;

said first, second, and/or third information include a measurement of a signal-to-noise ratio;

said first data, the second data, and the third each include different data;

said first multiple of the antennas, the second multiple of the antennas, and the third multiple of the antennas include the same antennas of the antennas;

said first multiple of the antennas, the second multiple of the antennas, and the third multiple of the antennas include different ones of the antennas;

said first multiple of the antennas, the second multiple of the antennas, and the third multiple of the antennas include different ones of the antennas, at least in part;

said antennas have associated therewith a MIMO virtual sector including an area where a MIMO physical sector is to operate;

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said antennas form MIMO virtual sectors that are capable of being selected to provide MIMO physical sectors; or

said first multiple-input-multiple-output (MIMO)-capable portable wireless device includes at least one of a mobile device, a client, a computer, or a hand-held device.

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ABSTRACT

A system, method, and computer program product is provided to select at least one channel based on one or more channel characteristics and initiate a first transmission to a first multiple-input-multiple-output (MIMO)-capable portable wireless device, and further initiate a second transmission to a second multiple-input-multiple-output (MIMO)-capable portable wireless device, such that at least a portion of the first transmission occurs simultaneously with at least a portion of the second transmission and both occur via a first wireless protocol; and is further configured to initiate a third transmission to a third multiple-input-multiple-output (MIMO)-capable portable wireless device via a second wireless protocol including a 802.11n protocol, where the first wireless protocol includes another 802.11 protocol other than the 802.11n protocol.

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PTO/SB/08a (03-15)
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	102	20080268848	A1	2008-10-30	TOMOE et al.	
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	3	Notice of Allowance from U.S. Application No. 12/134,122, dated October 22, 2010	
	4	Non-Final Office Action from U.S. Application No. 12/134,122, dated May 24, 2010	
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See attached certification statement.

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Name/Print	Thomas Fortenberry	Registration Number	56537

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	10	7595756		2009-09-29	Lastinger et al.	
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	54	2272312		1942-02-01	Tunick	
	55	3681770		1972-08-01	Alford	
	56	4101901		1978-07-18	Kommrusch	
	57	6069591		2000-05-30	Smith	
	58	6914577		2005-07-05	McCandless	
	59	3803625		1974-04-09	Nemit	
	60	4128740		1978-12-05	Graziano	
	61	5265263		1993-11-23	Ramsdale et al.	
	62	5276907		1994-01-04	Meidan	
	63	5307507		1994-04-26	Kanai	

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	65	5491833		1996-02-13	Hamabe	
	66	5548813		1996-08-20	Charas et al.	
	67	5603082		1997-02-11	Hamabe	
	68	5606727		1997-02-25	Ueda	
	69	5613200		1997-03-18	Hamabe	
	70	5649292		1997-07-15	Doner	
	71	5684491		1997-11-04	Newman et al.	
	72	5740536		1998-04-14	Benveniste	
	73	5835859		1998-11-10	Doner	
	74	5901356		1999-05-04	Hudson	

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	76	6055230		2000-04-25	Feuerstein et al.	
	77	6128497		2000-10-03	Faruque	
	78	6154654		2000-11-28	Mao	
	79	6178328		2001-01-23	Tang et al.	
	80	6360107		2002-03-19	Lin et al.	
	81	6400697		2002-06-04	Leung et al.	
	82	6400704		2002-06-04	Mikuni et al.	
	83	6405043		2002-06-11	Jensen et al.	
	84	6418316		2002-07-09	Hildebrand et al.	
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	87	6497599		2002-12-24	Johnson et al.	
	88	6522885		2003-02-18	Tang et al.	
	89	6542485		2003-04-01	Mujtaba	
	90	6615047		2003-09-02	Yasooka et al.	
	91	6654612		2003-11-25	Avidor et al.	
	92	6708036		2004-03-16	Proctor et al.	
	93	6741837		2004-05-25	Nakano et al.	
	94	6748218		2004-06-08	Johnson et al.	
	95	6795409		2004-09-21	Youssefmir et al.	
	96	6898431		2005-05-24	Peele	

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	97	7010015		2006-03-07	Hervey, Jr. et al.	
	98	7069009		2006-06-27	Li et al.	
	99	7194017		2007-03-20	Hervey, Jr. et al.	
	100	7202824		2007-04-10	Sanelli et al.	
	101	7280829		2007-10-09	Rudolf	
	102	5212930		1993-05-25	Raudat	
	103	6549169		2003-04-15	Matsuyoshi et al.	
	104	7181258		2007-02-20	Lin et al.	
	105	7373176		2008-05-13	Chotkowski et al.	
	106	6266527		2001-07-24	Mintz	
	107	6738599		2004-05-18	Black et al.	

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	109	4475010		1984-10-02	Huensch et al.	
	110	6774864		2004-08-10	Evans et al.	
	111	7193562		2007-03-20	Shtrom et al.	
	112	7292198		2007-11-06	Shtrom et al.	
	113	7358912		2008-04-15	Kish et al.	
	114	7362280		2008-04-22	Shtrom et al.	
	115	7498996		2009-03-03	Shtrom et al.	
	116	7522552		2009-04-21	Fein et al.	
	117	7646343		2010-01-12	Shtrom et al.	
	118	7675474		2010-03-09	Shtrom et al.	

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	120	6249256		2001-06-19	Luxon et al.	
	121	6906674		2005-06-14	McKinzie, III et al.	
	122	7171248		2007-01-30	Brown	
	123	4736453		1988-04-05	Schloemer	
	124	4829554		1989-05-09	Barnes et al.	
	125	5134709		1992-07-28	Bi et al.	
	126	5396649		1995-03-07	Hamabe	
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	128	5448761		1995-09-05	Ushirokawa	
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	131	5507008		1996-04-09	Kanai et al.	
	132	5574977		1996-11-12	Joseph et al.	
	133	5590399		1996-12-31	Matsumoto et al.	
	134	5697059		1997-12-09	Carney	
	135	5722043		1998-02-24	Rappaport et al.	
	136	5726978		1998-03-10	Frodigh et al.	
	137	5732353		1998-03-24	Haartsen	
	138	5771454		1998-06-23	Ohsawa	
	139	5787352		1998-07-28	Benveniste	
	140	5790551		1998-08-04	Chan	

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	142	5828948		1998-10-27	Almgren et al.	
	143	5887263		1999-03-23	Ishii	
	144	5896573		1999-04-20	Yang et al.	
	145	5926763		1999-07-20	Greene, Sr. et al.	
	146	5956643		1999-09-21	Benveniste	
	147	5963865		1999-10-05	Desgagne et al.	
	148	5974327		1999-10-26	Agrawal et al.	
	149	6002934		1999-12-14	Boyer et al.	
	150	6009332		1999-12-28	Haartsen	
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	155	6108321		2000-08-22	Anderson et al.	
	156	6112092		2000-08-29	Benveniste	
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	163	6219541		2001-04-17	Brodie	
	164	6219554		2001-04-17	Eswara et al.	
	165	6230016		2001-05-08	Benveniste	
	166	6243584		2001-06-05	O'Byrne	
	167	6259685		2001-07-10	Rinne et al.	
	168	6272348		2001-08-07	Saario et al.	
	169	6295453		2001-09-25	Desgagne et al.	
	170	6317598		2001-11-13	Wiesen et al.	
	171	6330429		2001-12-11	He	
	172	6334057		2001-12-25	Malmgren et al.	
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	175	6459901		2002-10-01	Chawla et al.	
	176	6470183		2002-10-22	Herrig	
	177	6496490		2002-12-17	Andrews et al.	
	178	6507568		2003-01-14	Kumar et al.	
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	180	6539203		2003-03-25	Herrig	
	181	6580912		2003-06-17	Leung et al.	
	182	6591108		2003-07-08	Herrig	
	183	6597920		2003-07-22	Yegani et al.	
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	188	6728544		2004-04-27	Boyer et al.	
	189	6744743		2004-06-01	Walton et al.	
	190	6871073		2005-03-22	Boyer et al.	
	191	6889047		2005-05-03	Ishida	
	192	6940845		2005-09-06	Benveniste	
	193	6999772		2006-02-14	Song et al.	
	194	7042856		2006-05-09	Walton et al.	
	195	7050812		2006-05-23	Boyer et al.	

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	197	7085579		2006-08-01	Mizutani et al.	
	198	7130636		2006-10-31	Kitazawa et al.	
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	202	7177298		2007-02-13	Chillariga et al.	
	203	7180877		2007-02-20	Benveniste	
	204	7184772		2007-02-27	Lim et al.	
	205	7187933		2007-03-06	Song et al.	
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	208	7257376		2007-08-14	Reudink	
	209	7315533		2008-01-01	Theobold et al.	
	210	7336956		2008-02-26	Halonen et al.	
	211	7366178		2008-04-29	Lee et al.	
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	213	6870515		2005-03-22	Kitchener et al.	
	214	7415288		2008-08-19	Hou et al.	
	215	7498999		2009-03-03	Shtrom	
	216	7511680		2009-03-31	Shtrom et al.	
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	219	7652632		2010-01-26	Shtrom	
	220	7880683		2011-02-01	Shtrom et al.	
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	222	7899497		2011-03-01	Kish et al.	
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	226	7876838		2011-01-25	Clarkson et al.	
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	232	8139658		2012-03-20	Tsatsanis et al.	
	233	8130854		2012-03-06	Fischer et al.	
	234	7796544		2010-09-14	Hench	
	235	7664195		2010-02-16	Chenu-Tournier et al.	
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	Attorney Docket Number	WBWL001H

	2	03003511	WO	A1	2003-01-09	E.m.w. Antenna Co., Ltd		
	3	2785488	FR	A1	2000-05-05	Engineering Et De Representati		
	4	0022991	EP	A1	1981-01-28	Siemens Ag		
	5	0668627	EP	A1	1995-08-23	Northern Telecom Ltd		
	6	0435283	EP	A1	1991-07-03	Nec Corp		
	7	0715478	EP	A2	1996-06-05	Texas Instruments Inc		
	8	0895436	EP	A2	1999-02-03	Northern Telecom Ltd		
	9	0980111	EP	A1	2000-02-16	Libertel N V		
	10	0622925	EP	A1	1994-11-02	Ibm		
	11	0660631	EP	A2	1995-06-28	Nec Corp		
	12	0983705	EP	A2	2000-03-08	Nortel Networks Corp		

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INFORMATION DISCLOSURE STATEMENT BY APPLICANT (Not for submission under 37 CFR 1.99)		
	Application Number	
	Filing Date	
	First Named Inventor	Roc Lastinger
	Art Unit	
	Examiner Name	
	Attorney Docket Number	WBWL001H

	13	1014740	EP	A1	2000-06-28	Motorola, Inc		
	14	0785695	EP	A2	1997-07-23	At & T Corp		
	15	0782361	EP	A2	1997-07-02	At & T Corp		
	16	1189467	EP	A1	2002-03-20	Allen Telecom, Llc		
	17	57020002	JP		1982-02-01			
	18	2000031721	JP	A	2000-01-28	Suyama, Hideo		
	19	200235289	KR		2001-10-01			
	20	9842150	WO	A2	1998-09-24	At & T Corp		
	21	9952311	WO	A1	1999-10-14	Ericsson Telefon Ab L M		
	22	0101582	WO	A2	2001-01-04	Ericsson Telefon Ab L M		
	23	02073739	WO	A1	2002-09-19	Guerouni, Souren		

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INFORMATION DISCLOSURE STATEMENT BY APPLICANT (Not for submission under 37 CFR 1.99)		
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	First Named Inventor	Roc Lastinger
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	Attorney Docket Number	WBWL001H

	24	03043128	WO	A1	2003-05-22	Lg Electronics Inc		
	25	03023895	WO	A2	2003-03-20	Tantivy Communications, Inc		
	26	2005039225	WO	A1	2005-04-28	Thomson Licensing Sa		
	27	2005010652	WO	A2	2005-02-03	Rotani, Inc		
	28	490554	EP	A2	1992-06-17	American Telephone & Telegraph		
	29	578197	EP	A2	1994-01-12	Nec Corp		
	30	571133	EP	A2	1993-11-24	American Telephone & Telegraph		
	31	925706	EP	A1	1999-06-30	Hughes Electronics Corp		
	32	635989	EP	A1	1995-01-25	Nec Corp		
	33	867096	EP	A1	1998-09-30	Stanford Telecommunications, Inc		
	34	522276	EP	A2	1993-01-13	Nec Corp		

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	Application Number	
	Filing Date	
	First Named Inventor	Roc Lastinger
	Art Unit	
	Examiner Name	
	Attorney Docket Number	WBWL001H

	35	1013013	EP	A1	2000-06-28	Arraycomm, Inc		
	36	802695	EP	A2	1997-10-22	Lucent Technologies Inc		
	37	1106028	EP	A1	2001-06-13	Qualcomm Inc		
	38	1148749	EP	A2	2001-10-24	Hitachi, Ltd		
	39	1594261	EP	A2	2005-11-09	Lucent Technologies Inc		

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Examiner Initials*	Cite No	Include name of the author (in CAPITAL LETTERS), title of the article (when appropriate), title of the item (book, magazine, journal, serial, symposium, catalog, etc), date, pages(s), volume-issue number(s), publisher, city and/or country where published.	T[5]
	1	Kagoshima, K., "Pattern Control Antennas for Wireless Access Systems," Antennas and Propagation Society International Symposium, 2000, IEEE, Jul.16, 2000, vol. 2, pp. 574-577	
	2	Non-Final Office Action from U.S. Application No. 11/709,431, dated September 22, 2009	
	3	Johnson, R. C., "Antenna Engineering Handbook," McGraw-Hill, pp. 27-8-27-10	
	4	Restriction Requirement from U.S. Application No. 11/709,431, dated April 7, 2010	

INFORMATION DISCLOSURE STATEMENT BY APPLICANT (Not for submission under 37 CFR 1.99)		
	Application Number	
	Filing Date	
	First Named Inventor	Roc Lastinger
	Art Unit	
	Examiner Name	
	Attorney Docket Number	WBWL001H

	5	Nigam, G. et al., "Coordinated Multipoint in Heterogeneous Networks: A Stochastic Geometry Approach," IEEE Globecom Workshops, December 2013, pp. 1-6	
	6	Zhang, H. et all., "Base Station Cooperation for Multiuser MIMO: Joint Transmission and BS Selection," 2004 Conference on Information Sciences and Systems, March 17-19, 2004, pp. 1-6	
	7	Notice of Allowance from U.S. Application No. 10/869,201, dated September 27, 2007	
	8	Non-Final Office Action from U.S. Application No. 10/869,201, dated June 6, 2007	
	9	Final Office Action from U.S. Application No. 10/869,201, dated January 4, 2007	
	10	Non-Final Office Action from U.S. Application No. 10/869,201, dated September 7, 2006	
	11	Advisory Action from U.S. Application No. 10/869,201, dated June 19, 2006	
	12	Final Office Action from U.S. Application No. 10/869,201, dated April 17, 2006	
	13	Non-Final Office Action from U.S. Application No. 10/869,201, dated November 4, 2005	
	14	Final Office Action from U.S. Application No. 10/869,201, dated May 20, 2005	
	15	Restriction Requirement from U.S. Application No. 10/869,201, dated Jauary 13, 2005	

INFORMATION DISCLOSURE STATEMENT BY APPLICANT (Not for submission under 37 CFR 1.99)		
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	16	Notice of Allowance from U.S. Application No. 10/880,387, dated November 1, 2007	
	17	Non-Final Office Action from U.S. Application No. 10/880,387, dated July 19, 2007	
	18	Restriction Requirement from U.S. Application No. 10/880,387, dated March 29, 2007	
	19	Notice of Allowance from U.S. Application No. 11/160,549, dated October 15, 2007	
	20	Non-Final Office Action from U.S. Application No. 11/160,549, dated June 6, 2007	
	21	Final Office Action from U.S. Application No. 11/160,549, dated January 4, 2007	
	22	Non-Final Office Action from U.S. Application No. 11/160,549, dated July 26, 2006	
	23	Restriction Requirement from U.S. Application No. 11/160,549, dated June 29, 2006	
	24	Notice of Allowance from U.S. Application No. 11/160,550, dated July 24, 2007	
	25	Non-Final Office Action from U.S. Application No. 11/160,550, dated December 15, 2006	
	26	Advisory Action from U.S. Application No. 11/160,550, dated September 21, 2006	

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	First Named Inventor	Roc Lastinger
	Art Unit	
	Examiner Name	
	Attorney Docket Number	WBWL001H

	27	Final Office Action from U.S. Application No. 11/160,550, dated June 30, 2006	
	28	Non-Final Office Action from U.S. Application No. 11/160,550, dated March 6, 2006	
	29	Notice of Allowance from U.S. Application No. 11/160,551, dated October 19, 2007	
	30	Non-Final Office Action from U.S. Application No. 11/160,551, dated June 6, 2007	
	31	Final Office Action from U.S. Application No. 11/160,551, dated February 9, 2007	
	32	Non-Final Office Action from U.S. Application No. 11/160,551, dated September 22, 2006	
	33	Restriction Requirement from U.S. Application No. 11/160,551, dated June 29, 2006	
	34	Notice of Allowance from U.S. Application No. 11/160,937, dated November 20, 2007	
	35	Restriction Requirement from U.S. Application No. 11/160,937, dated August 23, 2007	
	36	Notice of Allowance from U.S. Application No. 11/275,605, dated November 19, 2007	
	37	Non-Final Office Action from U.S. Application No. 11/275,605, dated October 2, 2007	

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	First Named Inventor	Roc Lastinger
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	Attorney Docket Number	WBWL001H

	38	Notice of Allowance from U.S. Application No. 11/275,619, dated November 24, 2008	
	39	Non-Final Office Action from U.S. Application No. 11/275,619, dated April 30, 2008	
	40	Notice of Allowance from U.S. Application No. 11/420,605, dated April 2, 2008	
	41	Notice of Allowance from U.S. Application No. 11/584,730, dated August 6, 2009	
	42	Ex Parte Quayle from U.S. Application No. 11/584,730, dated May 28, 2015	
	43	Notice of Allowance from U.S. Application No. 11/586,178, dated July 17, 2009	
	44	Non-Final Office Action from U.S. Application No. 11/586,178, dated April 15, 2009	
	45	Final Office Action from U.S. Application No. 11/586,178, dated November 21, 2008	
	46	Non-Final Office Action from U.S. Application No. 11/586,178, dated June 9, 2008	
	47	Notice of Allowance from U.S. Application No. 11/709,431, dated July 18, 2011	
	48	Notice of Allowance from U.S. Application No. 11/709,431, dated July 23, 2010	

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INFORMATION DISCLOSURE STATEMENT BY APPLICANT (**Not for submission under 37 CFR 1.99)**		
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	Attorney Docket Number	WBWL001H

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[1] See Kind Codes of USPTO Patent Documents at www.USPTO.GOV or MPEP 901.04. [2] Enter office that issued the document, by the two-letter code (WIPO Standard ST.3). [3] For Japanese patent documents, the indication of the year of the reign of the Emperor must precede the serial number of the patent document. [4] Kind of document by the appropriate symbols as indicated on the document under WIPO Standard ST.16 if possible. [5] Applicant is to place a check mark here if English language translation is attached.

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	Application Number	
	Filing Date	
	First Named Inventor	Roc Lastinger
	Art Unit	
	Examiner Name	
	Attorney Docket Number	WBWL001H

CERTIFICATION STATEMENT

Please see 37 CFR 1.97 and 1.98 to make the appropriate selection(s):

That each item of information contained in the information disclosure statement was first cited in any communication from a foreign patent office in a counterpart foreign application not more than three months prior to the filing of the information disclosure statement. See 37 CFR 1.97(e)(1).

OR

☐ That no item of information contained in the information disclosure statement was cited in a communication from a foreign patent office in a counterpart foreign application, and, to the knowledge of the person signing the certification after making reasonable inquiry, no item of information contained in the information disclosure statement was known to any individual designated in 37 CFR 1.56(c) more than three months prior to the filing of the information disclosure statement. See 37 CFR 1.97(e)(2).

See attached certification statement.

The fee set forth in 37 CFR 1.17 (p) has been submitted herewith.

☒ A certification statement is not submitted herewith.

SIGNATURE

A signature of the applicant or representative is required in accordance with CFR 1.33, 10.18. Please see CFR 1.4(d) for the form of the signature.

Signature	/Thomas D. Fortenberry/	Date (YYYY-MM-DD)	2018-09-01
Name/Print	Thomas Fortenberry	Registration Number	56537

This collection of information is required by 37 CFR 1.97 and 1.98. 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 1 hour 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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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:

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

I hereby appoint:

■ Practitioners associated with Customer Number: 112117

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

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

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OR

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

Assignee Name and Address: Woodbury Wireless LLC, a Texas limited liability company
1003 Rocky Creek Drive, Pfugerville, TX 78660

A copy of this form, together with a statement under 37 CFR 3.73(c) (Form PTO/AIA/96 or equivalent) is required to be Filed in each application in which this form is used. The statement under 37 CFR 3.73(c) may be completed by one of The practitioners appointed in this form, 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	Roc Lastinger	Date	10/6/2015
Name	Roc Lastinger	Telephone	409-283-2811
Title	Managing-Member		

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Application Data Sheet 37 CFR 1.76	Attorney Docket Number	WBWL001H
	Application Number	
Title of Invention	MIMO Methods and Systems	

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
	Roc		Lastinger	

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

City	State/Province	Country of Residence
Cave Creek	AZ	US

Mailing Address of Inventor:

Address 1	14362 N. Frank Lloyd Wright Blvd., Suite 2500
Address 2	

City	State/Province	Postal Code	Country
Scottsdale	AZ	85260	US

Inventor 2 Remove

Legal Name

Prefix	Given Name	Middle Name	Family Name	Suffix
	John		Spenik	

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

City	State/Province	Country of Residence
Scottsdale	AZ	US

Mailing Address of Inventor:

Address 1	14362 N. Frank Lloyd Wright Blvd., Suite 2500
Address 2	

City	State/Province	Postal Code	Country
Scottsdale	AZ	85260	US

Inventor 3 Remove

Legal Name

Prefix	Given Name	Middle Name	Family Name	Suffix
	Brian	C	Woodbury	

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

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Application Data Sheet 37 CFR 1.76	Attorney Docket Number	WBWL001H
	Application Number	
Title of Invention	MIMO Methods and Systems	

City	Gilbert	State/Province	AZ	Country of Residence	US

Mailing Address of Inventor:

Address 1	1343 S. Nielson Street		
Address 2			
City	Gilbert	**State/Province**	AZ
Postal Code	85296	**Country**	US

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

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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	112117		
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Application Information:

Title of the Invention	MIMO Methods and Systems		
Attorney Docket Number	WBWL001H	**Small Entity Status Claimed**	☒
Application Type	Nonprovisional		
Subject Matter	Utility		
Total Number of Drawing Sheets (if any)	8	**Suggested Figure for Publication (if any)**	

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

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☐ 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.

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Application Data Sheet 37 CFR 1.76	Attorney Docket Number	WBWL001H
	Application Number	
Title of Invention	MIMO Methods and Systems	

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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).
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Prior Application Status	Pending				Remove
Application Number	Continuity Type	Prior Application Number		Filing or 371(c) Date (YYYY-MM-DD)	
	Continuation of	15824010		2017-11-28	
Prior Application Status	Patented				Remove
Application Number	Continuity Type	Prior Application Number	Filing Date (YYYY-MM-DD)	Patent Number	Issue Date (YYYY-MM-DD)
15824010	Continuation of	15406661	2017-01-13	9859963	2018-01-02
Prior Application Status	Patented				Remove
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15406661	Continuation of	14952874	2015-11-25	9584197	2017-02-28
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14952874	Continuation of	14476628	2014-09-03	9503163	2016-11-22
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14476628	Continuation of	13348523	2012-01-11	8855089	2014-10-07

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Application Data Sheet 37 CFR 1.76	Attorney Docket Number	WBWL001H
	Application Number	
Title of Invention	MIMO Methods and Systems	

Prior Application Status	Patented				Remove
Application Number	Continuity Type	Prior Application Number	Filing Date (YYYY-MM-DD)	Patent Number	Issue Date (YYYY-MM-DD)
13348523	Continuation of	13118386	2011-05-28	8345651	2013-01-01
Prior Application Status	Patented				Remove
Application Number	Continuity Type	Prior Application Number	Filing Date (YYYY-MM-DD)	Patent Number	Issue Date (YYYY-MM-DD)
13118386	Continuation of	11709431	2007-02-21	8009646	2011-08-30
Prior Application Status	Expired				Remove
Application Number	Continuity Type	Prior Application Number	Filing or 371(c) Date (YYYY-MM-DD)		
11709431	Claims benefit of provisional	60743376	2006-02-28		

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

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.

PTO/AIA/14 (02-18)
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Application Data Sheet 37 CFR 1.76	Attorney Docket Number	WBWL001H
	Application Number	
Title of Invention	MIMO Methods and Systems	

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.

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Application Data Sheet 37 CFR 1.76	Attorney Docket Number	WBWL001H
	Application Number	
Title of Invention	MIMO Methods and Systems	

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	Woodbury Wireless LLC		
Mailing Address Information For Applicant:			
Address 1	1003 Rocky Creek Drive		
Address 2			
City	Pflugerville	**State/Province**	TX
Country	US	Postal Code	78660
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.

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Application Data Sheet 37 CFR 1.76	Attorney Docket Number	WBWL001H
	Application Number	
Title of Invention	MIMO Methods and Systems	

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	/Thomas Donald Fortenberry/			Date (YYYY-MM-DD)	2018-09-01
First Name	Thomas	Last Name	Fortenberry	Registration Number	56537

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

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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	WBWL001H
	Application Number	
Title of Invention	MIMO Methods and Systems	

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.**

Exhibit 1002
Nokia v. Woodbury Wireless Inc.
Page 000440

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.

Exhibit 1002
Nokia v. Woodbury Wireless Inc.
Page 000441

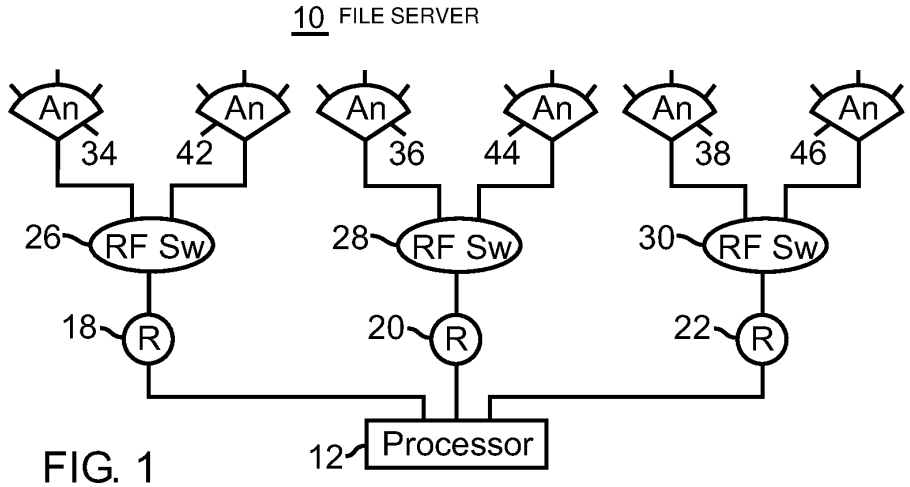


FIG. 1

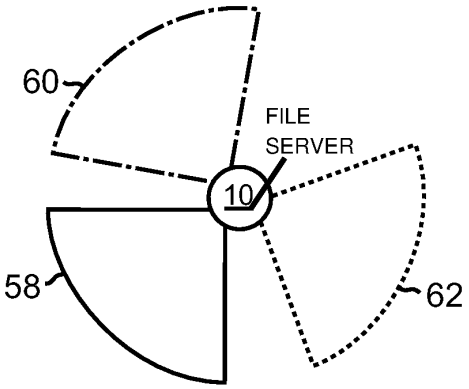


FIG. 2

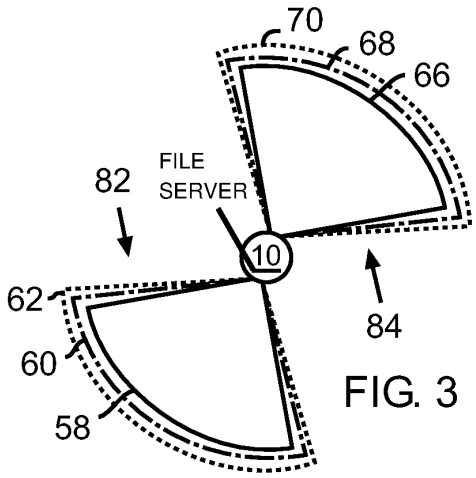


FIG. 3

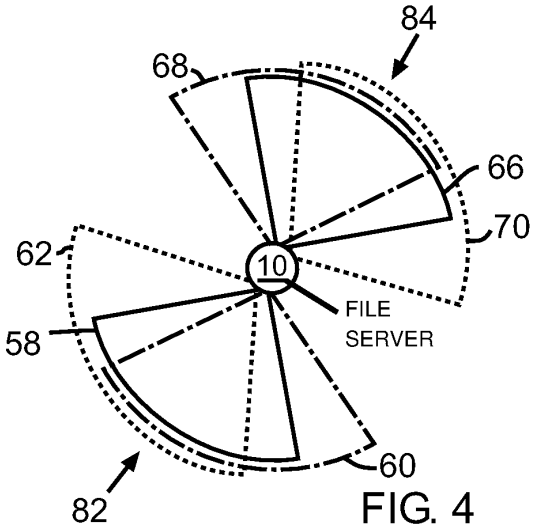


FIG. 4

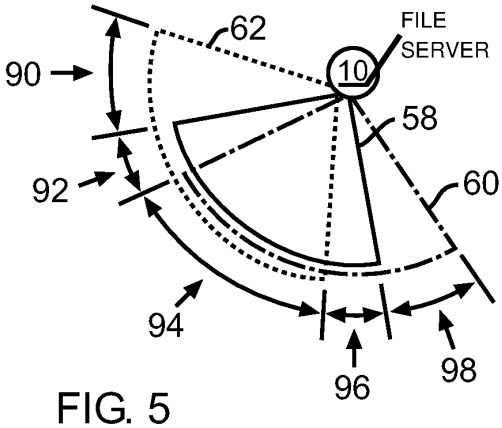


FIG. 5

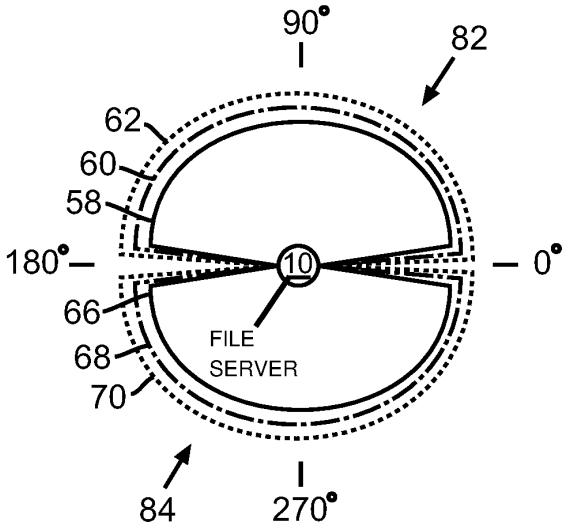


FIG. 6

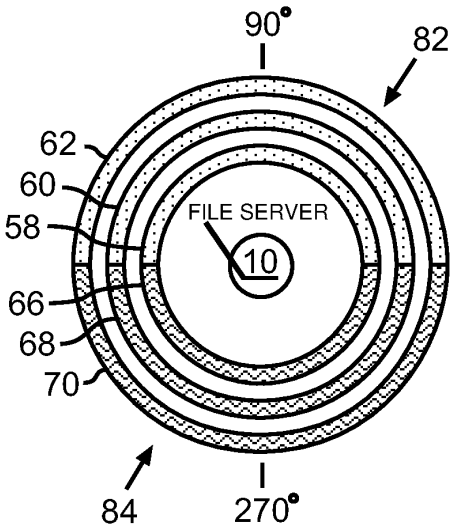


FIG. 7

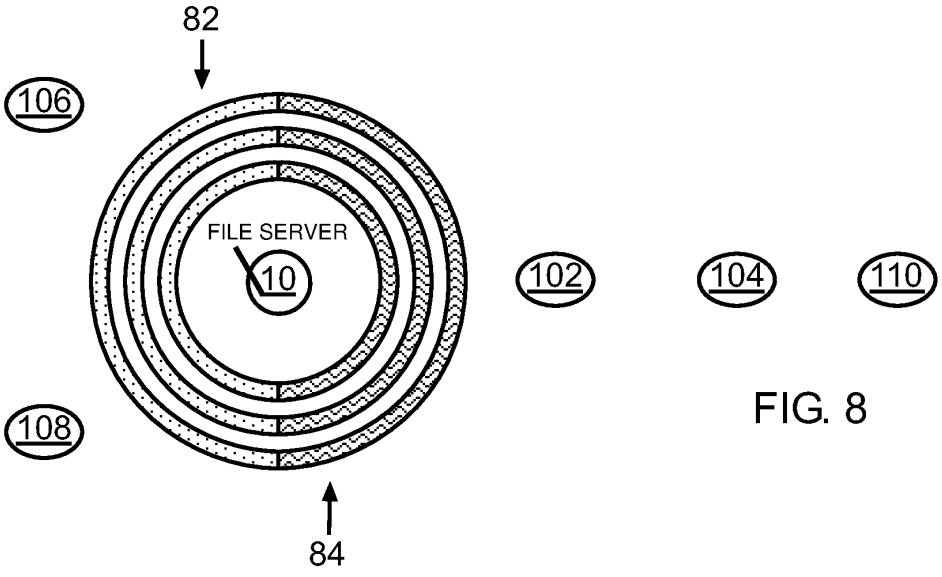


FIG. 8

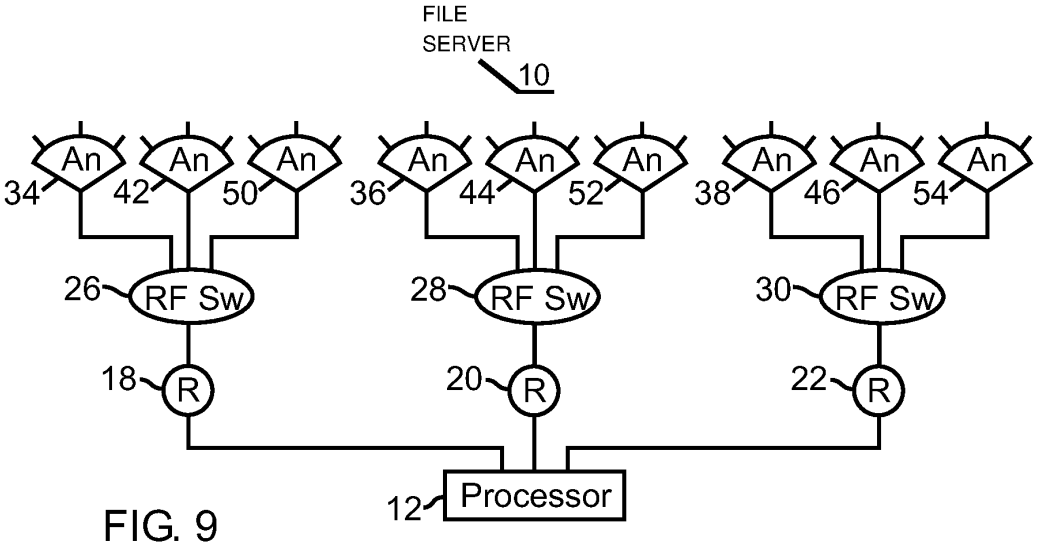

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FIG. 9

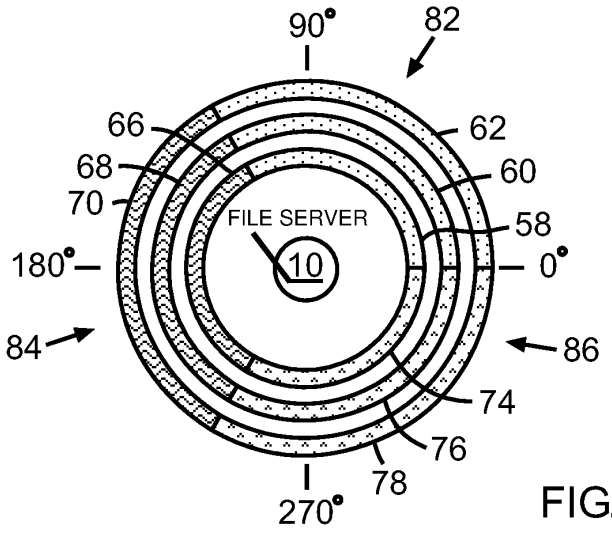

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FIG. 10

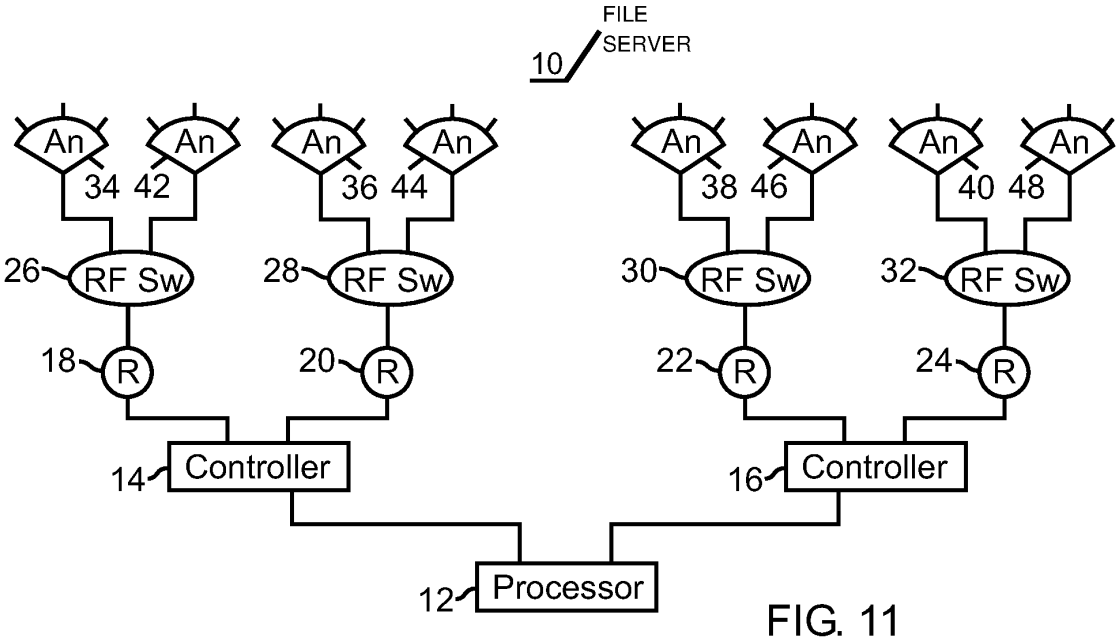

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FIG. 11

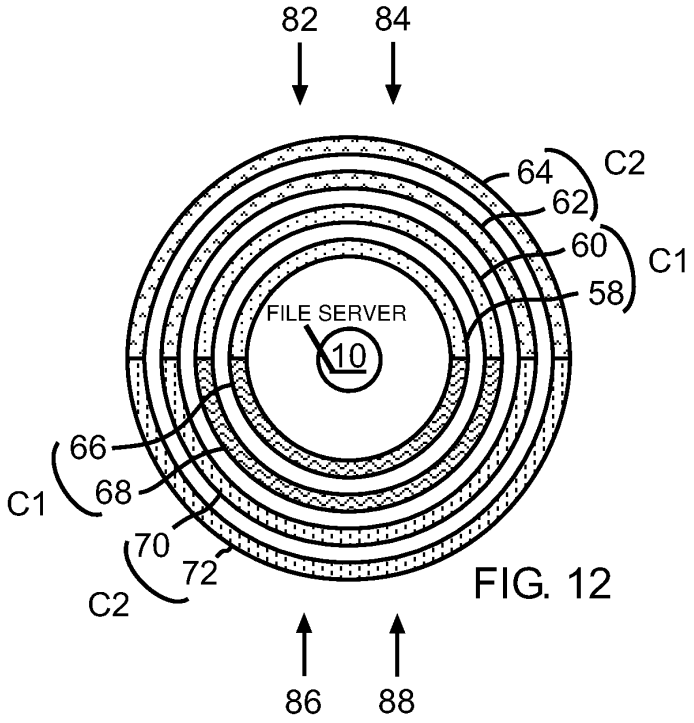

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FIG. 12

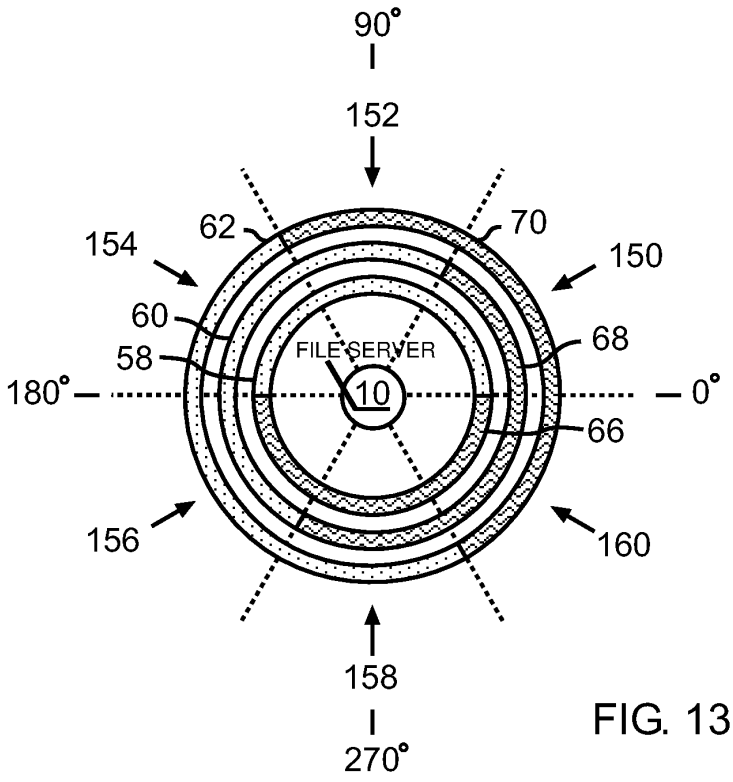

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FIG. 13

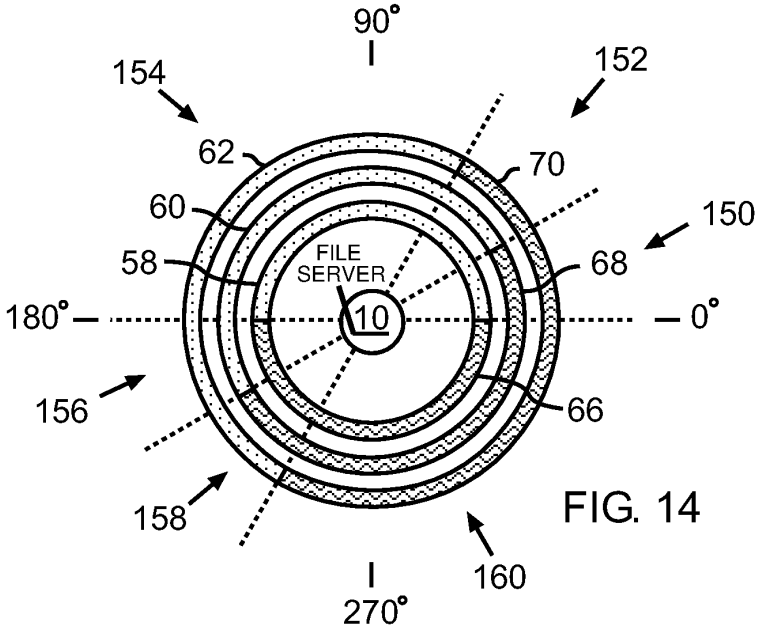

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FIG. 14

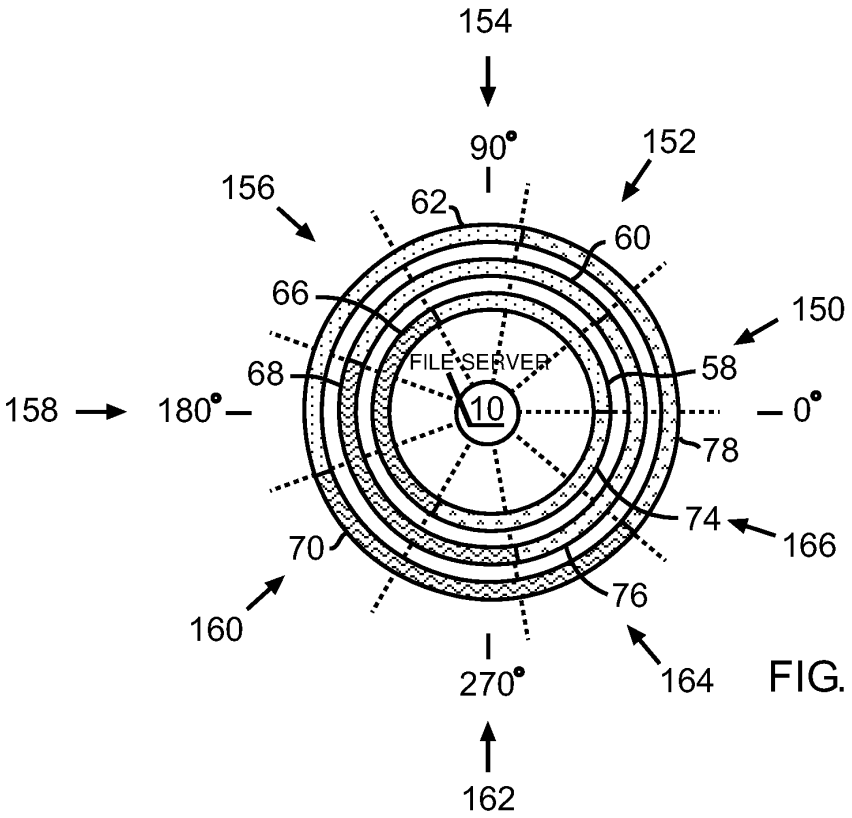

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FIG. 15

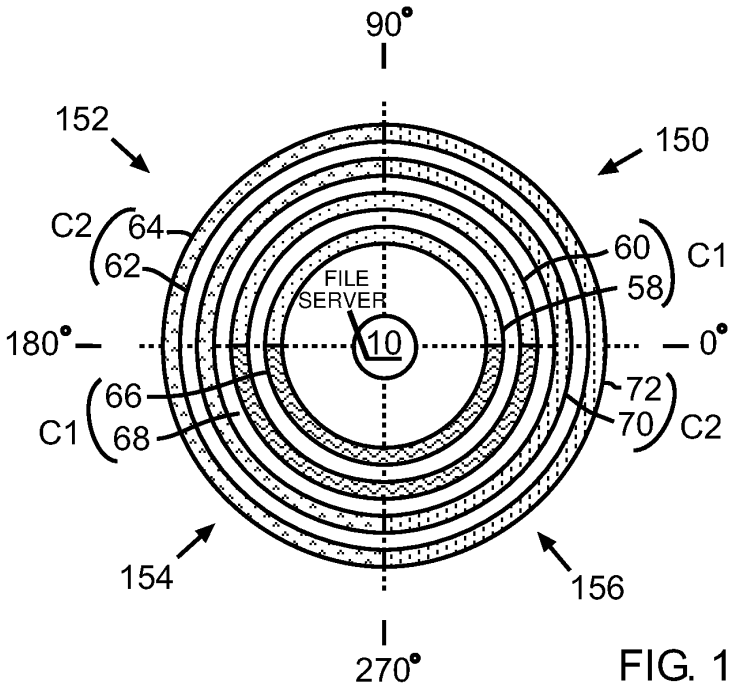

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FIG. 16

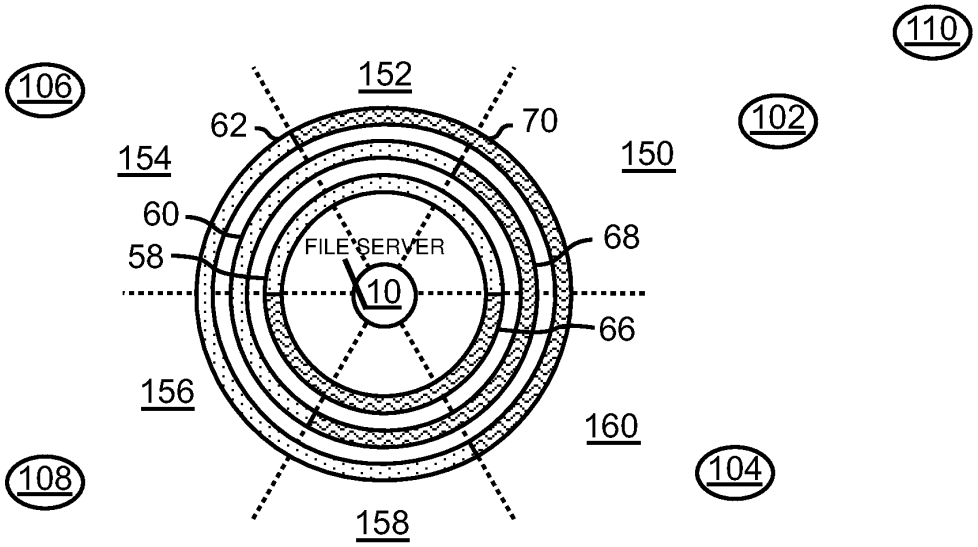

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FIG. 17

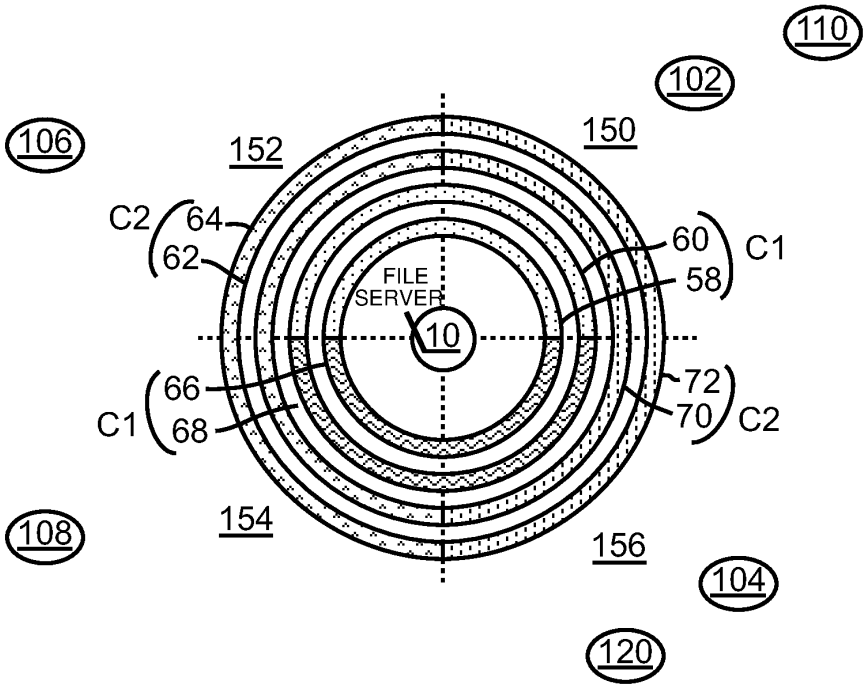

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FIG. 18

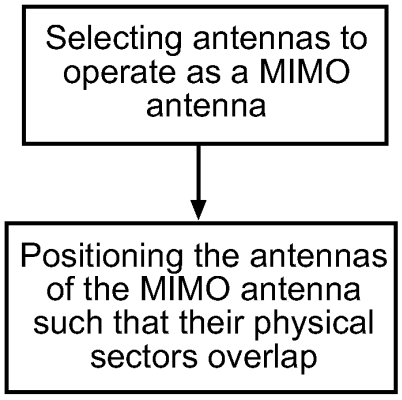

Selecting antennas to operate as a MIMO antenna
Positioning the antennas of the MIMO antenna such that their physical sectors overlap

FIG. 19

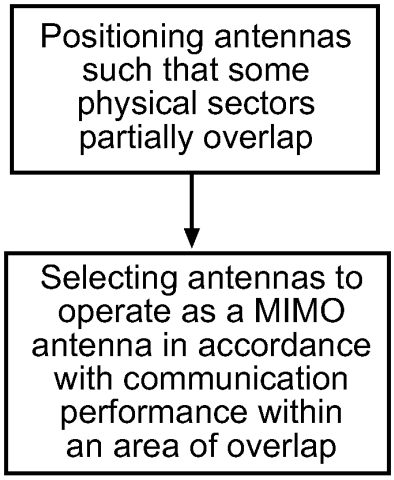

Positioning antennas such that some physical sectors partially overlap
Selecting antennas to operate as a MIMO antenna in accordance with communication performance within an area of overlap

FIG. 20