AO 120 (Rev. 08/10)

TO:	REPORT ON THE FILING OR DETERMINATION OF AN ACTION REGARDING A PATENT OR TRADEMARK
Mail Stop 8 Director of the U.S. Patent and Trademark Office P.O. Box 1450 Alexandria, VA 22313-1450	

In Compliance with 35 U.S.C. § 290 and/or 15 U.S.C. § 1116 you are hereby advised that a court action has been filed in the U.S. District Court Eastern District of Texas on the following

☐ Trademarks or ☑ Patents. (☐ the patent action involves 35 U.S.C. § 292.):

DOCKET NO.	DATE FILED	U.S. DISTRICT COURT
2:23-cv-00202	5/8/2023	Eastern District of Texas

PLAINTIFF	DEFENDANT
XR COMMUNICATIONS, LLC, dba VIVATO TECHNOLOGIES,	AT&T INC.; AT&T SERVICES INC.; AT&T MOBILITY LLC; AND AT&T CORP.,

	PATENT OR TRADEMARK NO.	DATE OF PATENT OR TRADEMARK	HOLDER OF PATENT OR TRADEMARK
1	8,737,511	5/27/2014	XR Communications, LLC
2	10,715,235	7/14/2020	XR Communications, LLC
3	10,594,376	3/17/2020	XR Communications, LLC
4	7,177,369	2/13/2007	XR Communications, LLC
5	8,289,939	10/16/2012	XR Communications, LLC

In the above—entitled case, the following patent(s)/ trademark(s) have been included:

DATE INCLUDED	INCLUDED BY ☐ Amendment ☐ Answer ☐ Cross Bill ☐ Other Pleading	
PATENT OR TRADEMARK NO.	DATE OF PATENT OR TRADEMARK	HOLDER OF PATENT OR TRADEMARK
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In the above—entitled case, the following decision has been rendered or judgement issued:

DECISION/JUDGEMENT

CLERK	(BY) DEPUTY CLERK	DATE

Copy 1—Upon initiation of action, mail this copy to Director Copy 3—Upon termination of action, mail this copy to Director
Copy 2—Upon filing document adding patent(s), mail this copy to Director Copy 4—Case file copy

Print Save As... Reset

AO 120 (Rev. 08/10)

TO:	REPORT ON THE FILING OR DETERMINATION OF AN ACTION REGARDING A PATENT OR TRADEMARK
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In Compliance with 35 U.S.C. § 290 and/or 15 U.S.C. § 1116 you are hereby advised that a court action has been filed in the U.S. District Court Eastern District of Texas on the following

☐ Trademarks or ☑ Patents. (☐ the patent action involves 35 U.S.C. § 292.):

DOCKET NO.	DATE FILED	U.S. DISTRICT COURT
2:23-cv-00203	5/8/2023	Eastern District of Texas

PLAINTIFF	DEFENDANT
XR COMMUNICATIONS, LLC, dba VIVATO TECHNOLOGIES,	VERIZON COMMUNICATIONS, INC., CELLCO PARTNERSHIP D/B/A VERIZON WIRELESS,

	PATENT OR TRADEMARK NO.	DATE OF PATENT OR TRADEMARK	HOLDER OF PATENT OR TRADEMARK
1	8,737,511	5/27/2014	XR Communications, LLC
2	10,715,235	7/14/2020	XR Communications, LLC
3	10,594,376	3/17/2020	XR Communications, LLC
4	7,177,369	2/13/2007	XR Communications, LLC
5	8,289,939	10/16/2012	XR Communications, LLC

In the above—entitled case, the following patent(s)/ trademark(s) have been included:

DATE INCLUDED	INCLUDED BY ☐ Amendment ☐ Answer ☐ Cross Bill ☐ Other Pleading	
PATENT OR TRADEMARK NO.	DATE OF PATENT OR TRADEMARK	HOLDER OF PATENT OR TRADEMARK
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In the above—entitled case, the following decision has been rendered or judgement issued:

DECISION/JUDGEMENT

CLERK	(BY) DEPUTY CLERK	DATE

Copy 1—Upon initiation of action, mail this copy to Director **Copy 3—Upon termination of action, mail this copy to Director**
Copy 2—Upon filing document adding patent(s), mail this copy to Director **Copy 4—Case file copy**

Print Save As... Reset

AO 120 (Rev. 08/10)

TO:	REPORT ON THE FILING OR DETERMINATION OF AN ACTION REGARDING A PATENT OR TRADEMARK
Mail Stop 8 Director of the U.S. Patent and Trademark Office P.O. Box 1450 Alexandria, VA 22313-1450	

In Compliance with 35 U.S.C. § 290 and/or 15 U.S.C. § 1116 you are hereby advised that a court action has been filed in the U.S. District Court Eastern District of Texas on the following

☐ Trademarks or ☑ Patents. (☐ the patent action involves 35 U.S.C. § 292.):

DOCKET NO.	DATE FILED	U.S. DISTRICT COURT
2:23-cv-00204	5/8/2023	Eastern District of Texas

PLAINTIFF	DEFENDANT
XR COMMUNICATIONS, LLC, dba VIVATO TECHNOLOGIES,	T-MOBILE USA, INC.

	PATENT OR TRADEMARK NO.	DATE OF PATENT OR TRADEMARK	HOLDER OF PATENT OR TRADEMARK
1	8,737,511	5/27/2014	XR Communications, LLC
2	10,715,235	7/14/2020	XR Communications, LLC
3	10,594,376	3/17/2020	XR Communications, LLC
4	7,177,369	2/13/2007	XR Communications, LLC
5	8,289,939	10/16/2012	XR Communications, LLC

In the above—entitled case, the following patent(s)/ trademark(s) have been included:

DATE INCLUDED	INCLUDED BY ☐ Amendment ☐ Answer ☐ Cross Bill ☐ Other Pleading	
PATENT OR TRADEMARK NO.	DATE OF PATENT OR TRADEMARK	HOLDER OF PATENT OR TRADEMARK
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In the above—entitled case, the following decision has been rendered or judgement issued:

DECISION/JUDGEMENT

CLERK	(BY) DEPUTY CLERK	DATE

Copy 1—Upon initiation of action, mail this copy to Director **Copy 3—Upon termination of action, mail this copy to Director**
Copy 2—Upon filing document adding patent(s), mail this copy to Director **Copy 4—Case file copy**

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AO 120 (Rev. 08/10)

TO:	REPORT ON THE FILING OR DETERMINATION OF AN ACTION REGARDING A PATENT OR TRADEMARK
Mail Stop 8 Director of the U.S. Patent and Trademark Office P.O. Box 1450 Alexandria, VA 22313-1450	

In Compliance with 35 U.S.C. § 290 and/or 15 U.S.C. § 1116 you are hereby advised that a court action has been filed in the U.S. District Court Western District of Texas on the following

☐ Trademarks or ☑ Patents. (☐ the patent action involves 35 U.S.C. § 292.):

DOCKET NO.	DATE FILED	U.S. DISTRICT COURT
6:21-cv-00646	6/22/2021	Western District of Texas

PLAINTIFF	DEFENDANT
XR COMMUNICATIONS, LLC, dba VIVATO TECHNOLOGIES	DELL TECHNOLOGIES INC. AND DELL INC.

	PATENT OR TRADEMARK NO.	DATE OF PATENT OR TRADEMARK	HOLDER OF PATENT OR TRADEMARK
1	10,715,235	7/14/2020 Format m/d/yyyy	XR Communications, LLC
2			
3			
4			
5			

In the above—entitled case, the following patent(s)/ trademark(s) have been included:

DATE INCLUDED	INCLUDED BY ☐ Amendment ☐ Answer ☐ Cross Bill ☐ Other Pleading	
PATENT OR TRADEMARK NO.	DATE OF PATENT OR TRADEMARK	HOLDER OF PATENT OR TRADEMARK
1		
2		
3		
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5		

In the above—entitled case, the following decision has been rendered or judgement issued:

DECISION/JUDGEMENT
See attached Order entered 06/08/2023

CLERK	(BY) DEPUTY CLERK	DATE
PHILIP J. DEVLIN	Jay Vicha	06/08/2023

Copy 1—Upon initiation of action, mail this copy to Director **Copy 3—Upon termination of action, mail this copy to Director**
Copy 2—Upon filing document adding patent(s), mail this copy to Director **Copy 4—Case file copy**

Print Save As... Reset

IN THE UNITED STATES DISTRICT COURT
FOR THE WESTERN DISTRICT OF TEXAS
AUSTIN DIVISION

XR COMMUNICATIONS, LLC, *d/b/a* VIVATO TECHNOLOGIES, Plaintiff, v. DELL TECHNOLOGIES INC. and DELL INC., Defendants.	§ § § § § § § § § § §	1:22-CV-861-RP

ORDER

On June 1, 2023, the parties filed a joint and agreed motion to dismiss stating that the parties have resolved their dispute. (Dkt. 84). The Court construes the parties' motion as a joint stipulation of dismissal pursuant to Federal Rule of Civil Procedure 41(a)(1)(A)(ii). "Stipulated dismissals under Rule 41(a)(1)(A)(ii) . . . require no judicial action or approval and are effective automatically upon filing." *Yesh Music v. Lakewood Church*, 727 F.3d 356, 362 (5th Cir. 2013). As nothing remains to resolve, **IT IS ORDERED** that the case is **CLOSED**.

SIGNED on June 8, 2023.

ROBERT PITMAN
UNITED STATES DISTRICT JUDGE

UNITED STATES PATENT AND TRADEMARK OFFICE

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

APPLICATION NO.	ISSUE DATE	PATENT NO.	ATTORNEY DOCKET NO.	CONFIRMATION NO.
15/495,539	07/14/2020	10715235	1640-001.203	1050

22145 7590 06/24/2020

KLEIN, O'NEILL & SINGH, LLP
16755 VON KARMAN AVENUE
SUITE 275
IRVINE, CA 92606

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):

Marcus Da Silva, Spokane, WA;
XR Communications, LLC D/B/A Vivato Technologies, Solana Beach, CA;
William J. Crilly JR., Liberty Lake, WA;
James Brennan, Sammamish, WA;
Robert J. Conley, Liberty Lake, WA;
Siavash Alamouti, Spokane, WA;
Eduardo Casas, Vancouver, CANADA;
Hujun Yin, Spokane, WA;
Bobby Jose, Veradale, WA;
Yang-Seok Choi, Liberty Lake, WA;
Vahid Tarokh, Cambridge, MA;
Praveen Mehrotra, Spokane, WA;

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

IPR2024-00613
Petitioner's Exhibit 1002
Page 000006

UNITED STATES PATENT AND TRADEMARK OFFICE

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

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
15/495,539	04/24/2017	Marcus Da Silva	1640-001.203	1050

22145 7590 06/17/2020
KLEIN, O'NEILL & SINGH, LLP
16755 VON KARMAN AVENUE
SUITE 275
IRVINE, CA 92606

EXAMINER	
MCKIE, GINA M	

ART UNIT	PAPER NUMBER
2631	

NOTIFICATION DATE	DELIVERY MODE
06/17/2020	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):

KOS_Docketing@koslaw.com

Supplemental ***Notice of Allowability***	**Application No.** 15/495,539	**Applicant(s)** Da Silva et al.	
	Examiner GINA M MCKIE	**Art Unit** 2631	**AIA (FITF) 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 the IDS filed June 05, 2020.
   ☐ 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 2-8,10-18 and 21-23 . As a result of the allowed claim(s), you may be eligible to benefit from the **Patent Prosecution Highway** program at a participating intellectual property office for the corresponding application. For more information , please see **http://www.uspto.gov/patents/init_events/pph/index.jsp** or send an inquiry to **PPHfeedback@uspto.gov.**

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

   Certified copies:

   a) ☐All b) ☐ Some *c) ☐ None of the:

   1. ☐ Certified copies of the priority documents have been received.
   2. ☐ Certified copies of the priority documents have been received in Application No. _____ .
   3. ☐ Copies of the certified copies of the priority documents have been received in this national stage application from the International Bureau (PCT Rule 17.2(a)).

   * Certified copies not received: _____ .

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

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

   Identifying indicia such as the application number (see 37 CFR 1.84(c)) should be written on the drawings in the front (not the back) of each sheet. Replacement sheet(s) should be labeled as such in the header according to 37 CFR 1.121(d).

6. ☐ DEPOSIT OF and/or INFORMATION about the deposit of BIOLOGICAL MATERIAL must be submitted. Note the attached Examiner's comment regarding REQUIREMENT FOR THE DEPOSIT OF BIOLOGICAL MATERIAL.

Attachment(s)

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

/GINA M MCKIE/ Examiner, Art Unit 2631	/SHUWANG LIU/ Supervisory Patent Examiner, Art Unit 2631

IPR2024-00613
Petitioner's Exhibit 1002
Page 000008

PTO/SB/08 Equivalent

INFORMATION DISCLOSURE STATEMENT BY APPLICANT	Application No.	15/495,539
	Filing Date	April 24, 2017
	First Named Inventor	Marcus Da Silva
	Art Unit	2631
(Multiple sheets used when necessary)	Examiner	McKie, Gina M.
SHEET 1 OF 2	Attorney Docket No.	1640-001.203

U.S. PATENT DOCUMENTS					
Examiner Initials	Cite No.	Document Number *Number - Kind Code (if known)* Example: 1,234,567 B1	Publication Date MM-DD-YYYY	Name of Patentee or Applicant	Pages, Columns, Lines Where Relevant Passages or Relevant Figures Appear
	1	5,933,421 A	08-03-1999	Alamouti et al.	
	2	6,414,986 B1	07-02-2002	Usui	
	3	6,982,968 B1	01-03-2006	Barratt et al.	
	4	8,412,106 B2	04-02-2013	da Silva et al.	
	5	2001/0003443 A1	06-14-2001	VELAZQUEZ et al.	
	6	2002/0097700 A1	07-25-2002	Alastalo et al.	
	7	2004/0014429 A1	01-22-2004	Guo	

NON PATENT LITERATURE DOCUMENTS			
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, page(s), volume-issue number(s), publisher, city and/or country where published.	T[1]
	8	Decision to Institute; CISCO SYSTEMS, INC. v. XR COMMUNICATIONS LLC; Case No. IPR2018-00764; Paper 10; 39 pages.	
	9	Decision Institution of IPR; RUCKUS WIRELESS, INC. et al. v. XR COMMUNICATIONS LLC; Case No. IPR2018-01018; Paper 12; 39 pages.	
	10	Decision to Institute; RUCKUS WIRELESS, INC. et al. v. XR COMMUNICATIONS LLC; Case No. IPR2018-01017; 41 pages.	
	11	Decision to Institute, ARUBA NETWORKS, INC. v. XR COMMUNICATIONS, LLC, Case No. IPR2018-00725, U.S. Patent No. 7,062,296, 31 pages.	
	12	Decision Instituting IPR; ARUBA NETWORKS, INC. v. XR COMMUNICATIONS, LLC, Case No. IPR2018-00726; Paper 15; pages 33.	
	13	Decision Institution of IPR; CISCO SYSTEMS, INC. v. XR COMMUNICATIONS LLC; Case No. IPR2018-00763; Paper 9; 35 pages.	
	14	Decision to Institute IPR; CISCO SYSTEMS, INC. v. XR COMMUNICATIONS LLC; Case No. IPR2018-00762; Paper 10; 53 pages.	
	15	Decision Denying Institution; RUCKUS WIRELESS, INC. et al. v. XR COMMUNICATIONS LLC; Case No. IPR2018-01016; Paper 17; 22 pages.	
	16	Decision Denying Institution, ARUBA NETWORKS, INC. v. XR COMMUNICATIONS, LLC, Case No. IPR2018-00701, U.S. Patent No. 6,611,231, Paper 10; 16 pages.	
	17	Patent Owner's Preliminary Response; RUCKUS WIRELESS, INC. et al. v. XR COMMUNICATIONS LLC; Case No. IPR2018-01016; 31 pages.	
	18	Patent Owner's Preliminary Response; RUCKUS WIRELESS, INC. et al. v. XR COMMUNICATIONS LLC; Case No. IPR2018-01018; 61 pages.	
	19	Patent Owner's Preliminary Response; ARUBA NETWORKS, INC. v. XR COMMUNICATIONS, LLC, Case No. IPR2018-00726; 33 pages.	

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

T[1] - Place a check mark in this area when an English language Translation is attached.

PTO/SB/08 Equivalent

INFORMATION DISCLOSURE STATEMENT BY APPLICANT	Application No.	15/495,539
	Filing Date	April 24, 2017
	First Named Inventor	Marcus Da Silva
	Art Unit	2631
(Multiple sheets used when necessary)	Examiner	McKie, Gina M.
SHEET 2 OF 2	Attorney Docket No.	1640-001.203

NON PATENT LITERATURE DOCUMENTS			
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, page(s), volume-issue number(s), publisher, city and/or country where published.	T[1]
	20	Petitioner's Reply to Patent Owner's Preliminary Response; ARUBA NETWORKS, INC. v. XR COMMUNICATIONS, LLC, Case No. IPR2018-00726; 5 pages.	
	21	Patent Owner's Surr-reply to Petitioner's Reply to Patent Owner's Preliminary Response; ARUBA NETWORKS, INC. v. XR COMMUNICATIONS, LLC, Case No. IPR2018-00726; 6 pages.	
	22	Patent Owner's Preliminary Response; RUCKUS WIRELESS, INC. et al. v. XR COMMUNICATIONS LLC; Case No. IPR2018-01017; 61 pages.	
	23	Patent Owner's Preliminary Response; CISCO SYSTEMS, INC. v. XR COMMUNICATIONS LLC; Case No. IPR2018-00763; 40 pages.	
	24	Final Written Decision; ARUBA NETWORKS, INC. v. XR COMMUNICATIONS, LLC; Case No. IPR2018-00725; Paper 42; 57 pages.	
	25	Final Written Decision; CISCO SYSTEMS, INC. v. XR COMMUNICATIONS, LLC; Case No. IPR2018-00762; Paper 43; 28 pages.	
	26	Final Written Decision; CISCO SYSTEMS, INC. v. XR COMMUNICATIONS, LLC; Case No. IPR2018-00764; Paper 46; 86 pages.	
	27	Bellafiore et al., "Smart antenna system analysis, integration and performance for mobile ad-hoc networks (MANETs)," in IEEE Transactions on Antennas and Propagation, vol. 50, no. 5, pp. 571-581, May 2002 (Year: 2002)	
	28	Lal et al., "A novel MAC layer protocol for space division multiple access in wireless ad hoc networks," Proceedings. Eleventh International Conference on Computer Communications and Networks, Miami, FL, USA, 2002, pp. 614-619 (Year: 2002)	

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

T[1] - Place a check mark in this area when an English language Translation is attached.

PART B - FEE(S) TRANSMITTAL

Complete and send this form, together with applicable fee(s), by mail or fax, or via EFS-Web.

By mail, send to: Mail Stop ISSUE FEE
Commissioner for Patents
P.O. Box 1450
Alexandria, Virginia 22313-1450

By fax, send to: (571)-273-2885

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

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

22145 7590 03/05/2020
KLEIN, O'NEILL & SINGH, LLP
16755 VON KARMAN AVENUE
SUITE 275
IRVINE, CA 92606

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

Certificate of Mailing or Transmission

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

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

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
15/495,539	04/24/2017	Marcus Da Silva	1640-001.203	1050

TITLE OF INVENTION: DIRECTED WIRELESS COMMUNICATION

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	06/05/2020

EXAMINER	ART UNIT	CLASS-SUBCLASS
MCKIE, GINA M	2631	375-365000

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.

1 Klein, O'Neill & Singh, LLP
2
3

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

PLEASE NOTE: Unless an assignee is identified below, no assignee data will appear on the patent. If an assignee is identified below, the document 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 (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. 11-1159

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 /Glen L. Nuttall/ Date June 5, 2020

Typed or printed name Glen L. Nuttall Registration No. 46,188

IPR2024-00613
Petitioner's Exhibit 1002
Page 000011

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Applicants:	Marcus Da Silva et al.	
Title:	DIRECTED WIRELESS COMMUNICATION	
Serial No.:	15/495,539	Filed: April 24, 2017
Examiner:	McKie, Gina M.	Group Art Unit: 2631
Attorney Docket No.:	1640-001.203	Confirmation No.: 1050

CERTIFICATE OF EFS-WEB TRANSMISSION
UNDER 37 CFR § 1.8

I hereby certify that the enclosed IDS Transmittal (3 pages); Information Disclosure Statement by Applicant (2 pages); Issue Fee Transmittal Form PTOL-85 (1 page); and Payment by Credit Card are being transmitted to the United States Patent and Trademark Office **from the Pacific Time Zone** via EFS-Web on June 5, 2020.

Date: June 5, 2020

/Glen L. Nuttall/

Glen L. Nuttall

Mailing Address:

KLEIN, O'NEILL & SINGH, LLP (Customer No.: 22145)
16755 Von Karman Avenue, Suite 275
Irvine, California 92606
Tel: 949-955-1920
Fax: 949-955-1921

Electronic Patent Application Fee Transmittal

Application Number:	15495539
Filing Date:	24-Apr-2017
Title of Invention:	DIRECTED WIRELESS COMMUNICATION
First Named Inventor/Applicant Name:	Marcus Da Silva
Filer:	Glen L. Nuttall/Cindy Chen
Attorney Docket Number:	1640-001.203

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($)
Extension-of-Time:				
Miscellaneous:				
SUBMISSION- INFORMATION DISCLOSURE STMT	2806	1	120	120
		Total in USD ($)		**620**

Electronic Acknowledgement Receipt	
EFS ID:	39646636
Application Number:	15495539
International Application Number:	
Confirmation Number:	1050
Title of Invention:	DIRECTED WIRELESS COMMUNICATION
First Named Inventor/Applicant Name:	Marcus Da Silva
Customer Number:	22145
Filer:	Glen L. Nuttall/Cindy Chen
Filer Authorized By:	Glen L. Nuttall
Attorney Docket Number:	1640-001.203
Receipt Date:	05-JUN-2020
Filing Date:	24-APR-2017
Time Stamp:	22:41:36
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	yes
Payment Type	CARD
Payment was successfully received in RAM	$620
RAM confirmation Number	E202065M43578271
Deposit Account	111159
Authorized User	Cindy Chen
The Director of the USPTO is hereby authorized to charge indicated fees and credit any overpayment as follows: 37 CFR 1.17 (Patent application and reexamination processing fees)	

File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1		1640-001-203--IDS-IFPaymentAsFiled06052020.pdf	338749 243b3137e6252a48ee6c38362538f29ecf1b545a	yes	7

Multipart Description/PDF files in .zip description

Document Description	Start	End
Transmittal Letter	1	3
Information Disclosure Statement (IDS) Form (SB08)	4	5
Issue Fee Payment (PTO-85B)	6	6
Miscellaneous Incoming Letter	7	7

Warnings:					
Information:					
2	Non Patent Literature	NPL--IPR2018-00764-P10.pdf	461195 b67faf0330a07af4d6ffe2284bc6bc39d4d0f304	no	39
Warnings:					
Information:					
3	Non Patent Literature	NPL--IPR2018-01018-P12.pdf	1156697 d924c6de6f428e5bb232ae7225aabe03e764f38e	no	39
Warnings:					
Information:					
4	Non Patent Literature	NPL--IPR2018-01017-P12.pdf	657035 7f4de059277e9c29c41703a0b5620882c1622490	no	41
Warnings:					
Information:					

5	Non Patent Literature	NPL--IPR2018-00725-P14-DectoInstitute.pdf	414787 ea61ff6af106ebf4d08480132687e0ac43cf8a85	no	31
Warnings:					
Information:					
6	Non Patent Literature	NPL--IPR2018-00726-P15.pdf	508387 68a9484ccfab0dfebb4f557aa743f3d78651f1f9	no	33
Warnings:					
Information:					
7	Non Patent Literature	NPL--IPR2018-01016-P17.pdf	311613 d41bf0626ff50ee03730ba481b379702d645f38b	no	22
Warnings:					
Information:					
8	Non Patent Literature	NPL--IPR2018-00701-P10.pdf	265441 002dc5ed79af40f555bb22a9d1ed6d50aec6d8ff	no	16
Warnings:					
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9	Non Patent Literature	NPL--IPR2018-01016-P13-POsPrelimResp.pdf	1065499 6999a859b6a79ec63536f17d3aa0c4423fc7ce2b	no	34
Warnings:					
Information:					
10	Non Patent Literature	NPL--IPR2018-01018-P9-POsPrelimResp.pdf	1111166 45a577d3cc9d3ce2c2e73cb2b7c3c5cfc9084c18	no	61
Warnings:					
Information:					
11	Non Patent Literature	NPL--IPR2018-00726-P8-POsPrelimResp.pdf	788958 111f8530c4b724699e7265f3fbd0719e262535fc	no	33
Warnings:					
Information:					

12	Non Patent Literature	NPl--IPR2018-00726-P12-PetsReplytoPOsPrelimResp.pdf	758231 b67f2f68d972cbf44f5cbe05ec40393d3831e568	no	5
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Information:					
13	Non Patent Literature	NPL--IPR2018-00726-P13-POsSurReplytoPetsReplytoPOsPrelimResp.pdf	127705 7243f20f0845a20ac781e5278350a697528de4fb	no	6
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Information:					
14	Non Patent Literature	NPL--IPR2018-01017-P9-POsPrelimResp.pdf	1163437 8a9f66408a6f2125ed9bc081d3e2ff6e80debf4c	no	61
Warnings:					
Information:					
15	Non Patent Literature	NPL--IPR2018-00763-P8-POsPrelimResp.pdf	546562 c37796c7c3a91322b7091586184218a2fc306222	no	40
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Information:					
16	Non Patent Literature	NPL--IPR2018-00725-P42.pdf	614857 5233175e7340dc79aad6a7a7eb85b71d12119cb9	no	57
Warnings:					
Information:					
17	Non Patent Literature	NPL--IPR2018-00762-P43.pdf	550824 8d56d571dffa42eda9c4a4857ca3dc95b04277ea	no	28
Warnings:					
Information:					
18	Non Patent Literature	NPL--IPR2018-00764-P46.pdf	915731 239b9a08aa0778061d5774e384e7e480a036368c	no	86
Warnings:					
Information:					

19	Non Patent Literature	NPL--IPR2018-00763-P9.pdf	674692 63436f0e3c0a746bba1e6a62f9d4c28e3a35fa75	no	35
Warnings:					
Information:					
20	Non Patent Literature	NPL--IPR2018-00762-P10.pdf	957122 9452f3e8e52730879fe92135c11ea8f056517f44	no	53
Warnings:					
Information:					
21	Non Patent Literature	NPL--BELLAFIORE-SmartAntennaSystemAnalysis-May2002.pdf	12057242 f22f17b7e5010ccc4db1cea49f050612812bd367	no	11
Warnings:					
Information:					
22	Non Patent Literature	NPL--LAL-NovelMACLayerProtocol-2002.pdf	4130077 4a36dd7f01110835b86fa47ed9623adad2bb9e96	no	14
Warnings:					
Information:					
23	Fee Worksheet (SB06)	fee-info.pdf	32218 7e6843abc4fad74309cf21c4574f34cecfa6a25d	no	2
Warnings:					
Information:					
		Total Files Size (in bytes):	29608225		

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.

Information Disclosure Statement Transmittal

Docket Number
1640-001.203

Address To
Commissioner for Patents
P.O. Box 1450
Alexandria, Virginia 22313-1450

In Re Application Of:

Da Silva et al.

Application No.	15/495,539
Filing Date	April 24, 2017
Examiner	McKie, Gina M.
Art Unit	2631

Title of Invention

DIRECTED WIRELESS COMMUNICATION

BASIS FOR FILING (Select 1, 2 or 3 below.)

37 CFR 1.97(b)

1) ☐ The Information Disclosure Statement submitted herewith is being filed within three months of the filing of a national application other than a continued prosecution application under 37 CFR 1.53 (d); within three months of the date of entry of the national stage as set forth in 37 CFR 1.491 in an international application; before the mailing of a first Office Action on the merits, or before the mailing of a first Office Action after the filing of a request for continued examination under 37 CFR 1.114.

37 CFR 1.97(c)

2) ☐ The Information Disclosure Statement submitted herewith is being filed after the period specified in 37 CFR 1.97(b), but before the mailing date of a Final Action under 37 CFR 1.113, a Notice of Allowance under 37 CFR 1.311, or an Action that otherwise closes prosecution in the application, and is accompanied by one of:

a) ☐ the statement specified in 37 CFR 1.97(e);

OR

b) ☐ the fee set forth in 37 CFR 1.17(p).

37 CFR 1.97(d)

3) ☒ The Information Disclosure Statement submitted herewith is being filed after the period specified in 37 CFR 1.97(c), and on or before payment of the issue fee, and is accompanied by the Statement as specified in 37 CFR 1.97(e) and the fee set forth in 37 CFR 1.17(p).

IPR2024-00613
Petitioner's Exhibit 1002
Page 000021

Information Disclosure Statement Transmittal

Docket Number
1640-001.203

STATEMENT UNDER 37 CFR 1.97(e) ACCOMPANYING INFORMATION DISCLOSURE STATEMENT

The Information Disclosure Statement submitted herewith is submitted under one of the following conditions, which satisfies the requirement under 37 CFR 1.97(e). (Select 4 or 5 below if applicable.)

4) ☐ 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; or

5) ☒ 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.

Remarks (Enter Remarks Below or Attach Document Containing Remarks)

Fee set forth in 37 CFR 1.17(p):

☐ No additional fee is required.

☐ A check in the amount of _____ is attached.

☒ The Director is hereby authorized to charge and credit Deposit Account No. 11-1159 as described below.

- ☐ Charge the amount of _____
- ☒ Credit any overpayment.
- ☒ Charge any additional fee required.

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

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

IPR2024-00613
Petitioner's Exhibit 1002
Page 000022

Information Disclosure Statement Transmittal

Docket Number
1640-001.203

Correspondence Address

Customer Number	22145		
-OR-			
Name			
Address			
City		State	
Country		Postal Code	
Phone Number			
E-mail Address			

Certificate of Mailing by Express Mail

I hereby certify that this Transmittal Letter, accompanying documents and fee (if appropriate) are being deposited with the United States Postal Service "Express Mail Post Office to Addressee" service under 37 CFR 1.10 in an envelope addressed to Commissioner for Patents, P.O. Box 1450, Alexandria, Virginia 22313-1450 on the date indicated below:

(Date of Mailing)

(Typed or Printed Name of Person Mailing Correspondence)

(Signature of Person Mailing Correspondence)

("Express Mail" Mailing Label Number)

Certificate of Mailing by First Class Mail

I hereby certify that this Transmittal Letter, accompanying documents and fee (if appropriate) are being deposited with the United States Postal Service with sufficient postage as first class mail in an envelope addressed to Commissioner for Patents, P.O. Box 1450, Alexandria, Virginia 22313-1450 on the date indicated below:

(Date of Mailing) *(Name of Person Mailing Correspondence)*

(Signature of Person Mailing Correspondence)

Certificate of Transmission

I hereby certify that this Transmittal Letter, accompanying documents and fee authorization (if appropriate) is being facsimile transmitted to the United States Patent and Trademark Office on the date indicated below:

(Date of Transmission) *(Name of Person Transmitting Correspondence)*

(Signature of Person Transmitting Correspondence)

Signature Instructions

Select the name of the person who will electronically sign the Trasmittal Letter from the drop-down box below.

If a practitioner is not present in the drop-down list, you must close this form and select 'Add Practitioner...' in the Form Manager's Utility menu.

Verify that the signatory information is correct and press the 'eSign' button to electronically sign the submission. If you prefer to sign the form manually, simply do not click the 'eSign' button; just print and manually sign.

Signatory Drop-Down Box Glen L. Nuttall

Name	Glen L. Nuttall	Registration Number	46,188
Signatory Capacity	Attorney for Applicant	E-mail Address	GlenNuttall@koslaw.com
eSign	/Glen L. Nuttall/	Date Signed	6/5/2020

IPR2024-00613
Petitioner's Exhibit 1002
Page 000023

UNITED STATES PATENT AND TRADEMARK OFFICE

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

NOTICE OF ALLOWANCE AND FEE(S) DUE

22145 7590 03/05/2020

KLEIN, O'NEILL & SINGH, LLP
16755 VON KARMAN AVENUE
SUITE 275
IRVINE, CA 92606

EXAMINER	
MCKIE, GINA M	
ART UNIT	PAPER NUMBER
2631	

DATE MAILED: 03/05/2020

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
15/495,539	04/24/2017	Marcus Da Silva	1640-001.203	1050

TITLE OF INVENTION: DIRECTED WIRELESS COMMUNICATION

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	06/05/2020

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

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

HOW TO REPLY TO THIS NOTICE:

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

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

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

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

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

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

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

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Petitioner's Exhibit 1002
Page 000024

PART B - FEE(S) TRANSMITTAL

Complete and send this form, together with applicable fee(s), by mail or fax, or via EFS-Web.

By mail, send to: Mail Stop ISSUE FEE
Commissioner for Patents
P.O. Box 1450
Alexandria, Virginia 22313-1450

By fax, send to: (571)-273-2885

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

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

22145 7590 03/05/2020
KLEIN, O'NEILL & SINGH, LLP
16755 VON KARMAN AVENUE
SUITE 275
IRVINE, CA 92606

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

Certificate of Mailing or Transmission

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

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

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
15/495,539	04/24/2017	Marcus Da Silva	1640-001.203	1050

TITLE OF INVENTION: DIRECTED WIRELESS COMMUNICATION

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	06/05/2020

EXAMINER	ART UNIT	CLASS-SUBCLASS
MCKIE, GINA M	2631	375-365000

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.

1 _____
2 _____
3 _____

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

PLEASE NOTE: Unless an assignee is identified below, no assignee data will appear on the patent. If an assignee is identified below, the document 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 (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. _____

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Petitioner's Exhibit 1002
Page 000025

UNITED STATES PATENT AND TRADEMARK OFFICE

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

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
15/495,539	04/24/2017	Marcus Da Silva	1640-001.203	1050

22145 7590 03/05/2020

KLEIN, O'NEILL & SINGH, LLP
16755 VON KARMAN AVENUE
SUITE 275
IRVINE, CA 92606

EXAMINER	
MCKIE, GINA M	
ART UNIT	PAPER NUMBER
2631	

DATE MAILED: 03/05/2020

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)

IPR2024-00613
Petitioner's Exhibit 1002
Page 000026

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. 15/495,539	Applicant(s) Da Silva et al.	
	Examiner GINA M MCKIE	Art Unit 2631	AIA (FITF) 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 the RCE filed January 07, 2020.
   ☐ 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 2-8,10-18 and 21-23 . As a result of the allowed claim(s), you may be eligible to benefit from the **Patent Prosecution Highway** program at a participating intellectual property office for the corresponding application. For more information , please see **http://www.uspto.gov/patents/init_events/pph/index.jsp** or send an inquiry to **PPHfeedback@uspto.gov.**

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

   Certified copies:

   a) ☐All b) ☐ Some *c) ☐ None of the:

   1. ☐ Certified copies of the priority documents have been received.
   2. ☐ Certified copies of the priority documents have been received in Application No. _____ .
   3. ☐ Copies of the certified copies of the priority documents have been received in this national stage application from the International Bureau (PCT Rule 17.2(a)).

   * Certified copies not received: _____ .

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

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

   Identifying indicia such as the application number (see 37 CFR 1.84(c)) should be written on the drawings in the front (not the back) of each sheet. Replacement sheet(s) should be labeled as such in the header according to 37 CFR 1.121(d).

6. ☐ DEPOSIT OF and/or INFORMATION about the deposit of BIOLOGICAL MATERIAL must be submitted. Note the attached Examiner's comment regarding REQUIREMENT FOR THE DEPOSIT OF BIOLOGICAL MATERIAL.

Attachment(s)

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

/GINA M MCKIE/ Examiner, Art Unit 2631	/SHUWANG LIU/ Supervisory Patent Examiner, Art Unit 2631

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Petitioner's Exhibit 1002
Page 000028

DETAILED ACTION

Notice of Pre-AIA or AIA Status

1. The present application, filed on or after March 16, 2013, is being examined under the first inventor to file provisions of the AIA.

Response to Amendment

2. Acknowledgement is made of the amendment filed January 07, 2020. Claims 2-8, 10-18 and 21-23 remain pending in the application.

- Claims 2, 7 and 17 are currently amended.
- Claims 1, 9, 19 and 20 are canceled.
- Claims 21-23 are newly added.

Response to Arguments

3. Applicant's arguments, see REMARKS, filed January 07, 2020, with respect to claim 19 rejected under 35 U.S.C. 112(d) or pre-AIA 35 U.S.C. 112, 4th paragraph, as being of improper dependent form for failing to further limit the subject matter of the claim upon which it depends, or for failing to include all the limitations of the claim upon which it depends, have been fully considered and are persuasive. The rejection is withdrawn in view of amendment filed January 07, 2020 which cancelled claim 19.

Allowable Subject Matter

4. Claims 2-8, 10-18 and 21-23 are allowed.

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

The prior art of record, Chen et al. (US 2002/0137538 A1) in view of Ishii et al. (US 6,714,584), fails to teach, "The prior art of record does not specifically teach, "receive a first signal transmission from a remote station via the first antenna element and a second signal transmission from the remote station via the second antenna element simultaneously," as recited in claim 2.

The prior art of record does not specifically teach, "determine a plurality of signal strength indications for the first signal transmission; determine a first signal strength average based on the plurality of signal strength indications for the first signal transmission; determine a plurality of signal strength indications for the second signal transmission; determine a second signal strength average based on the plurality of signal strength indications for the second signal transmission; and cause the transceiver to generate a fourth signal based on the first signal strength average and the second signal strength average" as recited in claim 7.

The prior art of record does not specifically teach, "wherein the first signal transmission and the second signal transmission comprise electromagnetic signals comprising one or more transmission peaks and one or more transmission nulls," as recited in claim 11.

The prior art of record does not specifically teach, "determine a set of weighting values based on the first signal information and the second signal information, wherein the first signal information comprises one or more of: a transmit power level, a data transmit rate, an antenna direction, quality of service data, or timing data," as recited in claim 17,

Chen is an exemplary reference in the relevant field of endeavor. Chen discloses wireless communications with an adaptive antenna array. Systems and techniques for parallel demodulation and searching using an adaptive antenna array with a processor configured to control the adaptive antenna

to search for a first signal with the first beam and to receive a second signal for demodulation with a second beam. However, Chen fails to teach the above limitations as recited in claims 2, 7, 11 and 17.

Ishii is another exemplary reference in the relevant field of endeavor. Ishii discloses CDMA adaptive antenna receiving apparatus and communication system. A CDMA adaptive antenna receiving apparatus is provided with plural receivers of which each is for receiving one or more of desired signal components incoming at the same time. Each of the plural receivers includes plural adaptive receiving units for updating sequentially a directivity in accordance with one desired signal component. The plural adaptive receiving units which are included in the same receiver employ a symbol decision error of the same receiver in common. Each receiver further includes a means for detecting the incoming directions of the plural desired signal components and a means for controlling directivities of the plural adaptive receiving units in accordance with the incoming directions of the plural desired signal components and directivities of the plural adaptive receiving units. However, Ishii fails to teach the above limitations as recited in claims 2, 7, 11 and 17.

For these reasons claims 2-8, 10-18 and 21-23 are allowed over the prior art of record.

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

Any inquiry concerning this communication or earlier communications from the examiner should be directed to GINA M MCKIE whose telephone number is (571)270-5148. The examiner can normally be reached on Monday-Friday 9AM-5PM ET.

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, Shuwang Liu can be reached on 571-272-3036. 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.

GINA M. MCKIE
Examiner
Art Unit 2631

/GINA M MCKIE/
Examiner, Art Unit 2631

/SHUWANG LIU/
Supervisory Patent Examiner, Art Unit 2631

Notice of References Cited	Application/Control No. 15/495,539	Applicant(s)/Patent Under Reexamination Da Silva et al.	
	Examiner GINA M MCKIE	Art Unit 2631	Page 1 of 1

U.S. PATENT DOCUMENTS

*		Document Number Country Code-Number-Kind Code	Date MM-YYYY	Name	CPC Classification	US Classification
*	A	US-20120009964-A1	01-2012	Gormley; Eamonn	H04B7/0634	455/509
	B					
	C					
	D					
	E					
	F					
	G					
	H					
	I					
	J					
	K					
	L					
	M					

FOREIGN PATENT DOCUMENTS

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

NON-PATENT DOCUMENTS

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

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

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Issue Classification	Application/Control No.	Applicant(s)/Patent Under Reexamination
	15/495,539	Da Silva et al.
	Examiner	**Art Unit**
	GINA M MCKIE	2631

CPC							
Symbol						**Type**	**Version**
H04B	/	7	/	0617		F	2013-01-01
H04B	/	7	/	04		I	2013-01-01
H04W	/	16	/	28		I	2013-01-01
H04W	/	72	/	046		I	2013-01-01
H04B	/	7	/	0621		I	2013-01-01
H04B	/	17	/	318		I	2013-01-01

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

/GINA M MCKIE/ Examiner, Art Unit 2631	27 February 2020	**Total Claims Allowed:**	
(Assistant Examiner)	(Date)	19	
/SHUWANG LIU/ Supervisory Patent Examiner, Art Unit 2631	28 February 2020	O.G. Print Claim(s)	O.G. Print Figure
(Primary Examiner)	(Date)	1	2

U.S. Patent and Trademark Office — Part of Paper No.: 20200227

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Issue Classification	Application/Control No.	Applicant(s)/Patent Under Reexamination
	15/495,539	Da Silva et al.
	Examiner	**Art Unit**
	GINA M MCKIE	2631

INTERNATIONAL CLASSIFICATION				
CLAIMED				
H04B7/06	/	7	/	06
H04B7/04	/	7	/	04
H04W16/28	/	16	/	28
H04W72/04	/	72	/	04
H04B17/318	/	17	/	318

NON-CLAIMED				
	/		/	

US ORIGINAL CLASSIFICATION	
CLASS	**SUBCLASS**

CROSS REFERENCES(S)						
CLASS	**SUBCLASS (ONE SUBCLASS PER BLOCK)**					

/GINA M MCKIE/ Examiner, Art Unit 2631	27 February 2020	**Total Claims Allowed:**	
(Assistant Examiner)	(Date)	19	
/SHUWANG LIU/ Supervisory Patent Examiner, Art Unit 2631	28 February 2020	O.G. Print Claim(s)	O.G. Print Figure
(Primary Examiner)	(Date)	1	2

U.S. Patent and Trademark Office — Part of Paper No.: 20200227

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Issue Classification	Application/Control No.	Applicant(s)/Patent Under Reexamination
	15/495,539	Da Silva et al.
	Examiner	**Art Unit**
	GINA M MCKIE	2631

☐ 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	9	10		19										
1	2	8	11		20										
2	3	10	12	17	21										
3	4	11	13	18	22										
5	5	12	14	19	23										
4	6	13	15												
6	7	14	16												
7	8	15	17												
	9	16	18												

/GINA M MCKIE/ Examiner, Art Unit 2631	27 February 2020	**Total Claims Allowed:**	
(Assistant Examiner)	(Date)	19	
/SHUWANG LIU/ Supervisory Patent Examiner, Art Unit 2631	28 February 2020	O.G. Print Claim(s)	O.G. Print Figure
(Primary Examiner)	(Date)	1	2

U.S. Patent and Trademark Office — Part of Paper No.: 20200227

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Search Notes	Application/Control No.	Applicant(s)/Patent Under Reexamination
	15/495,539	Da Silva et al.
	Examiner	Art Unit
	GINA M MCKIE	2631

CPC - Searched*		
Symbol	Date	Examiner
H04L7/042, H04L27/2675 (EAST keyword search)	6/22/2017	gmckie

CPC Combination Sets - Searched*		
Symbol	Date	Examiner

US Classification - Searched*			
Class	Subclass	Date	Examiner

* 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
Performed double patenting search in EAST	6/21/2017	gmckie
Performed initial prior art search in EAST	6/21/2017	gmckie
Updated prior art search in EAST	1/19/2018	gmckie
Updated prior art search in EAST	9/17/2018	gmckie

Interference Search			
US Class/CPC Symbol	US Subclass/CPC Group	Date	Examiner
	SEE SEARCH HISTORY	05/13/2019	gmckie
	SEE SEARCH HISTORY	02/27/2020	gmckie

/GINA M MCKIE/ Examiner, Art Unit 2631	

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Index of Claims	Application/Control No.	Applicant(s)/Patent Under Reexamination
	15/495,539	Da Silva et al.
	Examiner	**Art Unit**
	GINA M MCKIE	2631

✓	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	05/13/2019	05/13/2019	05/13/2019	06/27/2019	02/27/2020				
	1	✓	✓	✓	-	-				
1	2	✓	✓	O	=	=				
2	3	✓	✓	✓	=	=				
3	4	✓	✓	✓	=	=				
5	5	✓	✓	O	=	=				
4	6	✓	✓	O	=	=				
6	7	✓	✓	O	=	=				
7	8	✓	✓	O	=	=				
	9	✓	✓	✓	-	-				
9	10	✓	✓	✓	=	=				
8	11	✓	✓	O	=	=				
10	12	✓	✓	✓	=	=				
11	13	✓	✓	O	=	=				
12	14	✓	✓	O	=	=				
13	15	✓	✓	O	=	=				
14	16	✓	✓	O	=	=				
15	17	✓	✓	✓	=	=				
16	18	✓	✓	O	=	=				
	19	✓	✓	O	✓	-				
	20	✓	✓	O	-	-				
17	21					=				
18	22					=				
19	23					=				

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Petitioner's Exhibit 1002
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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 15/495,539	Filing Date 04/24/2017	☐ 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 $40 =	
INDEPENDENT CLAIMS (37 CFR 1.16(h))	minus 3 =	*		x $210 =	
☐ APPLICATION SIZE FEE (37 CFR 1.16(s))	If the specification and drawings exceed 100 sheets of paper, the application size fee due is $310 ($155 for small entity) for each additional 50 sheets or fraction thereof. See 35 U.S.C. 41(a)(1)(G) and 37 CFR 1.16(s).				
☐ 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

		(Column 1)		(Column 2)	(Column 3)			
AMENDMENT	01/07/2020	CLAIMS REMAINING AFTER AMENDMENT		HIGHEST NUMBER PREVIOUSLY PAID FOR	PRESENT EXTRA		RATE ($)	ADDITIONAL FEE ($)
	Total (37 CFR 1.16(i))	* 19	Minus	** 20	= 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

		(Column 1)		(Column 2)	(Column 3)			
AMENDMENT		CLAIMS REMAINING AFTER AMENDMENT		HIGHEST NUMBER PREVIOUSLY PAID FOR	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.	LIE
** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 20, enter "20".	/MARQUITA D JONES/
*** 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.

PTO/SB/30 (11-17)
Approved for use through 11/30/2020. OMB 0651-0031
U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE
Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it contains a valid OMB control number.

Request for Continued Examination (RCE) Transmittal

Address to:
Mail Stop RCE
Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Application Number	15/495,539
Filing Date	April 24, 2017
First Named Inventor	Marcus Da Silva
Art Unit	2631
Examiner Name	Mckie, Gina M.
Attorney Docket Number	1640-001.203

This is a Request for Continued Examination (RCE) under 37 CFR 1.114 of the above-identified application.
Request for Continued Examination (RCE) practice under 37 CFR 1.114 does not apply to any utility or plant application filed prior to June 8, 1995, or to any design application. See Instruction Sheet for RCEs (not to be submitted to the USPTO) on page 2.

1. Submission required under 37 CFR 1.114 Note: If the RCE is proper, any previously filed unentered amendments and amendments enclosed with the RCE will be entered in the order in which they were filed unless applicant instructs otherwise. If applicant does not wish to have any previously filed unentered amendment(s) entered, applicant must request non-entry of such amendment(s).

   a. ☐ Previously submitted. If a final Office action is outstanding, any amendments filed after the final Office action may be considered as a submission even if this box is not checked.

      i. ☐ Consider the arguments in the Appeal Brief or Reply Brief previously filed on _____

      ii. ☐ Other _____

   b. ☑ Enclosed

      i. ☑ Amendment/Reply

      ii. ☐ Affidavit(s)/ Declaration(s)

      iii. ☐ Information Disclosure Statement (IDS)

      iv. ☐ Other _____

2. Miscellaneous

   a. ☐ Suspension of action on the above-identified application is requested under 37 CFR 1.103(c) for a period of _____ months. (Period of suspension shall not exceed 3 months; Fee under 37 CFR 1.17(i) required)

   b. ☐ Other _____

3. Fees The RCE fee under 37 CFR 1.17(e) is required by 37 CFR 1.114 when the RCE is filed.

   a. ☑ The Director is hereby authorized to charge the following fees, any underpayment of fees, or credit any overpayments, to Deposit Account No. 11-1159.

      i. ☐ RCE fee required under 37 CFR 1.17(e)

      ii. ☐ Extension of time fee (37 CFR 1.136 and 1.17)

      iii. ☐ Other _____

   b. ☐ Check in the amount of $ _____ enclosed

   c. ☐ Payment by credit card (Form PTO-2038 enclosed)

   d. ▩ Payment by EFS-Web

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

SIGNATURE OF APPLICANT, ATTORNEY, OR AGENT REQUIRED

Signature	/Glen L Nuttall/	Date	January 6, 2020
Name (Print/Type)	Glen L. Nuttall	Registration No.	46,188

CERTIFICATE OF MAILING OR TRANSMISSION

I hereby certify that this correspondence is being EFS-Web transmitted to the United States Patent and Trademark Office (USPTO), deposited with the United States Postal Service with sufficient postage as first class mail in an envelope addressed to: Mail Stop RCE, Commissioner for Patents, P. O. Box 1450, Alexandria, VA 22313-1450 or facsimile transmitted to the USPTO on the date shown below.

Signature	/Glen L Nuttall/		
Name (Print/Type)	Glen L Nuttall	Date	January 6, 2020

This collection of information is required by 37 CFR 1.114. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.11 and 1.14. This collection is estimated to take 12 minutes to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Mail Stop RCE, 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.

Electronic Patent Application Fee Transmittal

Application Number:	15495539
Filing Date:	24-Apr-2017
Title of Invention:	DIRECTED WIRELESS COMMUNICATION
First Named Inventor/Applicant Name:	Marcus Da Silva
Filer:	Glen L. Nuttall
Attorney Docket Number:	1640-001.203

Filed as Small Entity

Filing Fees for Utility under 35 USC 111(a)

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

Description	Fee Code	Quantity	Amount	Sub-Total in USD($)
Miscellaneous:				
RCE- 2ND AND SUBSEQUENT REQUEST	2820	1	950	950
		Total in USD ($)		**950**

Electronic Acknowledgement Receipt	
EFS ID:	38219130
Application Number:	15495539
International Application Number:	
Confirmation Number:	1050
Title of Invention:	DIRECTED WIRELESS COMMUNICATION
First Named Inventor/Applicant Name:	Marcus Da Silva
Customer Number:	22145
Filer:	Glen L. Nuttall
Filer Authorized By:	
Attorney Docket Number:	1640-001.203
Receipt Date:	07-JAN-2020
Filing Date:	24-APR-2017
Time Stamp:	02:23:45
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	yes
Payment Type	CARD
Payment was successfully received in RAM	$950
RAM confirmation Number	E202017325117566
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	Request for Continued Examination (RCE)	RCETransmittal-20200106.pdf	171005 ca14b19aa64b93d0e3efc63182f17eeecb55c8aa	no	1
Warnings:					
This is not a USPTO supplied RCE SB30 form.					
Information:					
2	Fee Worksheet (SB06)	fee-info.pdf	30399 982b9bc527cc76f02f5315823486507 89d869f7d	no	2
Warnings:					
Information:					
		Total Files Size (in bytes):	201404		

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

Applicant	:	Marcus DaSilva
Serial No.	:	15/495,539
Filed	:	April 24, 2017
For	:	DIRECTED WIRELESS COMMUNICATION
Examiner	:	McKie, Gina M
Art Unit	:	2631
Confirmation No.	:	1050

OFFICE ACTION RESPONSE

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

Commissioner:

In response to the Office action transmitted July 5, 2019, please reconsider the above-captioned application in light of the following amendments and remarks.

Amendments to the Claims are set forth in the listing of the claims beginning on page 2 of this paper; and

Remarks/Arguments begin on page 8 of this paper.

IPR2024-00613
Petitioner's Exhibit 1002
Page 000046

Electronic Patent Application Fee Transmittal

Application Number:	15495539
Filing Date:	24-Apr-2017
Title of Invention:	DIRECTED WIRELESS COMMUNICATION
First Named Inventor/Applicant Name:	Marcus Da Silva
Filer:	Glen L. Nuttall
Attorney Docket Number:	1640-001.203

Filed as Small Entity

Filing Fees for Utility under 35 USC 111(a)

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

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

Electronic Acknowledgement Receipt	
EFS ID:	38219121
Application Number:	15495539
International Application Number:	
Confirmation Number:	1050
Title of Invention:	DIRECTED WIRELESS COMMUNICATION
First Named Inventor/Applicant Name:	Marcus Da Silva
Customer Number:	22145
Filer:	Glen L. Nuttall
Filer Authorized By:	
Attorney Docket Number:	1640-001.203
Receipt Date:	07-JAN-2020
Filing Date:	24-APR-2017
Time Stamp:	02:09:07
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	yes
Payment Type	CARD
Payment was successfully received in RAM	$700
RAM confirmation Number	E202017311057551
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	Miscellaneous Incoming Letter	CertificateEFS.pdf	77799 06cc9f0026db825458cd30121417c441ab5401d4	no	1
Warnings:					
Information:					
2		1640-001-203RtoFOAof20190705.pdf	102787 f100370efb71d9cf61f2e0410756d9eefceede8e	yes	9

	Multipart Description/PDF files in .zip description		
	Document Description	**Start**	**End**
	Applicant Arguments/Remarks Made in an Amendment	8	9
	Claims	2	7
	Amendment/Req. Reconsideration-After Non-Final Reject	1	1

Warnings:					
Information:					
3	Fee Worksheet (SB06)	fee-info.pdf	30456 02e46d2296ad93ea95fbc9adddfe8695e856420a	no	2
Warnings:					
Information:					
		Total Files Size (in bytes):	211042		

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

Applicants:	Marcus Da Silva et al.	
Title:	DIRECTED WIRELESS COMMUNICATION	
Serial No.:	15/495,539	Filed: April 24, 2017
Examiner:	McKie, Gina M	Group Art Unit: 2631
Attorney Docket No.:	1640-001.203	

CERTIFICATE OF EFS-WEB TRANSMISSION
UNDER 37 CFR § 1.8

I hereby certify that the enclosed Office Action Response (9 pages) is being transmitted to the United States Patent and Trademark Office from the Pacific Time Zone via EFS-Web on January 6, 2020.

Date: January 6, 2020

/Glen L Nuttall/

Glen L Nuttall

Mailing Address:

KLEIN, O'NEILL & SINGH, LLP (Customer No.: 22145)
16755 Von Karman Avenue, Suite 275
Irvine, California 92606
Tel: 949-955-1920
Fax: 949-955-1921

REMARKS

By this paper Claims 2, 7 and 17 have been amended, Claim 19 has been cancelled without prejudice, and new dependent Claims 21-23 have been added. As such, Claims 2-8, 10-18 and 21-23 are currently pending for consideration in this application.

Rejection Under 35 USC 112

The Office Action rejected Claim 19 under 35 USC 112 as being of improper dependent form. Applicant has cancelled Claim 19, making the rejection moot.

Amendments to Independent Claims Change Scope

Applicant has amended independent Claims 2, 7 and 17 to replace the recited "remote station" with "transceiver" in one instance in each claim. This amendment is a correction of an earlier error, and makes these claims read as intended. However, the amendment changes the scope of these claims. Thus, Applicant wishes to specifically bring it to the examiner's attention.

New Dependent Claims

New Claims 21 - 23 have been added. Each of the new claims depends from an already-allowed independent claim, and thus is considered to be allowable. Applicant submits that these claims also recite additional patentable subject matter.

The new claims are supported by the application as originally filed, which includes the specification and drawings as well as the provisional application and other priority applications (which applications have been expressly incorporated by reference). No new subject matter has been added by the new dependent claims.

Conclusion

For the foregoing reasons, it is respectfully submitted that the rejections set forth in the outstanding Office action are inapplicable to the current claims. Accordingly, issuance of a Notice of Allowance is requested.

IPR2024-00613
Petitioner's Exhibit 1002
Page 000053

Please charge any additional fees, including any fees for additional extension of time, or credit overpayment to Deposit Account No. 11-1159.

Respectfully submitted,

Klein, O'Neill & Singh, LLP

Dated: January 6, 2020

By /Glen L Nuttall/
Glen L Nuttall, Reg. No. 46,188
Telephone: (949) 955-1920

Klein, O'Neill & Singh, LLP
16755 Von Karman, Suite 275
Irvine, CA 92606
T (949) 955-1920
F (949) 955-1921

AMENDMENTS TO THE CLAIMS

Please amend the claims to read as follows. Additions are underlined. Deletions are in ~~strikeout~~ text or [[double brackets]].

1. (Cancelled)

2. (Currently Amended) A receiver for use in a wireless communications system, the receiver comprising:

an antenna, wherein the antenna comprises a first antenna element and a second antenna element;

a transceiver operatively coupled to the antenna and configured to transmit and receive electromagnetic signals using the antenna; and

a processor operatively coupled to the transceiver, the processor configured to:

receive a first signal transmission from a remote station via the first antenna element and a second signal transmission from the remote station via the second antenna element simultaneously;

determine first signal information for the first signal transmission;

determine second signal information for the second signal transmission, wherein the second signal information is different than the first signal information;

determine a set of weighting values based on the first signal information and the second signal information, wherein the set of weighting values is configured to be used by the ~~remote station~~ transceiver to construct one or more beam-formed transmission signals;

cause the transceiver to transmit a third signal to the remote station via the antenna, the third signal comprising content based on the set of weighting values.

3. (Previously Presented) The receiver as recited in Claim 2, wherein the first signal transmission and the second signal transmission comprise electromagnetic signals comprising one or more transmission peaks and one or more transmission nulls.

4. (Previously Presented) The receiver as recited in Claim 3, wherein the first signal

transmission and the second signal transmission are directional transmissions.

5. (Previously Presented) The receiver as recited in Claim 6, wherein the set of weighting values is further based on one or more of: a transmit power level, a data transmit rate, an antenna direction, quality of service data, or timing data.

6. (Previously Presented) The receiver as recited in Claim 2, wherein the content comprises data configured to be used by the remote station to modify the placement of one or more transmission peaks and one or more transmission nulls in a subsequent signal transmission.

7. (Currently Amended) A receiver for use in a wireless communications system, the receiver comprising:

an antenna;

a transceiver operatively coupled to the antenna and configured to transmit and receive electromagnetic signals using the antenna; and

a processor operatively coupled to the transceiver, the processor configured to:

receive a first signal transmission from a remote station via the antenna and a second signal transmission from the remote station via the antenna simultaneously;

determine first signal information for the first signal transmission;

determine second signal information for the second signal transmission, wherein the second signal information is different than the first signal information;

determine a set of weighting values based on the first signal information and the second signal information, wherein the set of weighting values is configured to be used by the ~~remote station~~ transceiver to construct one or more beam-formed transmission signals;

cause the transceiver to generate a third signal comprising content based on the set of weighting values;

determine a plurality of signal strength indications for the first signal transmission;

determine a first signal strength average based on the plurality of signal

strength indications for the first signal transmission;

determine a plurality of signal strength indications for the second signal transmission;

determine a second signal strength average based on the plurality of signal strength indications for the second signal transmission; and

cause the transceiver to generate a fourth signal based on the first signal strength average and the second signal strength average.

8. (Previously Presented) The receiver as recited in Claim 7, wherein the processor is further configured to: cause the transceiver to transmit the fourth signal to the remote station via the antenna.

9. (Cancelled)

10. (Previously Presented) The method as recited in Claim 11, further comprising: transmitting the third signal to the remote station via the antenna.

11. (Previously Presented) A method in a wireless communications system, the method comprising:

receiving a first signal transmission from a remote station via a first antenna element of an antenna and a second signal transmission from the remote station via a second antenna element of the antenna simultaneously, wherein the first signal transmission and the second signal transmission comprise electromagnetic signals comprising one or more transmission peaks and one or more transmission nulls;

determining first signal information for the first signal transmission;

determining second signal information for the second signal transmission, wherein the second signal information is different than the first signal information;

determining a set of weighting values based on the first signal information and the second signal information, wherein the set of weighting values is configured to be used by the remote station to construct one or more beam-formed transmission signals; and

transmitting to the remote station a third signal comprising content based on the set of

weighting values.

12. (Previously Presented) The method as recited in Claim 11, wherein the first signal transmission and the second signal transmission are directional transmissions.

13. (Previously Presented) The method as recited in Claim 11, wherein the set of weighting values is further based on one or more of: a transmit power level, a data transmit rate, an antenna direction, quality of service data, or timing data.

14. (Previously Presented) The method as recited in Claim 13, wherein the content comprises data configured to be used by the remote station to modify the placement of one or more transmission peaks and one or more transmission nulls in a subsequent signal transmission.

15. (Previously Presented) The method as recited in Claim 14, further comprising:

determining a plurality of signal strength indications for the first signal transmission;

determining a first signal strength average based on the plurality of signal strength indications for the first signal transmission;

determining a plurality of signal strength indications for the second signal transmission;

determining a second signal strength average based on the plurality of signal strength indications for the second signal transmission; and

generating a fourth signal based on the first signal strength average and the second signal strength average.

16. (Previously Presented) The method as recited in Claim 15, further comprising: causing the transceiver to transmit the fourth signal to the remote station via the antenna.

17. (Currently Amended) An apparatus for use in a wireless communications system, the apparatus comprising:

an antenna;

a transceiver operatively coupled to the antenna; and

a processor operatively coupled to the transceiver, the processor configured to:

receive a first signal transmission from a remote station via the antenna,

the first signal transmission comprising first signal information, wherein the first signal information comprises one or more of: a transmit power level, a data transmit rate, an antenna direction, quality of service data, or timing data;

receive a second signal transmission from the remote station via the antenna, the second signal transmission comprising second signal information;

determine a set of weighting values based on the first signal information and the second signal information, wherein the set of weighting values is configured to be used by the ~~remote station~~ transceiver to construct one or more beam-formed transmission signals;

cause the transceiver to generate a third signal comprising content based on the set of weighting values.

18. (Previously Presented) The apparatus as recited in Claim 17, wherein the first signal transmission and the second signal transmission comprise electromagnetic signals comprising one or more transmission peaks and one or more transmission nulls.

19. (Cancelled)

20. (Cancelled)

21. (New) The apparatus as recited in Claim 18, wherein the processor is configured to receive a fourth signal transmission from an interferer source, the fourth signal transmission being undesired, and the processor is configured to store identifying information concerning the undesired interferer source and the remote station.

22. (New) The apparatus as recited in Claim 21, wherein the processor is configured to identify a further interferer signal transmission from the interferer source, and to identify a further desired signal transmission from the remote station, wherein the processor is further configured to prevent the transceiver from transmitting a fifth signal transmission via the antenna during reception of the further desired signal transmission but to allow the transceiver to transmit a sixth signal transmission via the antenna during reception of the further interferer signal transmission.

23. (New) The apparatus as recited in Claim 17, wherein the set of weighting values are applied to the third signal, and wherein the transceiver is configured to receive a fourth signal transmitted from the remote station, and the processor is configured to apply the set of weighting values to the fourth signal.

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.
15/495,539	04/24/2017	Marcus Da Silva	1640-001.203	1050

22145 7590 07/05/2019

KLEIN, O'NEILL & SINGH, LLP
16755 VON KARMAN AVENUE
SUITE 275
IRVINE, CA 92606

EXAMINER	
MCKIE, GINA M	

ART UNIT	PAPER NUMBER
2631	

NOTIFICATION DATE	DELIVERY MODE
07/05/2019	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):

KOS_Docketing@koslaw.com

IPR2024-00613
Petitioner's Exhibit 1002
Page 000061

Office Action Summary	**Application No.** 15/495,539	**Applicant(s)** Da Silva et al.	
	Examiner GINA M MCKIE	**Art Unit** 2631	**AIA (FITF) 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 27 March 2019.

☐ 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) 2-8 and 10-19 is/are pending in the application.

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

6) ☑ Claim(s) 2-8 and 10-18 is/are allowed.

7) ☑ Claim(s) 19 is/are rejected.

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

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

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

Application Papers

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

11)☑ The drawing(s) filed on 05 October 2017 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: _____.

IPR2024-00613
Petitioner's Exhibit 1002
Page 000062

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 Amendment

2. Acknowledgement is made of the amendment filed March 27, 2019. Claims 2-8 and 10-19 remain pending in the application.

- Claims 2-7, 10-17 and 19 are currently amended.
- Claims 1, 9 and 20 have been canceled.
- No claims are new.

Response to Arguments

3. Applicant's arguments, see REMARKS, filed March 27, 2019, with respect to claims 1, 3, 4, 9, 10, 12 and 17 rejected under 35 U.S.C. 103 as being unpatentable over Chen et al. (US 2002/0137538 A1) in view of Ishii et al. (US 6,714,584), have been fully considered and are persuasive. The rejection of claims 1, 3, 4, 9, 10, 12 and 17 has been withdrawn.

Claim Rejections - 35 USC § 112

4. (d) REFERENCE IN DEPENDENT FORMS.—Subject to subsection (e), a claim in dependent form shall contain a reference to a claim previously set forth and then specify a further limitation of the subject matter claimed. A claim in dependent form shall be construed to incorporate by reference all the limitations of the claim to which it refers.

The following is a quotation of pre-AIA 35 U.S.C. 112, fourth paragraph:

> Subject to the following paragraph [i.e., the fifth paragraph of pre-AIA 35 U.S.C. 112], a claim in dependent form shall contain a reference to a claim previously set forth and then specify a further limitation of the subject matter claimed. A claim in dependent form shall be construed to incorporate by reference all the limitations of the claim to which it refers.

5. Claim 19 is rejected under 35 U.S.C. 112(d) or pre-AIA 35 U.S.C. 112, 4th paragraph, as being of improper dependent form for failing to further limit the subject matter of the claim upon which it depends, or for failing to include all the limitations of the claim upon which it depends. Claim 19 recites Applicant may cancel the claim(s), amend the claim(s) to place the claim(s) in proper dependent form, rewrite the claim(s) in independent form, or present a sufficient showing that the dependent claim(s) complies with the statutory requirements.

Allowable Subject Matter

6. Claims 2-8 and 10-18 are allowed.

The following is a statement of reasons for the indication of allowable subject matter:

The prior art of record does not specifically teach, “receive a first signal transmission from a remote station via the first antenna element and a second signal transmission from the remote station via the second antenna element simultaneously,” as recited in claim 2.

The prior art of record does not specifically teach, “determine a plurality of signal strength indications for the first signal transmission; determine a first signal strength average based on the plurality of signal strength indications for the first signal transmission; determine a plurality of signal strength indications for the second signal transmission; determine a second signal strength average

based on the plurality of signal strength indications for the second signal transmission; and cause the transceiver to generate a fourth signal based on the first signal strength average and the second signal strength average" as recited in claim 7.

The prior art of record does not specifically teach, "wherein the first signal transmission and the second signal transmission comprise electromagnetic signals comprising one or more transmission peaks and one or more transmission nulls," as recited in claim 11.

The prior art of record does not specifically teach, "determine a set of weighting values based on the first signal information and the second signal information, wherein the first signal information comprises one or more of: a transmit power level, a data transmit rate, an antenna direction, quality of service data, or timing data," as recited in claim 17.

Conclusion

Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to GINA M MCKIE whose telephone number is (571)270-5148. The examiner can normally be reached on Monday-Friday 9AM-5PM ET.

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, Shuwang Liu can be reached on 571-272-3036. 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.

GINA M. MCKIE
Examiner
Art Unit 2631

/GINA M MCKIE/
Examiner, Art Unit 2631

/SHUWANG LIU/
Supervisory Patent Examiner, Art Unit 2631

Notice of References Cited	Application/Control No. 15/495,539	Applicant(s)/Patent Under Reexamination Da Silva et al.	
	Examiner GINA M MCKIE	Art Unit 2631	Page 1 of 1

U.S. PATENT DOCUMENTS

*		Document Number Country Code-Number-Kind Code	Date MM-YYYY	Name	CPC Classification	US Classification
*	A	US-20130094454-A1	04-2013	Soriaga; Joseph B.	H04B7/0691	370/329
	B					
	C					
	D					
	E					
	F					
	G					
	H					
	I					
	J					
	K					
	L					
	M					

FOREIGN PATENT DOCUMENTS

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

NON-PATENT DOCUMENTS

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

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

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Search Notes	Application/Control No.	Applicant(s)/Patent Under Reexamination
	15/495,539	Da Silva et al.
	Examiner	Art Unit
	GINA M MCKIE	2631

CPC - Searched*		
Symbol	Date	Examiner
H04L7/042, H04L27/2675 (EAST keyword search)	6/22/2017	gmckie

CPC Combination Sets - Searched*		
Symbol	Date	Examiner

US Classification - Searched*			
Class	Subclass	Date	Examiner

* 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
Performed double patenting search in EAST	6/21/2017	gmckie
Performed initial prior art search in EAST	6/21/2017	gmckie
Updated prior art search in EAST	1/19/2018	gmckie
Updated prior art search in EAST	9/17/2018	gmckie

Interference Search			
US Class/CPC Symbol	US Subclass/CPC Group	Date	Examiner
	SEE SEARCH HISTORY	05/13/2019	gmckie

	/GINA MCKIE/ Examiner.Art Unit 2631

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Index of Claims	Application/Control No.	Applicant(s)/Patent Under Reexamination
	15/495,539	Da Silva et al.
	Examiner	**Art Unit**
	GINA M MCKIE	2631

✓	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	05/13/2019	05/13/2019	05/13/2019	06/27/2019					
	1	✓	✓	✓	-					
	2	✓	✓	O	=					
	3	✓	✓	✓	=					
	4	✓	✓	✓	=					
	5	✓	✓	O	=					
	6	✓	✓	O	=					
	7	✓	✓	O	=					
	8	✓	✓	O	=					
	9	✓	✓	✓	-					
	10	✓	✓	✓	=					
	11	✓	✓	O	=					
	12	✓	✓	✓	=					
	13	✓	✓	O	=					
	14	✓	✓	O	=					
	15	✓	✓	O	=					
	16	✓	✓	O	=					
	17	✓	✓	✓	=					
	18	✓	✓	O	=					
	19	✓	✓	O	✓					
	20	✓	✓	O	-					

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EAST Search History

EAST Search History (Prior Art)

Ref #	Hits	Search Query	DBs	Default Operator	Plurals	Time Stamp
S1	1165	375/365.CCLS.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2017/06/22 11:46
S2	2	"20020158801"	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2018/09/17 09:12
S3	88	("2002/0158801").URPN.	USPAT	OR	ON	2018/09/17 10:25
S4	994	"directed wireless communication"	USPAT	OR	ON	2018/09/17 11:02
S5	2396	"directed wireless communication"	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2018/09/17 11:04
S6	26	"directed wireless communication" AND multi-beam	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2018/09/17 11:04
S7	51	multi-beam WITH directed WITH communication	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2018/09/17 11:08
S8	349	multi-beam AND Wi-Fi	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2018/09/17 11:15
S9	327	multi-beam AND Wi-Fi AND array	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2018/09/17 11:25
S10	9134	multi-beam AND array	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2018/09/17 11:29
S11	585	multi-beam AND array AND "access point"	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2018/09/17 11:32
S12	2050	multi-beam AND array AND directional	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2018/09/17 11:32
S13	0	S11 AND @ad<"2003"	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2018/09/17 11:35

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S14	16	S11 AND @ad<"20030101"	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2018/09/17 11:35
S15	312593	first ADJ signal	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2018/09/17 11:42
S16	309870	second ADJ signal	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2018/09/17 11:43
S17	38189	remote ADJ station	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2018/09/17 11:43
S18	112197	set NEAR2 weight$3	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2018/09/17 11:45
S19	109	S15 AND S16 AND S17 AND S18	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2018/09/17 11:46
S20	4361	"first signal" WITH "second signal" WITH simultaneous$3	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2018/09/17 11:54
S21	34	S18 AND S20	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2018/09/17 12:03
S22	14	S20 AND "multi-beam"	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2018/09/17 12:04
S23	436	S12 AND @ad<"20030101"	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2018/09/17 12:08
S24	43	S23 AND ("first signal") AND "second signal"	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2018/09/17 12:11

EAST Search History (Interference)

Ref #	Hits	Search Query	DBs	Default Operator	Plurals	Time Stamp
S25	21	"6714584"	US-PGPUB; USPAT	OR	ON	2019/05/13 09:51
S26	1	"6714584".PN.	US-PGPUB; USPAT	OR	ON	2019/05/13 09:51
S27	1852	(simultaneous$3 WITH antenna WITH (first AND second)).CLM.	US-PGPUB; USPAT	OR	ON	2019/05/13 10:29

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S28	36	(simultaneous$3 WITH antenna WITH (first AND second) WITH remote).CLM.	US-PGPUB; USPAT	OR	ON	2019/05/13 10:33

6/28/2019 11:11:54 AM
C:\Users\gmckie\Documents\EAST\Workspaces\15495539.wsp

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PTO/SB/06 (09-11)
Approved for use through 1/31/2014. OMB 0651-0032
U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE
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PATENT APPLICATION FEE DETERMINATION RECORD Substitute for Form PTO-875	Application or Docket Number 15/495,539	Filing Date 04/24/2017	☐ 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 $40 =	
INDEPENDENT CLAIMS (37 CFR 1.16(h))	minus 3 =	*		x $210 =	
☐ APPLICATION SIZE FEE (37 CFR 1.16(s))	If the specification and drawings exceed 100 sheets of paper, the application size fee due is $310 ($155 for small entity) for each additional 50 sheets or fraction thereof. See 35 U.S.C. 41(a)(1)(G) and 37 CFR 1.16(s).				
☐ 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

		(Column 1)		(Column 2)	(Column 3)			
AMENDMENT	03/27/2019	CLAIMS REMAINING AFTER AMENDMENT		HIGHEST NUMBER PREVIOUSLY PAID FOR	PRESENT EXTRA		RATE ($)	ADDITIONAL FEE ($)
	Total (37 CFR 1.16(i))	* 17	Minus	** 20	= 0		x $50 =	0
	Independent (37 CFR 1.16(h))	* 4	Minus	*** 3	= 1		x $230 =	230
	☐ Application Size Fee (37 CFR 1.16(s))							
	☐ FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))							
							TOTAL ADD'L FEE	230

		(Column 1)		(Column 2)	(Column 3)			
AMENDMENT		CLAIMS REMAINING AFTER AMENDMENT		HIGHEST NUMBER PREVIOUSLY PAID FOR	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.	LIE
** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 20, enter "20".	/VINCENT S BUTLER/
*** 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.

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Applicant	:	Marcus DaSilva
Serial No.	:	15/495,539
Filed	:	April 24, 2017
For	:	DIRECTED WIRELESS COMMUNICATION
Examiner	:	McKie, Gina M
Art Unit	:	2631
Confirmation No.	:	1050

OFFICE ACTION RESPONSE

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

Commissioner:

In response to the Office action transmitted September 26, 2018, please reconsider the above-captioned application in light of the following amendments and remarks.

Amendments to the Claims are set forth in the listing of the claims beginning on page 2 of this paper; and

Remarks/Arguments begin on page 7 of this paper.

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Electronic Patent Application Fee Transmittal

Application Number:	15495539
Filing Date:	24-Apr-2017
Title of Invention:	DIRECTED WIRELESS COMMUNICATION
First Named Inventor/Applicant Name:	Marcus Da Silva
Filer:	Glen L. Nuttall
Attorney Docket Number:	1640-001.203

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:				
INDEPENDENT CLAIMS IN EXCESS OF 3	2201	1	230	230
Miscellaneous-Filing:				
Petition:				
Patent-Appeals-and-Interference:				
Post-Allowance-and-Post-Issuance:				

Description	Fee Code	Quantity	Amount	Sub-Total in USD($)
Extension-of-Time:				
Extension - 3 months with $0 paid	2253	1	700	700
Miscellaneous:				
		Total in USD ($)		**930**

Electronic Acknowledgement Receipt	
EFS ID:	35538790
Application Number:	15495539
International Application Number:	
Confirmation Number:	1050
Title of Invention:	DIRECTED WIRELESS COMMUNICATION
First Named Inventor/Applicant Name:	Marcus Da Silva
Customer Number:	22145
Filer:	Glen L. Nuttall
Filer Authorized By:	
Attorney Docket Number:	1640-001.203
Receipt Date:	27-MAR-2019
Filing Date:	24-APR-2017
Time Stamp:	02:46:16
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	yes
Payment Type	CARD
Payment was successfully received in RAM	$930
RAM confirmation Number	032719INTEFSW02482500
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		doc11784320190326235436.pdf	435137 2520b6c38578251b31774c7ede756366479 6c402	yes	9

	Multipart Description/PDF files in .zip description		
	Document Description	**Start**	**End**
	Miscellaneous Incoming Letter	9	9
	Applicant Arguments/Remarks Made in an Amendment	7	8
	Claims	2	6
	Amendment/Req. Reconsideration-After Non-Final Reject	1	1

Warnings:

The page size in the PDF is too large. The pages should be 8.5 x 11 or A4. If this PDF is submitted, the pages will be resized upon entry into the Image File Wrapper and may affect subsequent processing

Information:

2	Fee Worksheet (SB06)	fee-info.pdf	32244 704597a5fb97ef6ba11e1e2bd9730d12d29 663ee	no	2

Warnings:

Information:

Total Files Size (in bytes):	467381

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

Applicants:	Marcus Da Silva et al.	
Title:	DIRECTED WIRELESS COMMUNICATION	
Serial No.:	15/495,539	Filed: April 24, 2017
Examiner:	McKie, Gina M.	Group Art Unit: 2631
Attorney Docket No.:	1640-001.203	Confirmation No.: 1050

CERTIFICATE OF EFS-WEB TRANSMISSION
UNDER 37 CFR § 1.8

I hereby certify that the enclosed Office Action Response (8 pages); and Payment by Credit Card are being transmitted to the United States Patent and Trademark Office **from the Pacific Time Zone** via EFS-Web on March 26, 2019.

Date: March 26, 2019

/Glen L. Nuttall/

Glen L. Nuttall

Mailing Address:

KLEIN, O'NEILL & SINGH, LLP (Customer No.: 22145)
16755 Von Karman Avenue, Suite 275
Irvine, California 92606
Tel: 949-955-1920
Fax: 949-955-1921

REMARKS

By this paper Claims 2-7, 10-17 and 19 have been amended, and Claims 1, 9 and 20 have been cancelled without prejudice. Applicant reserves the right to purse the subject matter of the cancelled claims in the future. As such, Claims 2-8 and 10-19 are currently pending for consideration in this application.

Objected-to Claims Rewritten Into Independent Form

The Office Action objected to Claims 2, 5-8, 11, 13-16 and 18-20, but indicated that these claims would be allowable if rewritten into independent form. As such, Claims 2 and 7 have been amended into independent form, incorporating all of the limitations of previous independent Claim 1, which has been cancelled. Claim 11 has also been amended into independent form, incorporating all of the limitations of previous independent Claim 9, which has been cancelled. Lastly, independent Claim 17 has been amended to incorporate all of the limitations of dependent Claim 20, which has been cancelled.

As all of the above-discussed amendments comprise rewriting objected-to claims into independent form, Applicants submit that the pending claims are currently in condition for allowance.

Rejections Under 35 USC 103

The Office Action rejected several claims as unpatentable over Chen (US2002/0137538) in view of Ishii (US 6,714,584). In the interest of simplifying prosecution, Applicant has amended other, objected-to claims into allowable independent forms. Thus, these rejections are moot. Nevertheless, Applicant traverses the rejection, and reserves the right to present claims directed to the same or similar subject matter in the future.

Conclusion

For the foregoing reasons, it is respectfully submitted that the rejections set forth in the outstanding Office action are inapplicable to the current claims. Accordingly, issuance of a Notice of Allowance is requested.

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Please charge any additional fees, including any fees for additional extension of time, or credit overpayment to Deposit Account No. 11-1159.

Respectfully submitted,

Klein, O'Neill & Singh, LLP

Dated: March 25, 2019

By /Glen L Nuttall/
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AMENDMENTS TO THE CLAIMS

Please amend the claims to read as follows. Additions are underlined. Deletions are in ~~strikeout~~ text or [[double brackets]].

1. (Cancelled)

2. (Currently Amended) ~~The receiver as recited in Claim 1,~~ A receiver for use in a wireless communications system, the receiver comprising:

an antenna, wherein the antenna comprises a first antenna element and a second antenna element~~;, and~~

a transceiver operatively coupled to the antenna and configured to transmit and receive electromagnetic signals using the antenna; and

a processor operatively coupled to the transceiver, the processor configured to:

~~wherein the processor is further configured to:~~

receive ~~the~~ a first signal transmission from ~~the~~ a remote station via the first antenna element and ~~the~~ a second signal transmission from the remote station via the second antenna element simultaneously; ~~and~~

determine first signal information for the first signal transmission;

determine second signal information for the second signal transmission, wherein the second signal information is different than the first signal information;

determine a set of weighting values based on the first signal information and the second signal information, wherein the set of weighting values is configured to be used by the remote station to construct one or more beam-formed transmission signals;

cause the transceiver to transmit ~~the~~ a third signal to the remote station via the antenna, the third signal comprising content based on the set of weighting values.

3. (Currently Amended) The receiver as recited in Claim ~~1~~ 2, wherein the first signal transmission and the second signal transmission comprise electromagnetic signals comprising one or more transmission peaks and one or more transmission nulls.

4. (Currently Amended) The receiver as recited in Claim ~~1~~ 3, wherein the first signal transmission and the second signal transmission are directional transmissions.

5. (Currently Amended) The receiver as recited in Claim ~~1~~ 6, wherein the set of weighting values ~~1s~~ is further based on one or more of: a transmit power level, a data transmit rate, an antenna direction, quality of service data, or timing data.

6. (Currently Amended) The receiver as recited in Claim ~~1~~ 2, wherein the content comprises data configured to be used by the remote station to modify the placement of one or more transmission peaks and one or more transmission nulls in a subsequent signal transmission.

7. (Currently Amended) ~~The receiver as recited in Claim 1, wherein the processor is further configured to~~ A receiver for use in a wireless communications system, the receiver comprising:

an antenna;

a transceiver operatively coupled to the antenna and configured to transmit and receive electromagnetic signals using the antenna; and

a processor operatively coupled to the transceiver, the processor configured to:

receive a first signal transmission from a remote station via the antenna and a second signal transmission from the remote station via the antenna simultaneously;

determine first signal information for the first signal transmission;

determine second signal information for the second signal transmission, wherein the second signal information is different than the first signal information;

determine a set of weighting values based on the first signal information and the second signal information, wherein the set of weighting values is configured to be used by the remote station to construct one or more beam-formed transmission signals;

cause the transceiver to generate a third signal comprising content based on the set of weighting values;

determine a plurality of signal strength indications for the first signal

transmission;

determine a first signal strength average based on the plurality of signal strength indications for the first signal transmission;

determine a plurality of signal strength indications for the second signal transmission;

determine a second signal strength average based on the plurality of signal strength indications for the second signal transmission; and

cause the transceiver to generate a fourth signal based on the first signal strength average and the second signal strength average.

8. (Previously Presented) The receiver as recited in Claim 7, wherein the processor is further configured to: cause the transceiver to transmit the fourth signal to the remote station via the antenna.

9. (Cancelled)

10. (Currently Amended) The method as recited in Claim ~~9~~ 11, further comprising: transmitting the third signal to the remote station via the antenna.

11. (Currently Amended) ~~The method as recited in Claim 9~~ A method in a wireless communications system, the method comprising:

receiving a first signal transmission from a remote station via a first antenna element of an antenna and a second signal transmission from the remote station via a second antenna element of the antenna simultaneously, wherein the first signal transmission and the second signal transmission comprise electromagnetic signals comprising one or more transmission peaks and one or more transmission nulls;

determining first signal information for the first signal transmission;

determining second signal information for the second signal transmission, wherein the second signal information is different than the first signal information;

determining a set of weighting values based on the first signal information and the second signal information, wherein the set of weighting values is configured to be used by the

remote station to construct one or more beam-formed transmission signals; and

transmitting to the remote station a third signal comprising content based on the set of weighting values.

12. (Currently Amended) The method as recited in Claim ~~9~~ 11, wherein the first signal transmission and the second signal transmission are directional transmissions.

13. (Currently Amended) The method as recited in Claim ~~9~~ 11, wherein the set of weighting values is further based on one or more of: a transmit power level, a data transmit rate, an antenna direction, quality of service data, or timing data.

14. (Currently Amended) The method as recited in Claim ~~9~~ 13, wherein the content comprises data configured to be used by the remote station to modify the placement of one or more transmission peaks and one or more transmission nulls in a subsequent signal transmission.

15. (Currently Amended) The method as recited in Claim ~~9~~ 14, further comprising:

determining a plurality of signal strength indications for the first signal transmission;

determining a first signal strength average based on the plurality of signal strength indications for the first signal transmission;

determining a plurality of signal strength indications for the second signal transmission;

determining a second signal strength average based on the plurality of signal strength indications for the second signal transmission; and

generating a fourth signal based on the first signal strength average and the second signal strength average.

16. (Previously Presented) The method as recited in Claim 15, further comprising: causing the transceiver to transmit the fourth signal to the remote station via the antenna.

17. (Currently Amended) An apparatus for use in a wireless communications system, the apparatus comprising:

an antenna;

a transceiver operatively coupled to the antenna; and

a processor operatively coupled to the transceiver, the processor configured to:

receive a first signal transmission from a remote station via the antenna,

the first signal transmission comprising first signal information, wherein the first signal information comprises one or more of: a transmit power level, a data transmit rate, an antenna direction, quality of service data, or timing data;

receive a second signal transmission from the remote station via the antenna, the second signal transmission comprising second signal information;

determine a set of weighting values based on the first signal information and the second signal information, wherein the set of weighting values is configured to be used by the remote station to construct one or more beam-formed transmission signals;

cause the transceiver to generate a third signal comprising content based on the set of weighting values.

18. (Previously Presented) The apparatus as recited in Claim 17, wherein the first signal transmission and the second signal transmission comprise electromagnetic signals comprising one or more transmission peaks and one or more transmission nulls.

19. (Currently Amended) The apparatus as recited in Claim ~~17~~ 18, wherein the first signal information comprises one or more of: a transmit power level, a data transmit rate, an antenna direction, quality of service data, or timing data.

20. (Cancelled)

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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
15/495,539	04/24/2017	Marcus Da Silva	1640-001.203	1050

22145 7590 09/26/2018

KLEIN, O'NEILL & SINGH, LLP
16755 VON KARMAN AVENUE
SUITE 275
IRVINE, CA 92606

EXAMINER	
MCKIE, GINA M	

ART UNIT	PAPER NUMBER
2631	

NOTIFICATION DATE	DELIVERY MODE
09/26/2018	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):

KOS_Docketing@koslaw.com

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Petitioner's Exhibit 1002
Page 000088

Office Action Summary	Application No. 15/495,539	Applicant(s) DA SILVA ET AL.	
	Examiner GINA MCKIE	Art Unit 2631	AIA (First Inventor to File) Status No

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

Period for Reply

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

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

Status

1)☒ Responsive to communication(s) filed on *01 August 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) *1-20* 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) *1,3,4,9,10,12 and 17* is/are rejected.

8)☒ Claim(s) *2,5-8,11,13-16 and 18-20* 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 *05 October 2017* 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.

Continued Examination Under 37 CFR 1.114

2. A request for continued examination under 37 CFR 1.114, including the fee set forth in 37 CFR 1.17(e), was filed in this application after final rejection. Since this application is eligible for continued examination under 37 CFR 1.114, and the fee set forth in 37 CFR 1.17(e) has been timely paid, the finality of the previous Office action has been withdrawn pursuant to 37 CFR 1.114. Applicant's submission filed on August 01, 2018 has been entered.

Response to Amendment

3. Acknowledgement is made of the amendment filed August 01, 2018. Claims 1-20 remain pending in the application.

- No claims are currently amended.
- No claims have been canceled.
- No claims are new.

Response to Arguments

4. Applicant's arguments filed October 05, 2017 with respect to the rejection of claims 1-20 is/are rejected under pre-AIA 35 U.S.C. 103(a) as being unpatentable over Crilly, Jr. et al. (US 2002/0158801 A1) in view of Ishii et al. (US 6,714,584) have been fully considered and are persuasive. Therefore, the rejection has been withdrawn. However, upon further consideration, a new ground(s) of rejection is made in view of Chen et al. (US 2002/0137538 A1).

Claim Rejections - 35 USC § 103

5. The following is a quotation of pre-AIA 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

6. The factual inquiries set forth in *Graham v. John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under pre-AIA 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.

2. Ascertaining the differences between the prior art and the claims at issue.

3. Resolving the level of ordinary skill in the pertinent art.

4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

7. Claims 1, 3, 4, 9, 10, 12 and 17 is/are rejected under pre-AIA 35 U.S.C. 103(a) as being unpatentable over Chen et al. (US 2002/0137538 A1) in view of Ishii et al. (US 6,714,584).

Regarding claim 1,

As shown in FIGS. 1-5, Chen discloses a receiver for use in a wireless communications system, the receiver comprising:

- an antenna (**see Chen, FIG. 5, antenna array 506**);
- a transceiver operatively coupled to the antenna and configured to transmit and receive electromagnetic signals using the antenna (**see Chen, FIG. 5, tracking channel 502**); and
- a processor operatively coupled to the transceiver, (**see Chen, FIG. 5, tracking channel 502**) the processor configured to:
    - receive a first signal transmission from a remote station via the antenna and a second signal transmission via the antenna (**see Chen FIG. 5, paragraph [0047]; A tracking receiver 518 in the receiving path is coupled to the diplexer 516. Similar to its search receiver 508 counterpart, the tracking receiver 518 amplifies, filters and downconverts the signal from each tracking element 506a to baseband.)**;

- determine first signal information for the first signal transmission (**see Chen FIG. 5, paragraph [0042]; By applying different weights to the signals at to, and combining them, a directional search beam can effectively be formed in the digital domain. Specifically, a directional search beam can be formed in one angular direction by applying the following algorithm**);
- determine second signal information for the second signal transmission, wherein the second signal information is different than the first signal information (**see Chen FIG. 5, paragraph [0042]; By applying different weights to the signals at to, and combining them, a directional search beam can effectively be formed in the digital domain. Specifically, a directional search beam can be formed in one angular direction by applying the following algorithm**);
- determine a set of weighting values based on the first signal information and the second signal information, wherein the set of weighting values is configured to be used by the remote station to construct one or more beam-formed transmission signals (**see Chen FIG. 5, paragraph [0042]; By applying different weights to the signals at to, and combining them, a directional search beam can effectively be formed in the digital domain. Specifically, a directional search beam can be formed in one angular direction by applying the following algorithm**); and
- cause the transceiver to generate a third signal comprising content based on the set of weighting values (**see Chen, FIG. 5, paragraph [0053]; A**

transmitter 530 is coupled to the tracking filter 526. The transmitter 530 upconverts, filters and amplifies the weighted modulated signal. The output of the transmitter 530 is coupled through the diplexer 516 to the tracking antennas 506a where the signal is transmitted into free space with increased gain in the direction defined by the weights applied to the signal by the tracking filter 526.)

Chen does not specifically disclose "receive a first signal transmission from a remote station via the antenna and a second signal transmission from the remote station via the antenna simultaneously."

However, Ishii in the same field of endeavor discloses receiving a first signal transmission from a remote station via the antenna and a second signal transmission from the remote station via the antenna simultaneously (**see Ishii, col. 3, lines 9-30; "Signals received at different directional antennas 1-1 to 1-N are introduced into delay circuits 2-2 to 2-M. A directivity in a direction, for example, at every equal angle (360/N degrees) is assigned to each of antennas 1-1 to 1-N, respectively. Delay circuit 2-1 has a time delay of 0 and thus is omitted in the drawings. Delay circuits 2-2 to 2-M adaptively delay the received signals so that receivers 3-1 to 3-M may receive simultaneously the desired signal components incoming at different timings."**).

It would have been obvious to one of ordinary skill in the art at the time the present invention was made to modify the invention of Chen as taught by Ishii and

receive a first signal transmission from a remote station via the antenna and a second signal transmission from the remote station via the antenna simultaneously.

Rationale: Applying a known technique to a known device (method, or product) ready for improvement to yield predictable results

To reject a claim based on this rationale, Office personnel must resolve the Graham factual inquiries. Then, Office personnel must articulate the following:

(1) a finding that the prior art contained a “base” device (method, or product) upon which the claimed invention can be seen as an “improvement;”

(2) a finding that the prior art contained a known technique that is applicable to the base device (method, or product);

(3) a finding that one of ordinary skill in the art would have recognized that applying the known technique would have yielded predictable results and resulted in an improved system; and

(4) whatever additional findings based on the Graham factual inquiries may be necessary, in view of the facts of the case under consideration, to explain a conclusion of obviousness. (MPEP § 2143).

In this case:

Chen contains a “base" device of a receiver for use in a wireless communications system which the claimed invention can be seen as an “improvement” in that receiving a

first signal transmission from a remote station via the antenna and a second signal transmission from the remote station via the antenna simultaneously.

Ishii contains known technique of a first signal transmission from a remote station via the antenna and a second signal transmission from the remote station via the antenna simultaneously that is applicable to the “base" device.

Ishii’s known technique a first signal transmission from a remote station via the antenna and a second signal transmission from the remote station via the antenna simultaneously would have been recognized by one of ordinary skill in the art as applicable to the “base” process of Chen and the results would have been predictable and resulted in a receiver for use in a wireless communications system receiving a first signal transmission from a remote station via the antenna and a second signal transmission from the remote station via the antenna simultaneously which results in an improved process.

Therefore, the claimed subject matter would have been obvious to a person having ordinary skill in the art at the time the invention was made.

Regarding claim 3,

The combination of Chen and Ishii discloses the receiver as recited in Claim 1, wherein the first signal transmission and the second signal transmission comprise electromagnetic signals comprising one or more transmission peaks and one or more transmission nulls (**see Chen FIG. 4, paragraph [0035]; “This concept is illustrated in FIG. 4 where an exemplary CDMA cellular system is shown during soft handoff.**

In the exemplary CDMA cellular system, a base station 402 includes a directional antenna such as an antenna array 404 made up of spatially separated individual radiating elements.").

Regarding claim 4,

The combination of Crilly and Ishii discloses the receiver as recited in Claim 1, wherein the first signal transmission and the second signal transmission are directional transmissions (**see Chen FIG. 4, paragraph [0035]; "This concept is illustrated in FIG. 4 where an exemplary CDMA cellular system is shown during soft handoff. In the exemplary CDMA cellular system, a base station 402 includes a directional antenna such as an antenna array 404 made up of spatially separated individual radiating elements."**).

Regarding claim 9,

As shown in FIGS. 1-24, Crilly discloses a method in a wireless communications system, the method comprising:

- receiving a first signal transmission from a remote station via a first antenna element of an antenna and a second signal transmission via a second antenna element of the antenna (**see Chen, FIG. 5, antenna array 506**);
- determining first signal information for the first signal transmission (**see Chen FIG. 5, paragraph [0042]; By applying different weights to the signals at to, and**

combining them, a directional search beam can effectively be formed in the digital domain. Specifically, a directional search beam can be formed in one angular direction by applying the following algorithm);

- determining second signal information for the second signal transmission, wherein the second signal information is different than the first signal information (**see Chen FIG. 5, paragraph [0042]; By applying different weights to the signals at to, and combining them, a directional search beam can effectively be formed in the digital domain. Specifically, a directional search beam can be formed in one angular direction by applying the following algorithm**);
- determining a set of weighting values based on the first signal information and the second signal information, wherein the set of weighting values is configured to be used by the remote station to construct one or more beam-formed transmission signals (**see Chen FIG. 5, paragraph [0042]; By applying different weights to the signals at to, and combining them, a directional search beam can effectively be formed in the digital domain. Specifically, a directional search beam can be formed in one angular direction by applying the following algorithm**); and
- transmitting to the remote station a third signal comprising content based on the set of weighting values (**see Chen, FIG. 5, paragraph [0053]; A transmitter 530 is coupled to the tracking filter 526. The transmitter 530 upconverts, filters and amplifies the weighted modulated signal. The output of the transmitter 530 is coupled through the diplexer 516 to the tracking antennas 506a where the**

signal is transmitted into free space with increased gain in the direction defined by the weights applied to the signal by the tracking filter 526.).

Chen does not specifically disclose "receive a first signal transmission from a remote station via the antenna and a second signal transmission from the remote station via the antenna simultaneously."

However, Ishii in the same field of endeavor discloses receiving a first signal transmission from a remote station via the antenna and a second signal transmission from the remote station via the antenna simultaneously (**see Ishii, col. 3, lines 9-30; "Signals received at different directional antennas 1-1 to 1-N are introduced into delay circuits 2-2 to 2-M. A directivity in a direction, for example, at every equal angle (360/N degrees) is assigned to each of antennas 1-1 to 1-N, respectively. Delay circuit 2-1 has a time delay of 0 and thus is omitted in the drawings. Delay circuits 2-2 to 2-M adaptively delay the received signals so that receivers 3-1 to 3-M may receive simultaneously the desired signal components incoming at different timings."**).

It would have been obvious to one of ordinary skill in the art at the time the present invention was made to modify the invention of Chen as taught by Ishii and receive a first signal transmission from a remote station via the antenna and a second signal transmission from the remote station via the antenna simultaneously.

Rationale: Applying a known technique to a known device (method, or product) ready for improvement to yield predictable results

To reject a claim based on this rationale, Office personnel must resolve the Graham factual inquiries. Then, Office personnel must articulate the following:

(1) a finding that the prior art contained a “base” device (method, or product) upon which the claimed invention can be seen as an “improvement;”

(2) a finding that the prior art contained a known technique that is applicable to the base device (method, or product);

(3) a finding that one of ordinary skill in the art would have recognized that applying the known technique would have yielded predictable results and resulted in an improved system; and

(4) whatever additional findings based on the Graham factual inquiries may be necessary, in view of the facts of the case under consideration, to explain a conclusion of obviousness. (MPEP § 2143).

In this case:

Chen contains a “base" device of a receiver for use in a wireless communications system which the claimed invention can be seen as an “improvement” in that receiving a first signal transmission from a remote station via the antenna and a second signal transmission from the remote station via the antenna simultaneously.

Ishii contains known technique of a first signal transmission from a remote station via the antenna and a second signal transmission from the remote station via the antenna simultaneously that is applicable to the “base" device.

Ishii’s known technique a first signal transmission from a remote station via the antenna and a second signal transmission from the remote station via the antenna simultaneously would have been recognized by one of ordinary skill in the art as applicable to the “base” process of Chen and the results would have been predictable and resulted in a receiver for use in a wireless communications system receiving a first signal transmission from a remote station via the antenna and a second signal transmission from the remote station via the antenna simultaneously which results in an improved process.

Therefore, the claimed subject matter would have been obvious to a person having ordinary skill in the art at the time the invention was made.

Regarding claim 10,

The combination of Chen and Ishii discloses the method as recited in Claim 9, further comprising: transmitting the third signal to the remote station via the antenna (**see Chen FIG. 4, paragraph [0035]; “This concept is illustrated in FIG. 4 where an exemplary CDMA cellular system is shown during soft handoff. In the exemplary CDMA cellular system, a base station 402 includes a directional antenna such as an antenna array 404 made up of spatially separated individual radiating elements.”**).

Regarding claim 12,

The combination of Chen and Ishii discloses the method as recited in Claim 9, wherein the first signal transmission and the second signal transmission are directional transmissions (**see Chen FIG. 4, paragraph [0035]; "This concept is illustrated in FIG. 4 where an exemplary CDMA cellular system is shown during soft handoff. In the exemplary CDMA cellular system, a base station 402 includes a directional antenna such as an antenna array 404 made up of spatially separated individual radiating elements."**).

Regarding claim 17,

As shown in FIGS. 1-24, Crilly discloses an apparatus for use in a wireless communications system, the apparatus comprising:

- an antenna (**see Chen, FIG. 5, antenna array 506**);
- a transceiver operatively coupled to the antenna (**see Chen, FIG. 5, antenna array 506**); and
- a processor operatively coupled to the transceiver (**see Chen, FIG. 5, antenna array 506**), the processor configured to:

- receive a first signal transmission from a remote station via the antenna, the first signal transmission comprising first signal information (**see Chen FIG. 5, paragraph [0042]; By applying different weights to the signals at to, and combining them, a directional search beam can effectively be formed in the digital domain. Specifically, a directional search beam can be formed in one angular direction by applying the following algorithm**);
- receive a second signal transmission via the antenna, the second signal transmission comprising second signal information (**see Chen FIG. 5, paragraph [0042]; By applying different weights to the signals at to, and combining them, a directional search beam can effectively be formed in the digital domain. Specifically, a directional search beam can be formed in one angular direction by applying the following algorithm**);
- determine a set of weighting values based on the first signal information and the second signal information, wherein the set of weighting values is configured to be used by the remote station to construct one or more beam-formed transmission (**see Chen FIG. 5, paragraph [0042]; By applying different weights to the signals at to, and combining them, a directional search beam can effectively be formed in the digital domain. Specifically, a directional search beam can be formed in one angular direction by applying the following algorithm**);

- cause the transceiver to generate a third signal comprising content based on the set of weighting values (**see Chen, FIG. 5, paragraph [0053]; A transmitter 530 is coupled to the tracking filter 526. The transmitter 530 upconverts, filters and amplifies the weighted modulated signal. The output of the transmitter 530 is coupled through the diplexer 516 to the tracking antennas 506a where the signal is transmitted into free space with increased gain in the direction defined by the weights applied to the signal by the tracking filter 526.**).

Chen does not specifically disclose "receive a first signal transmission from a remote station via the antenna and a second signal transmission from the remote station via the antenna simultaneously."

However, Ishii in the same field of endeavor discloses receiving a first signal transmission from a remote station via the antenna and a second signal transmission from the remote station via the antenna simultaneously (**see Ishii, col. 3, lines 9-30; "Signals received at different directional antennas 1-1 to 1-N are introduced into delay circuits 2-2 to 2-M. A directivity in a direction, for example, at every equal angle (360/N degrees) is assigned to each of antennas 1-1 to 1-N, respectively. Delay circuit 2-1 has a time delay of 0 and thus is omitted in the drawings. Delay circuits 2-2 to 2-M adaptively delay the received signals so that receivers 3-1 to 3-M may receive simultaneously the desired signal components incoming at different timings."**).

It would have been obvious to one of ordinary skill in the art at the time the present invention was made to modify the invention of Chen as taught by Ishii and receive a first signal transmission from a remote station via the antenna and a second signal transmission from the remote station via the antenna simultaneously.

Rationale: Applying a known technique to a known device (method, or product) ready for improvement to yield predictable results

To reject a claim based on this rationale, Office personnel must resolve the Graham factual inquiries. Then, Office personnel must articulate the following:

(1) a finding that the prior art contained a “base” device (method, or product) upon which the claimed invention can be seen as an “improvement;”

(2) a finding that the prior art contained a known technique that is applicable to the base device (method, or product);

(3) a finding that one of ordinary skill in the art would have recognized that applying the known technique would have yielded predictable results and resulted in an improved system; and

(4) whatever additional findings based on the Graham factual inquiries may be necessary, in view of the facts of the case under consideration, to explain a conclusion of obviousness. (MPEP § 2143).

In this case:

Chen contains a “base" device of a receiver for use in a wireless communications system which the claimed invention can be seen as an “improvement” in that receiving a first signal transmission from a remote station via the antenna and a second signal transmission from the remote station via the antenna simultaneously.

Ishii contains known technique of a first signal transmission from a remote station via the antenna and a second signal transmission from the remote station via the antenna simultaneously that is applicable to the “base" device.

Ishii’s known technique a first signal transmission from a remote station via the antenna and a second signal transmission from the remote station via the antenna simultaneously would have been recognized by one of ordinary skill in the art as applicable to the “base” process of Chen and the results would have been predictable and resulted in a receiver for use in a wireless communications system receiving a first signal transmission from a remote station via the antenna and a second signal transmission from the remote station via the antenna simultaneously which results in an improved process.

Therefore, the claimed subject matter would have been obvious to a person having ordinary skill in the art at the time the invention was made.

Allowable Subject Matter

8. Claims 2, 5-8, 11, 13-16, and 18-20 are 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

Any inquiry concerning this communication or earlier communications from the examiner should be directed to GINA MCKIE whose telephone number is (571)270-5148. The examiner can normally be reached on Mon-Fri, 8:30 AM-5:00 PM EST.

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, Shuwang Liu can be reached on 571-272-3036. 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.

/GINA MCKIE/
Examiner, Art Unit 2631

/CHIEH M FAN/
Supervisory Patent Examiner, Art Unit 2632

Notice of References Cited	Application/Control No. 15/495,539	Applicant(s)/Patent Under Reexamination DA SILVA ET AL.	
	Examiner GINA MCKIE	Art Unit 2631	Page 1 of 1

U.S. PATENT DOCUMENTS

*		Document Number Country Code-Number-Kind Code	Date MM-YYYY	Name	CPC Classification	US Classification
*	A	US-2002/0137538 A1	09-2002	Chen, Tao	H04B7/0491	455/575.7
	B	US-				
	C	US-				
	D	US-				
	E	US-				
	F	US-				
	G	US-				
	H	US-				
	I	US-				
	J	US-				
	K	US-				
	L	US-				
	M	US-				

FOREIGN PATENT DOCUMENTS

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

NON-PATENT DOCUMENTS

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

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

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Page 000109

Search Notes	Application/Control No.	Applicant(s)/Patent Under Reexamination
	15495539	DA SILVA ET AL.
	Examiner	Art Unit
	GINA MCKIE	2631

CPC- SEARCHED		
Symbol	Date	Examiner
H04L7/042, H04L27/2675 (EAST keyword search)	6/22/2017	gmckie

CPC COMBINATION SETS - SEARCHED		
Symbol	Date	Examiner

US CLASSIFICATION SEARCHED			
Class	Subclass	Date	Examiner

* 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
Performed double patenting search in EAST	6/21/2017	gmckie
Performed initial prior art search in EAST	6/21/2017	gmckie
Updated prior art search in EAST	1/19/2018	gmckie
Updated prior art search in EAST	9/17/2018	gmckie

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

/GINA MCKIE/ Examiner.Art Unit 2631	

Index of Claims	Application/Control No.	Applicant(s)/Patent Under Reexamination
	15495539	DA SILVA ET AL.
	Examiner	Art Unit
	GINA MCKIE	2631

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

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

CLAIM		DATE								
Final	Original	06/21/2017	01/19/2018	09/17/2018						
	1	✓	✓	✓						
	2	✓	✓	O						
	3	✓	✓	✓						
	4	✓	✓	✓						
	5	✓	✓	O						
	6	✓	✓	O						
	7	✓	✓	O						
	8	✓	✓	O						
	9	✓	✓	✓						
	10	✓	✓	✓						
	11	✓	✓	O						
	12	✓	✓	✓						
	13	✓	✓	O						
	14	✓	✓	O						
	15	✓	✓	O						
	16	✓	✓	O						
	17	✓	✓	✓						
	18	✓	✓	O						
	19	✓	✓	O						
	20	✓	✓	O						

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PTO/SB/08 Equivalent

INFORMATION DISCLOSURE STATEMENT BY APPLICANT	Application No.	15/495,539
	Filing Date	April 24, 2017
	First Named Inventor	Marcus Da Silva
	Art Unit	2631
(Multiple sheets used when necessary)	Examiner	McKie, Gina M.
SHEET 1 OF 3	Attorney Docket No.	1640-001.203

U.S. PATENT DOCUMENTS

Examiner Initials	Cite No.	Document Number *Number - Kind Code (if known)* Example: 1,234,567 B1	Publication Date MM-DD-YYYY	Name of Patentee or Applicant	Pages, Columns, Lines Where Relevant Passages or Relevant Figures Appear
	1	5,345,599 A	09-06-1994	Paulraj et al.	
	2	5,515,378 A	05-07-1996	Roy, III et al.	
	3	5,548,813 A	08-20-1996	Charas et al.	
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	5	5,592,490 A	01-07-1997	Barratt et al.	
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	12	6,501,955 B1	12-31-2002	Durrant et al.	
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	18	7,039,441 B1	05-02-2006	Reudink et al.	
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	22	2004/0066762 A1	04-08-2004	Alastalo	

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Examiner Initials	Cite No.	Foreign Patent Document *Country Code-Number-Kind Code* Example: JP 1234567 A1	Publication Date MM-DD-YYYY	Name of Patentee or Applicant	Pages, Columns, Lines Where Relevant Passages or Relevant Figures Appear	T[1]
	23	GB 2349045 A	10-18-2000	Khalab		
	24	WO 00/038455 A1	06-29-2000	Jetzek		
	25	WO 02/063836 A2	08-15-2002	Alastalo		

Examiner Signature /GINA M MCKIE/	Date Considered 09/17/2018

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

T[1] - Place a check mark in this area when an English language Translation is attached.

ALL REFERENCES CONSIDERED EXCEPT WHERE LINED THROUGH. /G.M.M/

PTO/SB/08 Equivalent

INFORMATION DISCLOSURE STATEMENT BY APPLICANT	Application No.	15/495,539
	Filing Date	April 24, 2017
	First Named Inventor	Marcus Da Silva
	Art Unit	2631
(Multiple sheets used when necessary)	Examiner	McKie, Gina M.
SHEET 2 OF 3	Attorney Docket No.	1640-001.203

FOREIGN PATENT DOCUMENTS						
Examiner Initials	Cite No.	Foreign Patent Document *Country Code-Number-Kind Code* Example: JP 1234567 A1	Publication Date MM-DD-YYYY	Name of Patentee or Applicant	Pages, Columns, Lines Where Relevant Passages or Relevant Figures Appear	T[1]
	26	EP 1117270 A2	07-18-2001	Aravamudan et al.		

NON PATENT LITERATURE DOCUMENTS			
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, page(s), volume-issue number(s), publisher, city and/or country where published.	T[1]
	27	Petition for Inter Partes Review of U.S. Patent No. 6,611,231; CISCO SYSTEMS, INC. v. XR COMMUNICATIONS LLC; Case No. IPR2018-00762; pages 1-92.	No dates
	28	Petition for Inter Partes Review of U.S. Patent No. 7,729,728; CISCO SYSTEMS, INC. v. XR COMMUNICATIONS LLC; Case No. IPR2018-00763; pages 1-72.	
	29	Petition for Inter Partes Review of U.S. Patent No. 7,062,296; CISCO SYSTEMS, INC. v. XR COMMUNICATIONS LLC; Case No. IPR2018-00764; pages 1-83.	
	30	Petition for Inter Partes Review of U.S. Patent No. 7,062,296; ARUBA NETWORKS, INC. v. XR COMMUNICATIONS, LLC; Case No. IPR2018-00725; pages 1-68.	
	31	Petition for Inter Partes Review of U.S. Patent No. 7,729,728; ARUBA NETWORKS, INC. v. XR COMMUNICATIONS, LLC; Case No. IPR2018-00726; pages 1-53.	
	32	Petition for Inter Partes Review of U.S. Patent No. 6,611,231; ARUBA NETWORKS, INC. v. XR COMMUNICATIONS, LLC; Case No. IPR2018-00704; pages 1-76.	
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	41	"Radio Spectrum Allocation," Federal Communications Commission, available at https://www.fcc.gov/engineeringtechnology/policy-and-rules-division/general/radio-spectrumallocation	

Examiner Signature /GINA M MCKIE/	Date Considered 09/23/2018

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

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PTO/SB/08 Equivalent

INFORMATION DISCLOSURE STATEMENT BY APPLICANT	Application No.	15/495,539
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	First Named Inventor	Marcus Da Silva
	Art Unit	2631
(Multiple sheets used when necessary)	Examiner	McKie, Gina M.
SHEET 3 OF 3	Attorney Docket No.	1640-001.203

NON PATENT LITERATURE DOCUMENTS			
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, page(s), volume-issue number(s), publisher, city and/or country where published.	T[1]
	42	IEEE 802.11-1997	
	43	Jack H. Winters, "Smart Antennas," Chapter 6 of WTEC PANEL REPORT ON WIRELESS TECHNOLOGIES AND INFORMATION NETWORKS (July 2000).	
	44	Constantine Balanis, ANTENNA THEORY (1997) (selected pages).	
	45	S.C. Swales, et al., "The Performance Enhancement of Multibeam Adaptive Base-Station Antennas for Cellular Land Mobile Radio Systems," IEEE TRANSACTIONS ON VEHICULAR TECHNOLOGY, vol. 39, no. 1 (Feb. 1990).	
	46	John Litva, et al., DIGITAL BEAMFORMING IN WIRELESS NETWORKS (1996) (selected pages).	
	47	Joseph C. Liberti, Jr., et al., SMART ANTENNAS FOR WIRELESS COMMUNICATIONS (1999) (selected pages).	
	48	IEEE Standards Bearer (Oct. 1997)	
	49	Petition for Inter Partes Review of U.S. Patent No. 6,611,231; RUCKUS WIRELESS, INC. et al. v. XR COMMUNICATIONS LLC, Case No. IPR2018-01016, 87 pages.	No dates
	50	Petition for Inter Partes Review of U.S. Patent No. 7,062,296; RUCKUS WIRELESS, INC. et al. v. XR COMMUNICATIONS LLC, Case No. IPR2018-01017, 79 pages.	
	51	Petition for Inter Partes Review of U.S. Patent No. 7,729,728; RUCKUS WIRELESS, INC. et al. v. XR COMMUNICATIONS LLC, Case No. IPR2018-01018, 65 pages.	
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	53	Andrew S. Tanenbaum, Computer Networks, Third Edition, Prentice Hall (1996)	
	54	Patent Owner's Preliminary Response, CISCO SYSTEMS, INC. v. XR COMMUNICATIONS LLC, Case No. IPR2018-00762, U.S. Patent No. 6,611,231, 38 pages.	
	55	Patent Owner's Preliminary Response, CISCO SYSTEMS, INC. v. XR COMMUNICATIONS LLC, Case No. IPR2018-00764, U.S. Patent No. 7,062,296, 47 pages.	
	56	Patent Owner's Preliminary Response, ARUBA NETWORKS, INC. v. XR COMMUNICATIONS, LLC, Case No. IPR2018-00725, U.S. Patent No. 7,062,296, 35 pages.	
	57	Patent Owner's Preliminary Response, ARUBA NETWORKS, INC. v. XR COMMUNICATIONS, LLC, Case No. IPR2018-00701, U.S. Patent No. 6,611,231, 51 pages.	

Examiner Signature	/GINA M MCKIE/	Date Considered	09/17/2018

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

T[1] - Place a check mark in this area when an English language Translation is attached.

ALL REFERENCES CONSIDERED EXCEPT WHERE LINED THROUGH. /G.M.M/

Electronic Acknowledgement Receipt

EFS ID:	33348676
Application Number:	15495539
International Application Number:	
Confirmation Number:	1050
Title of Invention:	DIRECTED WIRELESS COMMUNICATION
First Named Inventor/Applicant Name:	Marcus Da Silva
Customer Number:	22145
Filer:	Glen L. Nuttall/Mariel Boyan
Filer Authorized By:	Glen L. Nuttall
Attorney Docket Number:	1640-001.203
Receipt Date:	01-AUG-2018
Filing Date:	24-APR-2017
Time Stamp:	17:47:23
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		1640-001-203--IDSAsFiled08012018.pdf	426542 eb84458129ada2fb7c88769bec5b8cb2b71d946e	yes	6

	Multipart Description/PDF files in .zip description		
	Document Description	**Start**	**End**
	Information Disclosure Statement (IDS) Form (SB08)	4	6
	Transmittal Letter	1	3

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2	Foreign Reference	GB2349045A.pdf	1662577 1eaac5002304aaad9c29727661ac9cc5abcabbf2	no	43

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3	Foreign Reference	WO0038455A1.pdf	1134190 ef8c3c4abe5c466f4fe2ee02d04ba91fab665268	no	33

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4	Foreign Reference	WO02063836A2.pdf	1589220 c73dd90f7ebc2d4cec0b508fb0ae147dc8eb027a	no	38

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5	Foreign Reference	EP1117270A2.pdf	553790 e9403f5aa17c00ce63adbe5f10a3ee9bafe137ea	no	9

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6	Non Patent Literature	IPR2018-00762-1.pdf	14657236 088aaeab7c0692ffb86f01fc2661809f8c92497c	no	50

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8	Non Patent Literature	IPR2018-00763.pdf	1950163 0481a11791ff3b65d96518accabb03034c944cd6	no	72
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Information:					
34	Non Patent Literature	IPR2018-00762--PO_PreliminaryResponse06272018-1.pdf	15752844 6f4d98c6e056731671bc7ba7b1380b2f79ff9e28	no	38

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35	Non Patent Literature	IPR2018-00764--PO_PreliminaryResponse06212018-1.pdf	18563044 e86d946e66396d2fa896af9583401379849fb2ee	no	47
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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.

PTO/SB/30 (11-17)
Approved for use through 11/30/2020. OMB 0651-0031
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Request for Continued Examination (RCE) Transmittal

Address to:
Mail Stop RCE
Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Application Number	15/495,539
Filing Date	April 24, 2017
First Named Inventor	Marcus Da Silva
Art Unit	2631
Examiner Name	Mckie, Gina M.
Attorney Docket Number	1640-001.203

This is a Request for Continued Examination (RCE) under 37 CFR 1.114 of the above-identified application.
Request for Continued Examination (RCE) practice under 37 CFR 1.114 does not apply to any utility or plant application filed prior to June 8, 1995, or to any design application. See Instruction Sheet for RCEs (not to be submitted to the USPTO) on page 2.

1. Submission required under 37 CFR 1.114 Note: If the RCE is proper, any previously filed unentered amendments and amendments enclosed with the RCE will be entered in the order in which they were filed unless applicant instructs otherwise. If applicant does not wish to have any previously filed unentered amendment(s) entered, applicant must request non-entry of such amendment(s).

   a. ☐ Previously submitted. If a final Office action is outstanding, any amendments filed after the final Office action may be considered as a submission even if this box is not checked.

      i. ☐ Consider the arguments in the Appeal Brief or Reply Brief previously filed on _____

      ii. ☐ Other _____

   b. ☑ Enclosed

      i. ☑ Amendment/Reply

      ii. ☐ Affidavit(s)/ Declaration(s)

      iii. ☐ Information Disclosure Statement (IDS)

      iv. ☐ Other _____

2. Miscellaneous

   a. ☐ Suspension of action on the above-identified application is requested under 37 CFR 1.103(c) for a period of _____ months. (Period of suspension shall not exceed 3 months; Fee under 37 CFR 1.17(i) required)

   b. ☐ Other _____

3. Fees The RCE fee under 37 CFR 1.17(e) is required by 37 CFR 1.114 when the RCE is filed.

   a. ☑ The Director is hereby authorized to charge the following fees, any underpayment of fees, or credit any overpayments, to Deposit Account No. 11-1159.

      i. ☐ RCE fee required under 37 CFR 1.17(e)

      ii. ☐ Extension of time fee (37 CFR 1.136 and 1.17)

      iii. ☐ Other _____

   b. ☐ Check in the amount of $ _____ enclosed

   c. ☐ Payment by credit card (Form PTO-2038 enclosed)

   d. ■ Payment by EFS-Web

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

SIGNATURE OF APPLICANT, ATTORNEY, OR AGENT REQUIRED

Signature	/Glen L Nuttall/	Date	July 25, 2018
Name (Print/Type)	Glen L. Nuttall	Registration No.	46,188

CERTIFICATE OF MAILING OR TRANSMISSION

I hereby certify that this correspondence is being EFS-Web transmitted to the United States Patent and Trademark Office (USPTO), deposited with the United States Postal Service with sufficient postage as first class mail in an envelope addressed to: Mail Stop RCE, Commissioner for Patents, P. O. Box 1450, Alexandria, VA 22313-1450 or facsimile transmitted to the USPTO on the date shown below.

Signature			
Name (Print/Type)		Date	

This collection of information is required by 37 CFR 1.114. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.11 and 1.14. This collection is estimated to take 12 minutes to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Mail Stop RCE, 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.

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Applicants:	Marcus Da Silva et al.	
Title:	DIRECTED WIRELESS COMMUNICATION	
Serial No.:	15/495,539	Filed: April 24, 2017
Examiner:	McKie, Gina M.	Group Art Unit: 2631
Attorney Docket No.:	1640-001.203	

CERTIFICATE OF EFS-WEB TRANSMISSION
UNDER 37 CFR § 1.8

I hereby certify that the enclosed Request for Continued Examination Transmittal (1 page); Office Action Response (7 pages); and Payment by Credit Card are being transmitted to the United States Patent and Trademark Office from the Pacific Time Zone via EFS-Web on July 25, 2018.

Date: July 25, 2018

/Glen L. Nuttall/

Glen L. Nuttall

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16755 Von Karman Avenue, Suite 275
Irvine, California 92606
Tel: 949-955-1920
Fax: 949-955-1921

Electronic Patent Application Fee Transmittal	
Application Number:	15495539
Filing Date:	24-Apr-2017
Title of Invention:	DIRECTED WIRELESS COMMUNICATION
First Named Inventor/Applicant Name:	Marcus Da Silva
Filer:	Glen L. Nuttall
Attorney Docket Number:	1640-001.203
Filed as Small Entity	
Filing Fees for Utility under 35 USC 111(a)	

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

Description	Fee Code	Quantity	Amount	Sub-Total in USD($)
Extension - 3 months with $0 paid	2253	1	700	700
Miscellaneous:				
RCE- 1ST REQUEST	2801	1	650	650
		Total in USD ($)		**1350**

Electronic Acknowledgement Receipt	
EFS ID:	33286570
Application Number:	15495539
International Application Number:	
Confirmation Number:	1050
Title of Invention:	DIRECTED WIRELESS COMMUNICATION
First Named Inventor/Applicant Name:	Marcus Da Silva
Customer Number:	22145
Filer:	Glen L. Nuttall
Filer Authorized By:	
Attorney Docket Number:	1640-001.203
Receipt Date:	26-JUL-2018
Filing Date:	24-APR-2017
Time Stamp:	02:05:07
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	yes
Payment Type	CARD
Payment was successfully received in RAM	$1350
RAM confirmation Number	072618INTEFSW02094700
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		doc08676520180725231047.pdf	494437 052858b432cdf8bcf91b899900bbed51f0b6ff2f	yes	9

	Multipart Description/PDF files in .zip description		
	Document Description	**Start**	**End**
	Response After Final Action	3	9
	Request for Continued Examination (RCE)	2	2
	Miscellaneous Incoming Letter	1	1

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The page size in the PDF is too large. The pages should be 8.5 x 11 or A4. If this PDF is submitted, the pages will be resized upon entry into the Image File Wrapper and may affect subsequent processing

Information:

2	Fee Worksheet (SB06)	fee-info.pdf	32180 c7b28bf36f4c14365d277ad5179ce44ef8a1155e	no	2

Warnings:

Information:

Total Files Size (in bytes):	526617

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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

Applicant	:	Marcus DaSilva
Serial No.	:	15/495,539
Filed	:	April 24, 2017
For	:	DIRECTED WIRELESS COMMUNICATION
Examiner	:	McKie, Gina M
Art Unit	:	2631
Confirmation No.	:	1050

OFFICE ACTION RESPONSE

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

Commissioner:

In response to the Office action transmitted January 24, 2018, and in conjunction with the Request for Continued Examination filed herewith, please reconsider the above-captioned application in light of the following remarks, which begin on page 2 of this paper.

IPR2024-00613
Petitioner's Exhibit 1002
Page 000129

REMARKS

By this paper none of the claims have been amended. As such, Claims 1-20 remain pending for consideration in this application.

The Office Action rejected Claims 1-20 under 35 USC 103 as being unpatentable over US Publication US 2002/0158801 to Crilly in view of US Pat. 6,714,584 to Ishii. Applicant respectfully traverses the rejection, contending that Crilly is not prior art to the present application.

The present application claims priority to US Provisional Application No. 62/423,660, which was filed November 4, 2002. The Provisional application includes a compilation of several documents, labeled Appendices A-L on page 2. These documents describe aspects and embodiments of Applicant's invention existing at the time the particular document was written.

Document A, at page A-71, lists several "References" used in compiling Document A. Included in the References list is "[2] Ed Casas, 'Beamforming for LittleJoe', ViVATO Technical Report, Feb 1, 2002", which is Document C of the Provisional. At least Document C describes aspects of Applicant's invention that had been invented at least as early as February, 2002, which is well before Crilly was published (October 31, 2002). As such, at least the disclosure in Document C was invented before Crilly was published, and Crilly is not prior art to such disclosure.

As demonstrated by Document C, at least the limitations that the Office Action contends are taught by Crilly were invented by Applicant prior to Crilly's publication.

For example, with respect to independent Claim 1 (and OA at pp.6-7) Doc C describes:

- an antenna
  - see C-2, section 1.2.
- a transceiver operatively coupled to the antenna and configured to transmit and receive electromagnetic signals using the antenna
  - see C-1 – C-2, C-4 ("each array element [can] generate the receive and transmit beams") and throughout Document C.
- a processor operatively coupled to the transceiver, the processor configured to:
  - C-1 and C-2, including Fig. 1 disclose a PC
- receive a first signal transmission for a remote station via the antenna and a second signal transmission from the remote station via the antenna

- C-3: "The signal received by the array elements will be the vector sum of signals arriving by many paths." C-3 also refers to the "arrival of signals from the desired and undesired users".

- determine first signal information for the first signal transmission
  - C-4: "The beamforming application uses the signal strength information derived from packet receptions by the 'searcher' receivers."
- determine second signal information for the second signal transmission, wherein the second signal information is different than the first signal information
  - C-4: "The beamforming application uses the signal strength information derived from packet receptions by the 'searcher' receivers. However, not all of these receivers will correctly receive each packet." Also, "Each beam points in a different direction . . . ."
- determine a set of weighting values based on the first signal information and the second signal information, wherein the set of weighting values is configured to be used by the remote station to construct one or more beam-formed transmission signals
  - C-4: "The beamforming algorithm computes the beamforming weights for a particular client (identified by its wireless MAC address) and stores it in a table which is made available to the application running the modified (polling) MAC protocol on 'card 13'".
- cause the transceiver to generate a third signal comprising content based on the set of weighting values
  - C-1: "This signal level information is used to compute the complex weights for a second RF beamformer. This so-called 'card 13' beamformer allows independent complex weights on each array element. This beamformer is connected to an additional WLAN card which is the one actually used for communication (it can transmit and receive)."
  - C-4: "The beamforming algorithm computes the beamforming weights for a particular client (identified by its wireless MAC address) and stores it in a table which is made available to the application running the modified (polling) MAC protocol on 'card 13'".

As demonstrated above, Document C of the Provisional application teaches at least the limitations that the Office Action contends are taught by Crilly in connection with the rejection of Claim 1. Since Document C demonstrates aspects invented by Applicant prior to Crilly's publication, Crilly is not prior art at least for the invention recited in Claim 1. As such, Applicant

respectfully requests that the rejection of Claim 1, and Claims 2-8 which depend therefrom, be withdrawn.

With respect to independent Claim 9 (and OA at pp. 14-15) Doc C describes:

- receiving a first signal transmission from a remote station via a first antenna element of an antenna and a second signal transmission from the remote station via a second antenna element of the antenna
    - C-3: "The signal received by the array elements will be the vector sum of signals arriving by many paths." C-3 also refers to the "arrival of signals from the desired and undesired users".
- determining first signal information for the first signal transmission
    - C-4: "The beamforming application uses the signal strength information derived from packet receptions by the 'searcher' receivers."
- determining second signal information for the second signal transmission, wherein the second signal information is different than the first signal information
    - C-4: "The beamforming application uses the signal strength information derived from packet receptions by the 'searcher' receivers. However, not all of these receivers will correctly receive each packet." Also, "Each beam points in a different direction . . . ."
- determining a set of weighting values based on the first signal information and the second signal information, wherein the set of weighting values is configured to be used by the remote station to construct one or more beam-formed transmission signals
    - C-4: "The beamforming algorithm computes the beamforming weights for a particular client (identified by its wireless MAC address) and stores it in a table which is made available to the application running the modified (polling) MAC protocol on 'card 13'".
- transmitting to the remote station a third signal comprising content based on the set of weighting values
    - C-1: "This signal level information is used to compute the complex weights for a second RF beamformer. This so-called 'card 13' beamformer allows independent complex weights on each array element. This beamformer is connected to an additional WLAN card which is the one actually used for communication (it can transmit and receive)."

- C-4: "The beamforming algorithm computes the beamforming weights for a particular client (identified by its wireless MAC address) and stores it in a table which is made available to the application running the modified (polling) MAC protocol on 'card 13'".

As demonstrated above, Document C of the Provisional application teaches at least the limitations that the Office Action contends are taught by Crilly in connection with the rejection of Claim 9. Since Document C demonstrates aspects invented by Applicant prior to Crilly's publication, Crilly is not prior art at least for the invention recited in Claim 9. As such, Applicant respectfully requests that the rejection of Claim 1, and Claims 10-16 which depend therefrom, be withdrawn.

With respect to independent Claim 17 (and OA at pp. 21-23) Doc C describes:

- an antenna
  - see C-2, section 1.2.
- a transceiver operatively coupled to the antenna
  - see C-1 – C-2, C-4 ("each array element [can] generate the receive and transmit beams") and throughout Document C.
- a processor operatively coupled to the transceiver, the processor configured to:
  - C-1 and C-2, including Fig. 1 disclose a PC
- receive a first signal transmission via the antenna, the first signal transmission comprising first signal information
  - C-3: "The signal received by the array elements will be the vector sum of signals arriving by many paths." C-3 also refers to the "arrival of signals from the desired and undesired users".
  - C-4: "The beamforming application uses the signal strength information derived from packet receptions by the 'searcher' receivers."
- receive a second signal transmission via the antenna, the second signal transmission comprising second signal information
  - C-3: "The signal received by the array elements will be the vector sum of signals arriving by many paths." C-3 also refers to the "arrival of signals from the desired and undesired users".
  - C-4: "The beamforming application uses the signal strength information derived from packet receptions by the 'searcher' receivers."
- determine a set of weighting values based on the first signal information and the second signal information, wherein the set of weighting values is configured to be

used by the remote station to construct one or more beam-formed transmission signals

- C-4: "The beamforming algorithm computes the beamforming weights for a particular client (identified by its wireless MAC address) and stores it in a table which is made available to the application running the modified (polling) MAC protocol on 'card 13'".

- cause the transceiver to generate a third signal comprising content based on the set of weighting values
  - C-1: "This signal level information is used to compute the complex weights for a second RF beamformer. This so-called 'card 13' beamformer allows independent complex weights on each array element. This beamformer is connected to an additional WLAN card which is the one actually used for communication (it can transmit and receive)."
  - C-4: "The beamforming algorithm computes the beamforming weights for a particular client (identified by its wireless MAC address) and stores it in a table which is made available to the application running the modified (polling) MAC protocol on 'card 13'".

As demonstrated above, Document C of the Provisional application teaches at least the limitations that the Office Action contends are taught by Crilly in connection with the rejection of Claim 17. Since Document C demonstrates aspects invented by Applicant prior to Crilly's publication, Crilly is not prior art at least for the invention recited in Claim 17. As such, Applicant respectfully requests that the rejection of Claim 17, and Claims 18-20 which depend therefrom, be withdrawn.

Conclusion

For the foregoing reasons, it is respectfully submitted that the rejections set forth in the outstanding Office action are inapplicable to the current claims. Accordingly, issuance of a Notice of Allowance is requested.

Please charge any additional fees, including any fees for additional extension of time, or credit overpayment to Deposit Account No. 11-1159.

Respectfully submitted,

Klein, O'Neill & Singh, LLP

Dated: July 25, 2018

By /Glen L Nuttall/
Glen L Nuttall, Reg. No. 46,188
Telephone: (949) 955-1920

Klein, O'Neill & Singh, LLP
16755 Von Karman, Suite 275
Irvine, CA 92606
T (949) 955-1920
F (949) 955-1921

UNITED STATES PATENT AND TRADEMARK OFFICE

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

APPLICATION NUMBER	FILING OR 371(C) DATE	FIRST NAMED APPLICANT	ATTY. DOCKET NO./TITLE
15/495,539	04/24/2017	Marcus Da Silva	1640-001.203

CONFIRMATION NO. 1050

22145
KLEIN, O'NEILL & SINGH, LLP
16755 VON KARMAN AVENUE
SUITE 275
IRVINE, CA 92606

POWER OF ATTORNEY NOTICE

OC00000009738743

Date Mailed: 03/01/2018

NOTICE REGARDING CHANGE OF POWER OF ATTORNEY

This is in response to the Power of Attorney filed 02/27/2018.

- The Power of Attorney to you in this application has been revoked by the applicant. Future correspondence will be mailed to the new address of record(37 CFR 1.33).

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

/sleutchit/

IPR2024-00613
Petitioner's Exhibit 1002
Page 000136

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Alexandria, Virginia 22313-1450
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APPLICATION NUMBER	FILING OR 371(C) DATE	FIRST NAMED APPLICANT	ATTY. DOCKET NO./TITLE
15/495,539	04/24/2017	Marcus Da Silva	1640-001.203

CONFIRMATION NO. 1050

22145
KLEIN, O'NEILL & SINGH, LLP
16755 VON KARMAN AVENUE
SUITE 275
IRVINE, CA 92606

POA ACCEPTANCE LETTER

OC00000097738791

Date Mailed: 03/01/2018

NOTICE OF ACCEPTANCE OF POWER OF ATTORNEY

This is in response to the Power of Attorney filed 02/27/2018.

The Power of Attorney in this application is accepted. Correspondence in this application will be mailed to the above address as provided by 37 CFR 1.33.

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

/sleutchit/

IPR2024-00613
Petitioner's Exhibit 1002
Page 000137

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

PTO/AIA/82B (07-13)
Approved for use through 11/30/2014. OMB 0651-0051
U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE
Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it displays a valid OMB control number

POWER OF ATTORNEY BY APPLICANT

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

Application Number	Filing Date

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

☑ I hereby appoint the Patent Practitioner(s) associated with the following Customer Number as my/our attorney(s) or agent(s), and to transact all business in the United States Patent and Trademark Office connected therewith for the application referenced in the attached transmittal letter (form PTO/AIA/82A) or identified above: 22145

OR

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

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

☑ The address associated with the above-mentioned Customer Number

OR

☐ The address associated with Customer Number:

OR

Firm or Individual Name					
Address					
City		State		Zip	
Country					
Telephone		Email			

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

XR Communications, LLC d/b/a Vivato Technologies

☐ Inventor or Joint Inventor (title not required below)

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

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

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

SIGNATURE of Applicant for Patent

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

Signature		Date (Optional)	1/10/2018
Name	Kai Hansen		
Title	Managing Member		

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

☐ Total of forms are submitted.

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

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Electronic Acknowledgement Receipt

EFS ID:	31908581
Application Number:	15495539
International Application Number:	
Confirmation Number:	1050
Title of Invention:	DIRECTED WIRELESS COMMUNICATION
First Named Inventor/Applicant Name:	Marcus Da Silva
Customer Number:	22145
Filer:	Glen L. Nuttall/Mariel Boyan
Filer Authorized By:	Glen L. Nuttall
Attorney Docket Number:	1640-001.203
Receipt Date:	27-FEB-2018
Filing Date:	24-APR-2017
Time Stamp:	20:10:57
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		1640-001-203--POAAsFiled02272018.pdf	209878 724297203efe4ec3431583166dcc38e89f8bba52	yes	2

	Multipart Description/PDF files in .zip description		
	Document Description	**Start**	**End**
	Transmittal Letter	1	1
	Power of Attorney	2	2

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Information:

Total Files Size (in bytes):	209878

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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.

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

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Application Number	15/495,539
Filing Date	April 24, 2017
First Named Inventor	Marcus Da Silva
Title	DIRECTED WIRELESS COMMUNICATION
Art Unit	2631
Examiner Name	Mckie, Gina M.
Attorney Docket Number	1640-001.203

SIGNATURE of Applicant or Patent Practitioner

Signature		Date (Optional)	February 27, 2018
Name	Glen L. Nuttall	Registration Number	46,188
Title (if Applicant is a juristic entity)			
Applicant Name (if Applicant is a juristic entity)			

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

☐ *Total of _____ forms are submitted.

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

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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
15/495,539	04/24/2017	Marcus Da Silva	1640-001.203	1050

22145 7590 01/25/2018
KLEIN, O'NEILL & SINGH, LLP
16755 VON KARMAN AVENUE
SUITE 275
IRVINE, CA 92606

EXAMINER	
MCKIE, GINA M	

ART UNIT	PAPER NUMBER
2631	

NOTIFICATION DATE	DELIVERY MODE
01/25/2018	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):

KOS_Docketing@koslaw.com

IPR2024-00613
Petitioner's Exhibit 1002
Page 000142

Office Action Summary	Application No. 15/495,539	Applicant(s) DA SILVA ET AL.	
	Examiner GINA MCKIE	Art Unit 2631	AIA (First Inventor to File) Status No

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

Period for Reply

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

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

Status

1)☒ Responsive to communication(s) filed on *05 October 2017*.

☐ 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) *1-20* 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) *1-20* is/are rejected.

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

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

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

Application Papers

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

11)☒ The drawing(s) filed on *05 October 2017* 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: _____.

IPR2024-00613
Petitioner's Exhibit 1002
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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 Amendment

2. Acknowledgement is made of the amendment filed October 05, 2017. Claims 1-20 remain pending in the application.

- No claims are currently amended.
- No claims have been canceled.
- No claims are new.

Response to Arguments

3. Applicant's arguments filed October 05, 2017 with respect to the rejection of claims 1-20 is/are rejected under pre-AIA 35 U.S.C. 103(a) as being unpatentable over Crilly, Jr. et al. (US 2002/0158801 A1) in view of Ishii et al. (US 6,714,584) have been fully considered but they are not persuasive. The examiner has thoroughly reviewed the applicant's arguments, however, firmly believes that the cited reference reasonably and properly meets the claimed limitation as rejected.

The applicant is reminded that the examiner is entitled to give the broadest reasonable interpretation to the language of the claim. A broad interpretation of a claim

by USPTO personnel will reduce the possibility that the claim, when issued, will be interpreted more broadly than is justified or intended.

The applicant is reminded that the rejection is made based on the entire content of the cited prior art.

(1) Applicant's arguments: "However, the cited portions of Ishii do not disclose or suggest receiving signal components from the same transmitter. In fact, Ishii discloses that the "present invention relates to CDMA (Code Division Multiple Access) adaptive antenna . . . for separating and synthesizing a plural of desired signal components incoming at a plural of different timings and from a *plural of different directions at each timing." Id.,*column 1, lines 8-13 (emphasis added). In Ishii, signal components come from a plurality of different directions, and are thus associated with *different* transmitters. In contrast, claim 1 recites "receive a first signal transmission from *a* remote station via the antenna and a second signal transmission from *the* remote station" (emphasis added).," (see REMARKS, page 11, line 23 – page 12, line 6).

Examiner's response:

In response to applicant's arguments against the references individually, one cannot show nonobviousness by attacking references individually where the rejections are based on combinations of references. See *In re Keller*, 642 F.2d 413, 208 USPQ 871 (CCPA 1981); *In re Merck & Co.,* 800 F.2d 1091, 231 USPQ 375 (Fed. Cir. 1986).

The combination of Crilly, Jr. and Ishii discloses receive a first signal transmission from *a* remote station via the antenna and a second signal transmission from *the* remote station."

Crilly discloses receive a first signal transmission from a remote station via the antenna and a second signal transmission via the antenna (**see Crilly FIG. 4, paragraph [0091]; These signals, both desired and undesired, are collected by receiving elements within antenna array 110 and are eventually provided to control logic 110.**);

Crilly does not specifically disclose "receive a first signal transmission from a remote station via the antenna and a second signal transmission from the remote station via the antenna simultaneously."

However, Ishii in the same field of endeavor discloses receiving a first signal transmission from a remote station via the antenna and a second signal transmission from the remote station via the antenna simultaneously (**see Ishii, col. 3, lines 9-30; "Signals received at different directional antennas 1-1 to 1-N are introduced into delay circuits 2-2 to 2-M. A directivity in a direction, for example, at every equal angle (360/N degrees) is assigned to each of antennas 1-1 to 1-N, respectively. Delay circuit 2-1 has a time delay of 0 and thus is omitted in the drawings. Delay circuits 2-2 to 2-M adaptively delay the received signals so that receivers 3-1 to 3-M may receive simultaneously the desired signal components incoming at different timings."**).

Therefore, the combination of Crilly, Jr. and Ishii discloses receive a first signal transmission from *a* remote station via the antenna and a second signal transmission from *the* remote station."

Claim Rejections - 35 USC § 103

4. The following is a quotation of pre-AIA 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

5. The factual inquiries set forth in *Graham v. John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under pre-AIA 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.

2. Ascertaining the differences between the prior art and the claims at issue.

3. Resolving the level of ordinary skill in the pertinent art.

4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

6. Claims 1-20 is/are rejected under pre-AIA 35 U.S.C. 103(a) as being unpatentable over Crilly, Jr. et al. (US 2002/0158801 A1) in view of Ishii et al. (US 6,714,584).

Regarding claim 1,

As shown in FIGS. 1-24, Crilly discloses a receiver for use in a wireless communications system, the receiver comprising:

- an antenna (**see Crilly, FIG. 4, antenna array 110**);
- a transceiver operatively coupled to the antenna and configured to transmit and receive electromagnetic signals using the antenna (**see Crilly, FIG. 2, transmitter/receiver 114**); and
- a processor operatively coupled to the transceiver, (**see Crilly, FIG. 4, control logic 112**) the processor configured to:
    - receive a first signal transmission from a remote station via the antenna and a second signal transmission via the antenna (**see Crilly FIG. 4, paragraph [0091]; These signals, both desired and undesired, are collected by receiving elements within antenna array 110 and are eventually provided to control logic 110.**);
    - determine first signal information for the first signal transmission (**see Crilly, paragraph [0092]; Here, control logic 112 includes a search receiver 164 that is configured to update routing information 120 with regard to the received signals.**);
    - determine second signal information for the second signal transmission, wherein the second signal information is different than the first signal information (**see Crilly, paragraph [0092]; Here, control logic 112 includes**

a search receiver 164 that is configured to update routing information 120 with regard to the received signals.);

- determine a set of weighting values based on the first signal information and the second signal information, wherein the set of weighting values is configured to be used by the remote station to construct one or more beam-formed transmission signals (**see Crilly, paragraph [0093]; The stored weighting values associated with each connection/source are utilized in a weighting matrix 166. Weighting matrix 166 operates so as to apply the latest weighting values to the received signals and also to transmitted signals. In this illustrative example, subsequently received signals will be processed using the most recent weighting values in the weighting matrix.**); and
- cause the transceiver to generate a third signal comprising content based on the set of weighting values (**see Crilly, paragraph [0093]; The stored weighting values associated with each connection/source are utilized in a weighting matrix 166. Weighting matrix 166 operates so as to apply the latest weighting values to the received signals and also to transmitted signals. In this illustrative example, subsequently received signals will be processed using the most recent weighting values in the weighting matrix.**)

Crilly does not specifically disclose "receive a first signal transmission from a remote station via the antenna and a second signal transmission from the remote station via the antenna simultaneously."

However, Ishii in the same field of endeavor discloses receiving a first signal transmission from a remote station via the antenna and a second signal transmission from the remote station via the antenna simultaneously (**see Ishii, col. 3, lines 9-30; "Signals received at different directional antennas 1-1 to 1-N are introduced into delay circuits 2-2 to 2-M. A directivity in a direction, for example, at every equal angle (360/N degrees) is assigned to each of antennas 1-1 to 1-N, respectively. Delay circuit 2-1 has a time delay of 0 and thus is omitted in the drawings. Delay circuits 2-2 to 2-M adaptively delay the received signals so that receivers 3-1 to 3-M may receive simultaneously the desired signal components incoming at different timings."**).

It would have been obvious to one of ordinary skill in the art at the time the present invention was made to modify the invention of Crilly as taught by Ishii and receive a first signal transmission from a remote station via the antenna and a second signal transmission from the remote station via the antenna simultaneously.

Rationale: Applying a known technique to a known device (method, or product) ready for improvement to yield predictable results

To reject a claim based on this rationale, Office personnel must resolve the Graham factual inquiries. Then, Office personnel must articulate the following:

(1) a finding that the prior art contained a “base” device (method, or product) upon which the claimed invention can be seen as an “improvement;”

(2) a finding that the prior art contained a known technique that is applicable to the base device (method, or product);

(3) a finding that one of ordinary skill in the art would have recognized that applying the known technique would have yielded predictable results and resulted in an improved system; and

(4) whatever additional findings based on the Graham factual inquiries may be necessary, in view of the facts of the case under consideration, to explain a conclusion of obviousness. (MPEP § 2143).

In this case:

Crilly contains a “base" device of a receiver for use in a wireless communications system which the claimed invention can be seen as an “improvement” in that receiving a first signal transmission from a remote station via the antenna and a second signal transmission from the remote station via the antenna simultaneously.

Ishii contains known technique of a first signal transmission from a remote station via the antenna and a second signal transmission from the remote station via the antenna simultaneously that is applicable to the “base" device.

Ishii's known technique a first signal transmission from a remote station via the antenna and a second signal transmission from the remote station via the antenna simultaneously would have been recognized by one of ordinary skill in the art as applicable to the "base" process of Crilly and the results would have been predictable and resulted in a receiver for use in a wireless communications system receiving a first signal transmission from a remote station via the antenna and a second signal transmission from the remote station via the antenna simultaneously which results in an improved process.

Therefore, the claimed subject matter would have been obvious to a person having ordinary skill in the art at the time the invention was made.

Regarding claim 2,

The combination of Crilly and Ishii discloses the receiver as recited in Claim 1, wherein the antenna comprises a first antenna element and a second antenna element, and wherein the processor is further configured to:

receive the first signal transmission from the remote station via the first antenna element and the second signal transmission for the remote station via the second antenna element simultaneously (**see Crilly FIG. 4, paragraph [0091]; These signals, both desired and undesired, are collected by receiving elements within antenna array 110 and are eventually provided to control logic 110.**); and

cause the transceiver to transmit the third signal to the remote station via the antenna (**see Crilly, paragraph [0093]; Weighting matrix 166 operates so as to**

apply the latest weighting values to the received signals and also to transmitted signals.)

Regarding claim 3,

The combination of Crilly and Ishii discloses the receiver as recited in Claim 1, wherein the first signal transmission and the second signal transmission comprise electromagnetic signals comprising one or more transmission peaks and one or more transmission nulls (**see Crilly, paragraph [0010]; "The logic is operatively coupled to the antenna array and configured to selectively control the placement of the transmission peaks and transmission nulls within the outgoing multi-beam electromagnetic signals."**).

Regarding claim 4,

The combination of Crilly and Ishii discloses the receiver as recited in Claim 1, wherein the first signal transmission and the second signal transmission are directional transmissions (**see Crilly, paragraph [0009]; In certain further implementations, the adaptive antenna is also configured to selectively receive at least one incoming electromagnetic signal directed through the coverage area.**).

Regarding claim 5,

The combination of Crilly and Ishii discloses the receiver as recited in Claim 1, wherein the set of weighting values is further based on one or more of: a transmit power level, a data transmit rate, an antenna direction, quality of service data, or timing data (**see Crilly, paragraph [0011], "By way of example, the routing information may include transmit power level information, transmit data rate information, antenna pointing direction information, weighting information, constraints information, transmission null location information, transmission peak location information, Quality of Service (QoS) information, priority information, data packet lifetime information, frequency information, timing information, and/or keep out area information."**).

Regarding claim 6,

The combination of Crilly and Ishii discloses the receiver as recited in Claim 1, wherein the content comprises data configured to be used by the remote station to modify the placement of one or more transmission peaks and one or more transmission nulls in a subsequent signal transmission (**see Crilly, paragraph [0057]; "…part of a wireless routing device and configured to produce a transmission pattern that selectively places transmission nulls and/or peaks in certain directions within an applicable coverage area**.")

Regarding claim 7,

The combination of Crilly and Ishii discloses the receiver as recited in Claim 1, wherein the processor is further configured to:

determine a plurality of signal strength indications for the first signal transmission; determine a first signal strength average based on the plurality of signal strength indications for the first signal transmission; determine a plurality of signal strength indications for the second signal transmission; determine a second signal strength average based on the plurality of signal strength indications for the second signal transmission (**see Crilly, paragraph [0012]; "All or part of this routing information may be stored in one or more routing tables. The routing table(s) may further include routing information such as, e.g., IP address information, MAC address information, protocol identifying information, modulation method identifying information, Connection ID (CID) information, node directional information, node transmit power level information, node received signal strength indicator (RSSI) level information, transmit channel information, backup transmit channel information, receive channel information, backup receive channel information, transmission data rate information, receive data rate information, and interference nulling information."**); and

cause the transceiver to generate a fourth signal based on the first signal strength average and the second signal strength average (**see Crilly, paragraph [0016]; "The scheduler can establish one or more traffic schedules by determining at least one assignment for an outgoing data transmission."**).

Regarding claim 8,

The combination of Crilly and Ishii discloses the receiver as recited in Claim 7, wherein the processor is further configured to: cause the transceiver to transmit the fourth signal to the remote station via the smart antenna (**see Crilly, paragraph [0016]; "The scheduler can establish one or more traffic schedules by determining at least one assignment for an outgoing data transmission."**).

Regarding claim 9,

As shown in FIGS. 1-24, Crilly discloses a method in a wireless communications system, the method comprising:

- receiving a first signal transmission from a remote station via a first antenna element of an antenna and a second signal transmission via a second antenna element of the antenna (**see Crilly, FIG. 4, antenna array 110**);
- determining first signal information for the first signal transmission (**see Crilly FIG. 4, paragraph [0091]; These signals, both desired and undesired, are collected by receiving elements within antenna array 110 and are eventually provided to control logic 110.**);
- determining second signal information for the second signal transmission, wherein the second signal information is different than the first signal information (**see Crilly FIG. 4, paragraph [0091]; These signals, both desired and undesired, are collected by receiving elements within antenna array 110 and are eventually provided to control logic 110.**);

- determining a set of weighting values based on the first signal information and the second signal information, wherein the set of weighting values is configured to be used by the remote station to construct one or more beam-formed transmission signals (**see Crilly, paragraph [0093]; The stored weighting values associated with each connection/source are utilized in a weighting matrix 166. Weighting matrix 166 operates so as to apply the latest weighting values to the received signals and also to transmitted signals. In this illustrative example, subsequently received signals will be processed using the most recent weighting values in the weighting matrix.**); and
- transmitting to the remote station a third signal comprising content based on the set of weighting values (**see Crilly, paragraph [0093]; The stored weighting values associated with each connection/source are utilized in a weighting matrix 166. Weighting matrix 166 operates so as to apply the latest weighting values to the received signals and also to transmitted signals. In this illustrative example, subsequently received signals will be processed using the most recent weighting values in the weighting matrix.**).

Crilly does not specifically disclose "receive a first signal transmission from a remote station via the antenna and a second signal transmission from the remote station via the antenna simultaneously."

However, Ishii in the same field of endeavor discloses receiving a first signal transmission from a remote station via the antenna and a second signal transmission

from the remote station via the antenna simultaneously (**see Ishii, col. 3, lines 9-30; "Signals received at different directional antennas 1-1 to 1-N are introduced into delay circuits 2-2 to 2-M. A directivity in a direction, for example, at every equal angle (360/N degrees) is assigned to each of antennas 1-1 to 1-N, respectively. Delay circuit 2-1 has a time delay of 0 and thus is omitted in the drawings. Delay circuits 2-2 to 2-M adaptively delay the received signals so that receivers 3-1 to 3-M may receive simultaneously the desired signal components incoming at different timings."**).

It would have been obvious to one of ordinary skill in the art at the time the present invention was made to modify the invention of Crilly as taught by Ishii and receive a first signal transmission from a remote station via the antenna and a second signal transmission from the remote station via the antenna simultaneously.

Rationale: Applying a known technique to a known device (method, or product) ready for improvement to yield predictable results

To reject a claim based on this rationale, Office personnel must resolve the Graham factual inquiries. Then, Office personnel must articulate the following:

(1) a finding that the prior art contained a "base" device (method, or product) upon which the claimed invention can be seen as an "improvement;"

(2) a finding that the prior art contained a known technique that is applicable to the base device (method, or product);

(3) a finding that one of ordinary skill in the art would have recognized that applying the known technique would have yielded predictable results and resulted in an improved system; and

(4) whatever additional findings based on the Graham factual inquiries may be necessary, in view of the facts of the case under consideration, to explain a conclusion of obviousness. (MPEP § 2143).

In this case:

Crilly contains a “base" device of a receiver for use in a wireless communications system which the claimed invention can be seen as an “improvement” in that receiving a first signal transmission from a remote station via the antenna and a second signal transmission from the remote station via the antenna simultaneously.

Ishii contains known technique of a first signal transmission from a remote station via the antenna and a second signal transmission from the remote station via the antenna simultaneously that is applicable to the “base" device.

Ishii’s known technique a first signal transmission from a remote station via the antenna and a second signal transmission from the remote station via the antenna simultaneously would have been recognized by one of ordinary skill in the art as applicable to the “base” process of Crilly and the results would have been predictable and resulted in a receiver for use in a wireless communications system receiving a first signal transmission from a remote station via the antenna and a second signal

transmission from the remote station via the antenna simultaneously which results in an improved process.

Therefore, the claimed subject matter would have been obvious to a person having ordinary skill in the art at the time the invention was made.

Regarding claim 10,

The combination of Crilly and Ishii discloses the method as recited in Claim 9, further comprising: transmitting the third signal to the remote station via the antenna (**see Crilly, paragraph [0016]; "The scheduler can establish one or more traffic schedules by determining at least one assignment for an outgoing data transmission."**).

Regarding claim 11,

The combination of Crilly and Ishii discloses the method as recited in Claim 9, wherein the first signal transmission and the second signal transmission comprise electromagnetic signals comprising one or more transmission peaks and one or more transmission nulls (**see Crilly, paragraph [0010]; "The logic is operatively coupled to the antenna array and configured to selectively control the placement of the transmission peaks and transmission nulls within the outgoing multi-beam electromagnetic signals."**).

Regarding claim 12,

The combination of Crilly and Ishii discloses the method as recited in Claim 9, wherein the first signal transmission and the second signal transmission are directional transmissions (**see Crilly, paragraph [0009]; In certain further implementations, the adaptive antenna is also configured to selectively receive at least one incoming electromagnetic signal directed through the coverage area.**).

Regarding claim 13,

The combination of Crilly and Ishii discloses the method as recited in Claim 9, wherein the set of weighting values is further based on one or more of: a transmit power level, a data transmit rate, an antenna direction, quality of service data, or timing data (**see Crilly, paragraph [0011], "By way of example, the routing information may include transmit power level information, transmit data rate information, antenna pointing direction information, weighting information, constraints information, transmission null location information, transmission peak location information, Quality of Service (QoS) information, priority information, data packet lifetime information, frequency information, timing information, and/or keep out area information."**).

Regarding claim 14,

The combination of Crilly and Ishii discloses the method as recited in Claim 9, wherein the one or more beam-formed transmission signals comprise data configured to be used by the remote station to modify the placement of one or more transmission

peaks and one or more transmission nulls in a subsequent signal transmission (**see Crilly, paragraph [0010]; "The logic is operatively coupled to the antenna array and configured to selectively control the placement of the transmission peaks and transmission nulls within the outgoing multi-beam electromagnetic signals."**).

Regarding claim 15,

The combination of Crilly and Ishii discloses the method as recited in Claim 9, wherein the processor is further configured to: determining a plurality of signal strength indications for the first signal transmission; determining a first signal strength average based on the plurality of signal strength indications for the first signal transmission; determining a plurality of signal strength indications for the second signal transmission ; determining a second signal strength average based on the plurality of signal strength indications for the second signal transmission; and determining a set of weighting values based on the first signal information and the second signal information, wherein the set of weighting values is configured to construct one or more beam-formed transmission signals (**see Crilly, paragraph [0012]; "All or part of this routing information may be stored in one or more routing tables. The routing table(s) may further include routing information such as, e.g., IP address information, MAC address information, protocol identifying information, modulation method identifying information, Connection ID (CID) information, node directional information, node transmit power level information, node received signal strength**

indicator (RSSI) level information, transmit channel information, backup transmit channel information, receive channel information, backup receive channel information, transmission data rate information, receive data rate information, and interference nulling information."); and

generating the one or more beam-formed transmission signals based on the set of weighting values for transmission to the remote station (**see Crilly, paragraph [0016]; "The scheduler can establish one or more traffic schedules by determining at least one assignment for an outgoing data transmission."**).

Regarding claim 16,

The combination of Crilly and Ishii discloses the method as recited in Claim 15, further comprising: causing the transceiver to transmit the fourth signal to the remote station via the antenna (**see Crilly, paragraph [0016]; "The scheduler can establish one or more traffic schedules by determining at least one assignment for an outgoing data transmission."**).

Regarding claim 17,

As shown in FIGS. 1-24, Crilly discloses an apparatus for use in a wireless communications system, the apparatus comprising:

- an antenna (**see Crilly, FIG. 4, antenna array 110**);
- a transceiver operatively coupled to the antenna (**see Crilly, FIG. 2, transmitter/receiver 114**); and

- a processor operatively coupled to the transceiver (**see Crilly, FIG. 4, control logic 112**), the processor configured to:
    - receive a first signal transmission from a remote station via the antenna, the first signal transmission comprising first signal information (**see Crilly FIG. 4, paragraph [0091]; These signals, both desired and undesired, are collected by receiving elements within antenna array 110 and are eventually provided to control logic 110.**);
    - receive a second signal transmission via the antenna, the second signal transmission comprising second signal information (**see Crilly FIG. 4, paragraph [0091]; These signals, both desired and undesired, are collected by receiving elements within antenna array 110 and are eventually provided to control logic 110.**);
    - determine a set of weighting values based on the first signal information and the second signal information, wherein the set of weighting values is configured to be used by the remote station to construct one or more beam-formed transmission signals (**see Crilly, paragraph [0093]; The stored weighting values associated with each connection/source are utilized in a weighting matrix 166. Weighting matrix 166 operates so as to apply the latest weighting values to the received signals and also to transmitted signals. In this illustrative example, subsequently received signals will be processed using the most recent weighting values in the weighting matrix.**);

- cause the transceiver to generate a third signal comprising content based on the set of weighting values (**see Crilly, paragraph [0093]; The stored weighting values associated with each connection/source are utilized in a weighting matrix 166. Weighting matrix 166 operates so as to apply the latest weighting values to the received signals and also to transmitted signals. In this illustrative example, subsequently received signals will be processed using the most recent weighting values in the weighting matrix.**).

Crilly does not specifically disclose "receive a first signal transmission from a remote station via the antenna and a second signal transmission from the remote station via the antenna."

However, Ishii in the same field of endeavor discloses receiving a first signal transmission from a remote station via the antenna and a second signal transmission from the remote station via the antenna (**see Ishii, col. 3, lines 9-30; "Signals received at different directional antennas 1-1 to 1-N are introduced into delay circuits 2-2 to 2-M. A directivity in a direction, for example, at every equal angle (360/N degrees) is assigned to each of antennas 1-1 to 1-N, respectively. Delay circuit 2-1 has a time delay of 0 and thus is omitted in the drawings. Delay circuits 2-2 to 2-M adaptively delay the received signals so that receivers 3-1 to 3-M may receive simultaneously the desired signal components incoming at different timings."**).

It would have been obvious to one of ordinary skill in the art at the time the present invention was made to modify the invention of Crilly as taught by Ishii and receive a first signal transmission from a remote station via the antenna and a second signal transmission from the remote station via the antenna.

Rationale: Applying a known technique to a known device (method, or product) ready for improvement to yield predictable results

To reject a claim based on this rationale, Office personnel must resolve the Graham factual inquiries. Then, Office personnel must articulate the following:

(1) a finding that the prior art contained a “base” device (method, or product) upon which the claimed invention can be seen as an “improvement;”

(2) a finding that the prior art contained a known technique that is applicable to the base device (method, or product);

(3) a finding that one of ordinary skill in the art would have recognized that applying the known technique would have yielded predictable results and resulted in an improved system; and

(4) whatever additional findings based on the Graham factual inquiries may be necessary, in view of the facts of the case under consideration, to explain a conclusion of obviousness. (MPEP § 2143).

In this case:

Crilly contains a “base" device of a receiver for use in a wireless communications system which the claimed invention can be seen as an “improvement” in that receiving a first signal transmission from a remote station via the antenna and a second signal transmission from the remote station via the antenna simultaneously.

Ishii contains known technique of a first signal transmission from a remote station via the antenna and a second signal transmission from the remote station via the antenna simultaneously that is applicable to the “base" device.

Ishii’s known technique a first signal transmission from a remote station via the antenna and a second signal transmission from the remote station via the antenna simultaneously would have been recognized by one of ordinary skill in the art as applicable to the “base” process of Crilly and the results would have been predictable and resulted in a receiver for use in a wireless communications system receiving a first signal transmission from a remote station via the antenna and a second signal transmission from the remote station via the antenna simultaneously which results in an improved process.

Therefore, the claimed subject matter would have been obvious to a person having ordinary skill in the art at the time the invention was made.

Regarding claim 18,

The combination of Crilly and Ishii discloses the apparatus as recited in Claim 17, wherein the first signal transmission and the second signal transmission comprise electromagnetic signals comprising one or more transmission peaks and one or more

transmission nulls (**see Crilly, paragraph [0010]; "The logic is operatively coupled to the antenna array and configured to selectively control the placement of the transmission peaks and transmission nulls within the outgoing multi-beam electromagnetic signals."**).

Regarding claim 19,

The combination of Crilly and Ishii discloses the apparatus as recited in Claim 17, wherein the first signal information comprises one or more of: a transmit power level, a data transmit rate, an antenna direction, quality of service data, or timing data (**see Crilly, paragraph [0011], "By way of example, the routing information may include transmit power level information, transmit data rate information, antenna pointing direction information, weighting information, constraints information, transmission null location information, transmission peak location information, Quality of Service (QoS) information, priority information, data packet lifetime information, frequency information, timing information, and/or keep out area information."**).

Regarding claim 20,

The combination of Crilly and Ishii discloses the apparatus as recited in Claim 17, wherein the antenna comprises a first antenna element and a second antenna element, and wherein the first antenna element and the second antenna element are directional antenna elements (**see Crilly, paragraph [0009]; In certain further implementations,**

the adaptive antenna is also configured to selectively receive at least one incoming electromagnetic signal directed through the coverage area.).

Conclusion

7. **THIS ACTION IS MADE FINAL.** Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to GINA MCKIE whose telephone number is (571)270-5148. The examiner can normally be reached on Mon-Fri, 8:30 AM-5:00 PM EST.

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, Shuwang Liu can be reached on 571-272-3036. 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.

/GINA MCKIE/
Examiner, Art Unit 2631

/SHUWANG LIU/

Supervisory Patent Examiner, Art Unit 2631

Notice of References Cited	Application/Control No. 15/495,539	Applicant(s)/Patent Under Reexamination DA SILVA ET AL.	
	Examiner GINA MCKIE	Art Unit 2631	Page 1 of 1

U.S. PATENT DOCUMENTS

*		Document Number Country Code-Number-Kind Code	Date MM-YYYY	Name	CPC Classification	US Classification
*	A	US-5,809,422 A	09-1998	Raleigh; Gregory G.	H04B7/2609	455/444
	B	US-				
	C	US-				
	D	US-				
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	First Named Inventor	Marcus Da Silva
	Art Unit	2631
(Multiple sheets used when necessary)	Examiner	McKie, Gina M.
SHEET 1 OF 8	Attorney Docket No.	1640-001.203

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Examiner Initials	Cite No.	Document Number *Number - Kind Code (if known)* Example: 1,234,567 B1	Publication Date MM-DD-YYYY	Name of Patentee or Applicant	Pages, Columns, Lines Where Relevant Passages or Relevant Figures Appear
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	140	Supplement to IEEE Standard for Information technology – Telecommunications and information exchange between systems – Local and metropolitan area networks – Specific requirements, "Part 11: Wireless LAN Medium Access Control (MAC) and Physical Layer (PHY) specifications: Higher-Speed Physical Layer Extension in the 2.4 GHz Band", IEEE Std 802.11b-1999 (R2003), Institute of Electrical Engineers, Inc., January 20, 2000, U.S.A., 96 pages. (2801)	
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Examiner Signature /GINA M MCKIE/	Date Considered 01/18/2018

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

T[1] - Place a check mark in this area when an English language Translation is attached.

ALL REFERENCES CONSIDERED EXCEPT WHERE LINED THROUGH. /G.M.M/

PTO/SB/08 Equivalent

INFORMATION DISCLOSURE STATEMENT BY APPLICANT	Application No.	15/495,539
	Filing Date	April 24, 2017
	First Named Inventor	Marcus Da Silva
	Art Unit	2631
(Multiple sheets used when necessary)	Examiner	McKie, Gina M.
SHEET 8 OF 8	Attorney Docket No.	1640-001.203

NON PATENT LITERATURE DOCUMENTS

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, page(s), volume-issue number(s), publisher, city and/or country where published.	T[1]
	142	KRISHNAMURTHY, S.V. et al.; "Polling-Based Media Access Protocols for Use with Smart Adaptive Array Antennas," IEEE/ACM Trans. Networking Vol. 9, No. 2, April 2001. (3065)	
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	149	ACAMPORA, A.S. et al., "Media Access Protocols for Use with Smart Adaptive Array Antennas to Enable Wireless Multimedia Applications", 9th Tyrrehenian Workshop on Digital Communications, Lerici (Italy), Sep. 1997. (3842)	
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	~~153~~	~~Exhibits A1 – A30~~	
	~~154~~	~~Exhibits B1 – B27~~	
	~~155~~	~~Exhibits C1 – C27~~	

Examiner Signature /GINA M MCKIE/	Date Considered 01/18/2018

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IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

First Inventor:	Marcus Da Silva
Application No.:	15/495,539
Filing Date:	April 24, 2017
For:	DIRECTED WIRELESS COMMUNICATION
Examiner:	Gina M. MCKIE
Art Unit:	2631
Confirmation No.:	1050

AMENDMENT AND RESPONSE TO NON-FINAL OFFICE ACTION

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

Dear Commissioner:

In response to the Non-Final Office Action issued on July 5, 2017, Applicant amends this application as follows:

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

Amendments to the Drawings begins on page 5 of this paper.

Listing of the Claims begins on page 6 of this paper.

Remarks/Arguments begin on page 11 of this paper.

AMENDMENTS TO THE SPECIFICATION

Please amend paragraph [0032] of the specification as follows:

[0032] FIG. 1 illustrates an exemplary wireless communications ~~environ merit~~ environment 100 that is generally representative of any number of different types of wireless communications environments, including but not limited to those pertaining to wireless local area networks (LANs) or wide area networks (WANs) (e.g., Wi-Fi compatible) technology, cellular technology, trunking technology, and the like. In wireless communications environment 100, an access station 102 communicates with remote client devices 104(1), 104(2), . . . , 104(N) via wireless communication or communication links 106(1), 106(2), . . . , 106(N), respectively. Although not required, access station 102 is typically fixed, and remote client devices 104 may be fixed or mobile. Although only three remote client devices 104 are shown, access station 102 can wirelessly communicate with any number of different client devices 104.

Please amend paragraph [0065] of the specification as follows:

[0065] The channel assignments coordinated by the signal control and coordination logic 304 provide[[s]] the best channel assignment for a signal based on given measurement information. Parameters of a channel assignment algorithm include:

Please amend paragraph [0085] of the specification as follows:

[0085] $Ne_{ij}(t)$ which is a number of uplink data packets with Physical Layer Convergence Procedure (PLCP) or data Cyclic Redundancy Check (CRC) errors in the ith beam on the jth channel and which is measured by the scanning receiver 822 and averaged over the *MeasurementDuration* period. This is also referred to as the Unidentified Interference Metric (UIM); and

Please amend paragraph [0099] of the specification as follows:

[0099] A combination index R with the least peak communication load is then selected such that $PL_{max}(R)$=min $\{PL_{max}(k)\}$ where $(0 \leq k \leq 71)$ which is the combination of channels and beams that minimize the peak load on any channel. If the peak load on a channel is not less than

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the *PeakLoadLimit*, then a three channel assignment can be implemented. Initially, the thirteen communication beams are divided into three blocks of which there are sixty-six possible combinations. For each combination, the channel selections can be $f_1 f_6 f_{11}$, $f_1 f_{11} f_6$, $f_6 f_1 f_{11}$, $f_6 f_{11} f_1$, $f_{11} f_1 f_6$, or $f_{11} f_6 f_1$ such that there are a total of three-hundred, ninety-six block and channel combinations. Assuming that the kth block-channel combination has a configuration as follows:

Please amend paragraph [0107] of the specification as follows:

[0107] When taking into account intermodulation such that channel combinations $f_1 f_6$ and $f_6 f_{11}$ are to be avoided, then f_6 is avoided. Initially, the thirteen communication beams are divided into two blocks of which there are twelve possible combinations. For each combination, the channel selections can be $f_1 f_{11}$ and $f_{11} f_1$ such that there are a total of twenty-four block and channel combinations. Assuming that the kth block-channel combination has a configuration as follows:

Please amend paragraph [0132] of the specification as follows:

[0132] The receive indicators forwarded to MAC coordinator logic 904 may be comprised of any one or more different indications from the baseband units 902. For example, the receive indicators may comprise clear channel assessment (CCA) or busy/non-busy indications. Alternatively, the receive indicators may comprise indications of signal reception based on energy signals, cross-correlation signals, data signals, other transmit and/or control signals, ~~seine~~ some combination thereof, and so forth. Furthermore, a receive indicator may comprise an analog or digital indication (of one or more bits), the driving of one or more lines, the presentation of one or more messages, some combination thereof, and so forth.

Please amend paragraph [0155] of the specification as follows:

[0155] A busy( ) function returns a receiver indication that a channel is busy, and an error( ) function indicates that a received frame had a CRC error. A notforus( ) function indicates that a frame was not addressed to a particular station, and a ~~nay( )~~ nav( ) function indicates that a

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timer has not expired. A data( ) function indicates that data is queued to send, and a short( ) function indicates that a MAC protocol data unit is shorter than an RTS Threshold and that there are additional data fragments to be sent from a current MAC controller. A more( ) function facilitates obtaining the additional data fragments.

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AMENDMENTS TO THE DRAWINGS

Replacement sheet for Figure 16 is included in the Appendix.

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LISTING OF CLAIMS

The following is a listing of the claims. No amendments have been made.

1. (Previously Presented) A receiver for use in a wireless communications system, the receiver comprising:

an antenna;

a transceiver operatively coupled to the antenna and configured to transmit and receive electromagnetic signals using the antenna; and

a processor operatively coupled to the transceiver, the processor configured to:

receive a first signal transmission from a remote station via the antenna and a second signal transmission from the remote station via the antenna simultaneously;

determine first signal information for the first signal transmission;

determine second signal information for the second signal transmission, wherein the second signal information is different than the first signal information;

determine a set of weighting values based on the first signal information and the second signal information, wherein the set of weighting values is configured to be used by the remote station to construct one or more beam-formed transmission signals; and

cause the transceiver to generate a third signal comprising content based on the set of weighting values.

2. (Previously Presented) The receiver as recited in Claim 1,

wherein the antenna comprises a first antenna element and a second antenna element, and

wherein the processor is further configured to:

receive the first signal transmission from the remote station via the first antenna element and the second signal transmission from the remote station via the second antenna element simultaneously; and

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cause the transceiver to transmit the third signal to the remote station via the antenna.

3. (Original) The receiver as recited in Claim 1, wherein the first signal transmission and the second signal transmission comprise electromagnetic signals comprising one or more transmission peaks and one or more transmission nulls.

4. (Original) The receiver as recited in Claim 1, wherein the first signal transmission and the second signal transmission are directional transmissions.

5. (Original) The receiver as recited in Claim 1, wherein the set of weighting values is further based on one or more of: a transmit power level, a data transmit rate, an antenna direction, quality of service data, or timing data.

6. (Previously Presented) The receiver as recited in Claim 1, wherein the content comprises data configured to be used by the remote station to modify the placement of one or more transmission peaks and one or more transmission nulls in a subsequent signal transmission.

7. (Previously Presented) The receiver as recited in Claim 1, wherein the processor is further configured to:

determine a plurality of signal strength indications for the first signal transmission;

determine a first signal strength average based on the plurality of signal strength indications for the first signal transmission;

determine a plurality of signal strength indications for the second signal transmission;

determine a second signal strength average based on the plurality of signal strength indications for the second signal transmission; and

cause the transceiver to generate a fourth signal based on the first signal strength average and the second signal strength average.

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8. (Previously Presented) The receiver as recited in Claim 7, wherein the processor is further configured to: cause the transceiver to transmit the fourth signal to the remote station via the antenna.

9. (Previously Presented) A method in a wireless communications system, the method comprising:

receiving a first signal transmission from a remote station via a first antenna element of an antenna and a second signal transmission from the remote station via a second antenna element of the antenna simultaneously;

determining first signal information for the first signal transmission;

determining second signal information for the second signal transmission, wherein the second signal information is different than the first signal information;

determining a set of weighting values based on the first signal information and the second signal information, wherein the set of weighting values is configured to be used by the remote station to construct one or more beam-formed transmission signals; and

transmitting to the remote station a third signal comprising content based on the set of weighting values.

10. (Previously Presented) The method as recited in Claim 9, further comprising: transmitting the third signal to the remote station via the antenna.

11. (Original) The method as recited in Claim 9, wherein the first signal transmission and the second signal transmission comprise electromagnetic signals comprising one or more transmission peaks and one or more transmission nulls.

12. (Original) The method as recited in Claim 9, wherein the first signal transmission and the second signal transmission are directional transmissions.

13. (Original) The method as recited in Claim 9, wherein the set of weighting values is further based on one or more of: a transmit power level, a data transmit rate, an antenna direction, quality of service data, or timing data.

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14. (Previously Presented) The method as recited in Claim 9, wherein the content comprises data configured to be used by the remote station to modify the placement of one or more transmission peaks and one or more transmission nulls in a subsequent signal transmission.

15. (Previously Presented) The method as recited in Claim 9, further comprising:

determining a plurality of signal strength indications for the first signal transmission;

determining a first signal strength average based on the plurality of signal strength indications for the first signal transmission;

determining a plurality of signal strength indications for the second signal transmission;

determining a second signal strength average based on the plurality of signal strength indications for the second signal transmission; and

generating a fourth signal based on the first signal strength average and the second signal strength average.

16. (Previously Presented) The method as recited in Claim 15, further comprising: causing the transceiver to transmit the fourth signal to the remote station via the antenna.

17. (Previously Presented) An apparatus for use in a wireless communications system, the apparatus comprising:

an antenna;

a transceiver operatively coupled to the antenna; and

a processor operatively coupled to the transceiver, the processor configured to:

receive a first signal transmission from a remote station via the antenna, the first signal transmission comprising first signal information;

receive a second signal transmission from the remote station via the antenna, the second signal transmission comprising second signal information;

determine a set of weighting values based on the first signal information and the second signal information, wherein the set of weighting values is

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configured to be used by the remote station to construct one or more beam-formed transmission signals;

cause the transceiver to generate a third signal comprising content based on the set of weighting values.

18. (Original) The apparatus as recited in Claim 17, wherein the first signal transmission and the second signal transmission comprise electromagnetic signals comprising one or more transmission peaks and one or more transmission nulls.

19. (Original) The apparatus as recited in Claim 17, wherein the first signal information comprises one or more of: a transmit power level, a data transmit rate, an antenna direction, quality of service data, or timing data.

20. (Previously Presented) The apparatus as recited in Claim 17, wherein the antenna comprises a first antenna element and a second antenna element, and wherein the first antenna element and the second antenna element are directional antenna elements.

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REMARKS

This paper is responsive to the Office Action dated on July 5, 2017 (the "Office Action"). Claims 1-20 remain pending. Applicant has not amended the claims. In view of the following remarks, Applicant respectfully submits that the application is in condition for allowance.

Discussion of Amendments to the Specification

Applicant has corrected typographical errors as indicated above. No new matter has been added by these amendments.

Discussion of Amendments to the Drawings

Applicant is submitting replacement Figure 16 to correct the direction of the arrow for transition 1610. No new matter has been added by this amendment.

Discussion of Claim Rejections under 35 U.S.C. § 103

The Office Action rejected claims 1-20 under 35 U.S.C. § 103 as being unpatentable over U.S. Patent Publication No. 2002/0158801 ("Crilly") in view of U.S. Patent No. 6,714,584 ("Ishii"). Applicant respectfully traverses these rejections.

The Office Action relies on Ishii as disclosing the following emphasized limitations of claim 1: "receive a first signal transmission from a remote station via the antenna and a second signal transmission ***from the remote station*** via the antenna simultaneously." In particular, the Office Action relies on the following disclosure in Ishii:

> Signals received at different directional antennas 1-1 to 1-N are introduced into delay circuits 2-2 to 2-M. A directivity in a direction, for example, at every equal angle (360/N degrees) is assigned to each of antennas 1-1 to 1-N, respectively. Delay circuit 2-1 has a time delay of 0 and thus is omitted in the drawings. Delay circuits 2-2 to 2-M adaptively delay the received signals so that receivers 3-1 to 3-M may receive simultaneously the desired signal components incoming at different timings.

Ishii, column 3, lines 15-23.

However, the cited portions of Ishii do not disclose or suggest receiving signal components from the same transmitter. In fact, Ishii discloses that the "present invention relates to CDMA (Code Division Multiple Access) adaptive antenna . . . for separating and synthesizing

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a plural of desired signal components incoming at a plural of different timings and from a ***plural of different directions at each timing***." *Id.*, column 1, lines 8-13 (emphasis added). In Ishii, signal components come from a plurality of different directions, and are thus associated with ***different*** transmitters. In contrast, claim 1 recites "receive a first signal transmission from ***a*** remote station via the antenna and a second signal transmission from ***the*** remote station" (emphasis added).

For at least these reasons, Applicant respectfully submits that Crilly in combination with Ishii does not disclose or suggest claim 1 and respectfully requests withdrawal of the rejection.

Independent claim 9 recites, among other limitations, "receiving a first signal transmission from a remote station via a first antenna element of an antenna and a second signal transmission from the remote station." Independent claim 17 recites, among other limitations, "receive a first signal transmission from a remote station via the antenna" and "receive a second signal transmission from the remote station via the antenna." At least for the foregoing reasons, Applicant respectfully submits that Crilly in combination with Ishii does not disclose or suggest claims 9 and 17 and respectfully requests withdrawal of the rejection.

In addition, each of the dependent claims depends from a patentable independent claim and also recites limitations that represent additional patentable distinctions over the cited references. Accordingly, Applicant respectfully submits that the dependent claims are patentable and requests withdrawal of the rejections.

Conclusion

For the foregoing reasons, Applicant respectfully submits that the application is in condition for allowance. Should any issues remain which may be addressed in a phone call, the Examiner is invited to call the undersigned at 949-721-5308.

No Disclaimers or Disavowals

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

application. Applicant reserves the right to pursue at a later date any previously pending or other broader or narrower claims that capture any subject matter supported by the present disclosure, including subject matter found to be specifically disclaimed herein or by any prior prosecution. Accordingly, reviewers of this or any parent, child or related prosecution history shall not reasonably infer that Applicant has made any disclaimers or disavowals of any subject matter supported by the present application.

Please charge any additional fees, including any fees for additional extension of time, or credit overpayment to Deposit Account No. 11-1410

Respectfully submitted,

KNOBBE, MARTENS, OLSON & BEAR, LLP

Dated: October 5, 2017

By:/Vladislav Z. Teplitskiy/
Vladislav Z. Teplitskiy
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26731652

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Petitioner's Exhibit 1002
Page 000192

Electronic Acknowledgement Receipt

EFS ID:	30574804
Application Number:	15495539
International Application Number:	
Confirmation Number:	1050
Title of Invention:	DIRECTED WIRELESS COMMUNICATION
First Named Inventor/Applicant Name:	Marcus Da Silva
Customer Number:	20995
Filer:	Vladislav Z. Teplitskiy/Angel Zehnder
Filer Authorized By:	Vladislav Z. Teplitskiy
Attorney Docket Number:	XRCOM.001C5
Receipt Date:	05-OCT-2017
Filing Date:	24-APR-2017
Time Stamp:	13:52:07
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	Drawings-other than black and white line drawings	Figures_XRCOM.pdf	737237 9dc4a8a84eec9ec8984bdf393aebca9ac06c90cc	no	1

Warnings:

Information:					
2		Amend_XRCOM.pdf	76181 cbb8f08758656b4d4bd9ecdfc4c3a5378ed6cb31	yes	13

Multipart Description/PDF files in .zip description		
Document Description	**Start**	**End**
Amendment/Req. Reconsideration-After Non-Final Reject	1	1
Specification	2	4
Drawings-only black and white line drawings	5	5
Claims	6	10
Applicant Arguments/Remarks Made in an Amendment	11	13

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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.
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Replacement Sheet

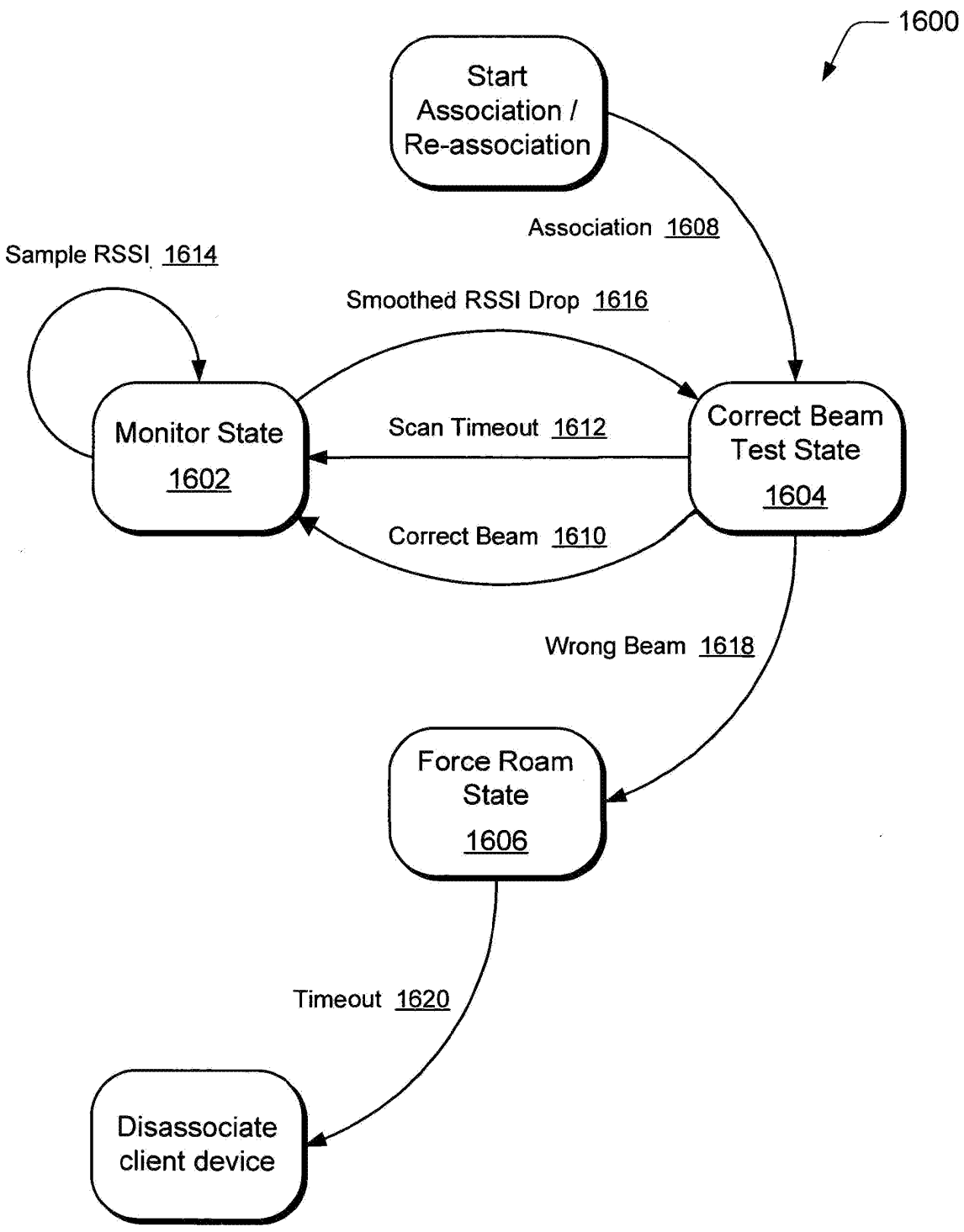


Fig. 16

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APPLICATION NUMBER	FILING OR 371(C) DATE	FIRST NAMED APPLICANT	ATTY. DOCKET NO./TITLE
15/495,539	04/24/2017	Marcus Da Silva	E1027.800(T).US1D1C1C3

CONFIRMATION NO. 1050

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2468 Historic Decatur Road
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PUBLICATION NOTICE



Title:DIRECTED WIRELESS COMMUNICATION

Publication No.US-2017-0230094-A1
Publication Date:08/10/2017

NOTICE OF PUBLICATION OF APPLICATION

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

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Page 000196

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	15495539
	Filing Date	2017-04-24
	First Named Inventor	Marcus DA SILVA
	Art Unit	2631
	Examiner Name	Gina M. MCKIE
	Attorney Docket Number	E1027.800(T).US1D1C1C3

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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	5933421	A	1999-08-03	ALAMOUTI et al	
	2	8412106	B2	2013-04-02	DA SILVA et al.	

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	1	20040014429	A1	2004-01-22	GUO	
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INFORMATION DISCLOSURE STATEMENT BY APPLICANT (**Not for submission under 37 CFR 1.99)**		
	Application Number	15495539
	Filing Date	2017-04-24
	First Named Inventor	Marcus DA SILVA
	Art Unit	2631
	Examiner Name	Gina M. MCKIE
	Attorney Docket Number	E1027.800(T).US1D1C1C3

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*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.

INFORMATION DISCLOSURE STATEMENT BY APPLICANT (Not for submission under 37 CFR 1.99)		
	Application Number	15495539
	Filing Date	2017-04-24
	First Named Inventor	Marcus DA SILVA
	Art Unit	2631
	Examiner Name	Gina M. MCKIE
	Attorney Docket Number	E1027.800(T).US1D1C1C3

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	/Nicholas R. Transier/	Date (YYYY-MM-DD)	2017-07-07
Name/Print	Nicholas R. TRANSIER	Registration Number	68743

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.**

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.

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Petitioner's Exhibit 1002
Page 000200

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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
15/495,539	04/24/2017	Marcus Da Silva	E1027.800(T).US1D1C1C3	1050

114581 7590 07/05/2017

EIP US LLP
2468 Historic Decatur Road
Suite 200
San Diego, CA 92106

EXAMINER	
MCKIE, GINA M	

ART UNIT	PAPER NUMBER
2631	

NOTIFICATION DATE	DELIVERY MODE
07/05/2017	ELECTRONIC

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

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

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

sandiego@eip.com

IPR2024-00613
Petitioner's Exhibit 1002
Page 000201

Office Action Summary	Application No. 15/495,539	Applicant(s) DA SILVA ET AL.	
	Examiner GINA MCKIE	Art Unit 2631	AIA (First Inventor to File) Status No

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

Period for Reply

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

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

Status

1)☒ Responsive to communication(s) filed on *19 June 2017*.

☐ 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) *1-20* 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) *1-20* is/are rejected.

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

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

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

Application Papers

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

11)☒ The drawing(s) filed on *24 April 2017* 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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Petitioner's Exhibit 1002
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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 Rejections - 35 USC § 103

2. The following is a quotation of pre-AIA 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

3. The factual inquiries set forth in *Graham v. John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under pre-AIA 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.

2. Ascertaining the differences between the prior art and the claims at issue.

3. Resolving the level of ordinary skill in the pertinent art.

4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

4. Claims 1-20 is/are rejected under pre-AIA 35 U.S.C. 103(a) as being unpatentable over Crilly, Jr. et al. (US 2002/0158801 A1) in view of Ishii et al. (US 6,714,584).

Regarding claim 1,

As shown in FIGS. 1-24, Crilly discloses a receiver for use in a wireless communications system, the receiver comprising:

- an antenna (**see Crilly, FIG. 4, antenna array 110**);
- a transceiver operatively coupled to the antenna and configured to transmit and receive electromagnetic signals using the antenna (**see Crilly, FIG. 2, transmitter/receiver 114**); and
- a processor operatively coupled to the transceiver, (**see Crilly, FIG. 4, control logic 112**) the processor configured to:
    - receive a first signal transmission from a remote station via the antenna and a second signal transmission via the antenna (**see Crilly FIG. 4, paragraph [0091]; These signals, both desired and undesired, are collected by receiving elements within antenna array 110 and are eventually provided to control logic 110.**);
    - determine first signal information for the first signal transmission (**see Crilly, paragraph [0092]; Here, control logic 112 includes a search receiver 164 that is configured to update routing information 120 with regard to the received signals.**);
    - determine second signal information for the second signal transmission, wherein the second signal information is different than the first signal information (**see Crilly, paragraph [0092]; Here, control logic 112 includes a search receiver 164 that is configured to update routing information 120 with regard to the received signals.**);

- determine a set of weighting values based on the first signal information and the second signal information, wherein the set of weighting values is configured to be used by the remote station to construct one or more beam-formed transmission signals (**see Crilly, paragraph [0093]; The stored weighting values associated with each connection/source are utilized in a weighting matrix 166. Weighting matrix 166 operates so as to apply the latest weighting values to the received signals and also to transmitted signals. In this illustrative example, subsequently received signals will be processed using the most recent weighting values in the weighting matrix.**); and
- cause the transceiver to generate a third signal comprising content based on the set of weighting values (**see Crilly, paragraph [0093]; The stored weighting values associated with each connection/source are utilized in a weighting matrix 166. Weighting matrix 166 operates so as to apply the latest weighting values to the received signals and also to transmitted signals. In this illustrative example, subsequently received signals will be processed using the most recent weighting values in the weighting matrix.**)

Crilly does not specifically disclose “receive a first signal transmission from a remote station via the antenna and a second signal transmission from the remote station via the antenna simultaneously.”

However, Ishii in the same field of endeavor discloses receiving a first signal transmission from a remote station via the antenna and a second signal transmission from the remote station via the antenna simultaneously (**see Ishii, col. 3, lines 9-30; "Signals received at different directional antennas 1-1 to 1-N are introduced into delay circuits 2-2 to 2-M. A directivity in a direction, for example, at every equal angle (360/N degrees) is assigned to each of antennas 1-1 to 1-N, respectively. Delay circuit 2-1 has a time delay of 0 and thus is omitted in the drawings. Delay circuits 2-2 to 2-M adaptively delay the received signals so that receivers 3-1 to 3-M may receive simultaneously the desired signal components incoming at different timings."**).

It would have been obvious to one of ordinary skill in the art at the time the present invention was made to modify the invention of Crilly as taught by Ishii and receive a first signal transmission from a remote station via the antenna and a second signal transmission from the remote station via the antenna simultaneously.

Rationale: Applying a known technique to a known device (method, or product) ready for improvement to yield predictable results

To reject a claim based on this rationale, Office personnel must resolve the Graham factual inquiries. Then, Office personnel must articulate the following:

(1) a finding that the prior art contained a "base" device (method, or product) upon which the claimed invention can be seen as an "improvement;"

(2) a finding that the prior art contained a known technique that is applicable to the base device (method, or product);

(3) a finding that one of ordinary skill in the art would have recognized that applying the known technique would have yielded predictable results and resulted in an improved system; and

(4) whatever additional findings based on the Graham factual inquiries may be necessary, in view of the facts of the case under consideration, to explain a conclusion of obviousness. (MPEP § 2143).

In this case:

Crilly contains a “base" device of a receiver for use in a wireless communications system which the claimed invention can be seen as an “improvement” in that receiving a first signal transmission from a remote station via the antenna and a second signal transmission from the remote station via the antenna simultaneously.

Ishii contains known technique of a first signal transmission from a remote station via the antenna and a second signal transmission from the remote station via the antenna simultaneously that is applicable to the “base" device.

Ishii’s known technique a first signal transmission from a remote station via the antenna and a second signal transmission from the remote station via the antenna simultaneously would have been recognized by one of ordinary skill in the art as applicable to the “base” process of Crilly and the results would have been predictable and resulted in a receiver for use in a wireless communications system receiving a first

signal transmission from a remote station via the antenna and a second signal transmission from the remote station via the antenna simultaneously which results in an improved process.

Therefore, the claimed subject matter would have been obvious to a person having ordinary skill in the art at the time the invention was made.

Regarding claim 2,

The combination of Crilly and Ishii discloses the receiver as recited in Claim 1, wherein the antenna comprises a first antenna element and a second antenna element, and wherein the processor is further configured to:

receive the first signal transmission from the remote station via the first antenna element and the second signal transmission for the remote station via the second antenna element simultaneously (**see Crilly FIG. 4, paragraph [0091]; These signals, both desired and undesired, are collected by receiving elements within antenna array 110 and are eventually provided to control logic 110.**); and

cause the transceiver to transmit the third signal to the remote station via the antenna (**see Crilly, paragraph [0093]; Weighting matrix 166 operates so as to apply the latest weighting values to the received signals and also to transmitted signals.**)

Regarding claim 3,

The combination of Crilly and Ishii discloses the receiver as recited in Claim 1, wherein the first signal transmission and the second signal transmission comprise electromagnetic signals comprising one or more transmission peaks and one or more transmission nulls (**see Crilly, paragraph [0010]; "The logic is operatively coupled to the antenna array and configured to selectively control the placement of the transmission peaks and transmission nulls within the outgoing multi-beam electromagnetic signals."**).

Regarding claim 4,

The combination of Crilly and Ishii discloses the receiver as recited in Claim 1, wherein the first signal transmission and the second signal transmission are directional transmissions (**see Crilly, paragraph [0009]; In certain further implementations, the adaptive antenna is also configured to selectively receive at least one incoming electromagnetic signal directed through the coverage area.**).

Regarding claim 5,

The combination of Crilly and Ishii discloses the receiver as recited in Claim 1, wherein the set of weighting values is further based on one or more of: a transmit power level, a data transmit rate, an antenna direction, quality of service data, or timing data (**see Crilly, paragraph [0011], "By way of example, the routing information may include transmit power level information, transmit data rate information, antenna**

pointing direction information, weighting information, constraints information, transmission null location information, transmission peak location information, Quality of Service (QoS) information, priority information, data packet lifetime information, frequency information, timing information, and/or keep out area information.").

Regarding claim 6,

The combination of Crilly and Ishii discloses the receiver as recited in Claim 1, wherein the content comprises data configured to be used by the remote station to modify the placement of one or more transmission peaks and one or more transmission nulls in a subsequent signal transmission (**see Crilly, paragraph [0057]; "…part of a wireless routing device and configured to produce a transmission pattern that selectively places transmission nulls and/or peaks in certain directions within an applicable coverage area**.")

Regarding claim 7,

The combination of Crilly and Ishii discloses the receiver as recited in Claim 1, wherein the processor is further configured to:

determine a plurality of signal strength indications for the first signal transmission; determine a first signal strength average based on the plurality of signal strength indications for the first signal transmission; determine a plurality of signal strength indications for the second signal transmission; determine a second signal

strength average based on the plurality of signal strength indications for the second signal transmission (**see Crilly, paragraph [0012]; "All or part of this routing information may be stored in one or more routing tables. The routing table(s) may further include routing information such as, e.g., IP address information, MAC address information, protocol identifying information, modulation method identifying information, Connection ID (CID) information, node directional information, node transmit power level information, node received signal strength indicator (RSSI) level information, transmit channel information, backup transmit channel information, receive channel information, backup receive channel information, transmission data rate information, receive data rate information, and interference nulling information."**); and

cause the transceiver to generate a fourth signal based on the first signal strength average and the second signal strength average (**see Crilly, paragraph [0016]; "The scheduler can establish one or more traffic schedules by determining at least one assignment for an outgoing data transmission."**).

Regarding claim 8,

The combination of Crilly and Ishii discloses the receiver as recited in Claim 7, wherein the processor is further configured to: cause the transceiver to transmit the fourth signal to the remote station via the smart antenna (**see Crilly, paragraph [0016]; "The scheduler can establish one or more traffic schedules by determining at least one assignment for an outgoing data transmission."**).

Regarding claim 9,

As shown in FIGS. 1-24, Crilly discloses a method in a wireless communications system, the method comprising:

- receiving a first signal transmission from a remote station via a first antenna element of an antenna and a second signal transmission via a second antenna element of the antenna (**see Crilly, FIG. 4, antenna array 110**);
- determining first signal information for the first signal transmission (**see Crilly FIG. 4, paragraph [0091]; These signals, both desired and undesired, are collected by receiving elements within antenna array 110 and are eventually provided to control logic 110.**);
- determining second signal information for the second signal transmission, wherein the second signal information is different than the first signal information (**see Crilly FIG. 4, paragraph [0091]; These signals, both desired and undesired, are collected by receiving elements within antenna array 110 and are eventually provided to control logic 110.**);
- determining a set of weighting values based on the first signal information and the second signal information, wherein the set of weighting values is configured to be used by the remote station to construct one or more beam-formed transmission signals (**see Crilly, paragraph [0093]; The stored weighting values associated with each connection/source are utilized in a weighting matrix 166. Weighting matrix 166 operates so as to apply the latest weighting values to the received**

signals and also to transmitted signals. In this illustrative example, subsequently received signals will be processed using the most recent weighting values in the weighting matrix.); and

- transmitting to the remote station a third signal comprising content based on the set of weighting values (**see Crilly, paragraph [0093]; The stored weighting values associated with each connection/source are utilized in a weighting matrix 166. Weighting matrix 166 operates so as to apply the latest weighting values to the received signals and also to transmitted signals. In this illustrative example, subsequently received signals will be processed using the most recent weighting values in the weighting matrix.**).

Crilly does not specifically disclose "receive a first signal transmission from a remote station via the antenna and a second signal transmission from the remote station via the antenna simultaneously."

However, Ishii in the same field of endeavor discloses receiving a first signal transmission from a remote station via the antenna and a second signal transmission from the remote station via the antenna simultaneously (**see Ishii, col. 3, lines 9-30; "Signals received at different directional antennas 1-1 to 1-N are introduced into delay circuits 2-2 to 2-M. A directivity in a direction, for example, at every equal angle (360/N degrees) is assigned to each of antennas 1-1 to 1-N, respectively. Delay circuit 2-1 has a time delay of 0 and thus is omitted in the drawings. Delay circuits 2-2 to 2-M adaptively delay the received signals so that receivers 3-1 to 3-**

M may receive simultaneously the desired signal components incoming at different timings.").

It would have been obvious to one of ordinary skill in the art at the time the present invention was made to modify the invention of Crilly as taught by Ishii and receive a first signal transmission from a remote station via the antenna and a second signal transmission from the remote station via the antenna simultaneously.

Rationale: Applying a known technique to a known device (method, or product) ready for improvement to yield predictable results

To reject a claim based on this rationale, Office personnel must resolve the Graham factual inquiries. Then, Office personnel must articulate the following:

(1) a finding that the prior art contained a "base" device (method, or product) upon which the claimed invention can be seen as an "improvement;"

(2) a finding that the prior art contained a known technique that is applicable to the base device (method, or product);

(3) a finding that one of ordinary skill in the art would have recognized that applying the known technique would have yielded predictable results and resulted in an improved system; and

(4) whatever additional findings based on the Graham factual inquiries may be necessary, in view of the facts of the case under consideration, to explain a conclusion of obviousness. (MPEP § 2143).

In this case:

Crilly contains a “base" device of a receiver for use in a wireless communications system which the claimed invention can be seen as an “improvement” in that receiving a first signal transmission from a remote station via the antenna and a second signal transmission from the remote station via the antenna simultaneously.

Ishii contains known technique of a first signal transmission from a remote station via the antenna and a second signal transmission from the remote station via the antenna simultaneously that is applicable to the “base" device.

Ishii’s known technique a first signal transmission from a remote station via the antenna and a second signal transmission from the remote station via the antenna simultaneously would have been recognized by one of ordinary skill in the art as applicable to the “base” process of Crilly and the results would have been predictable and resulted in a receiver for use in a wireless communications system receiving a first signal transmission from a remote station via the antenna and a second signal transmission from the remote station via the antenna simultaneously which results in an improved process.

Therefore, the claimed subject matter would have been obvious to a person having ordinary skill in the art at the time the invention was made.

Regarding claim 10,

The combination of Crilly and Ishii discloses the method as recited in Claim 9, further comprising: transmitting the third signal to the remote station via the antenna (**see Crilly, paragraph [0016]; "The scheduler can establish one or more traffic schedules by determining at least one assignment for an outgoing data transmission."**).

Regarding claim 11,

The combination of Crilly and Ishii discloses the method as recited in Claim 9, wherein the first signal transmission and the second signal transmission comprise electromagnetic signals comprising one or more transmission peaks and one or more transmission nulls (**see Crilly, paragraph [0010]; "The logic is operatively coupled to the antenna array and configured to selectively control the placement of the transmission peaks and transmission nulls within the outgoing multi-beam electromagnetic signals."**).

Regarding claim 12,

The combination of Crilly and Ishii discloses the method as recited in Claim 9, wherein the first signal transmission and the second signal transmission are directional transmissions (**see Crilly, paragraph [0009]; In certain further implementations, the adaptive antenna is also configured to selectively receive at least one incoming electromagnetic signal directed through the coverage area.**).

Regarding claim 13,

The combination of Crilly and Ishii discloses the method as recited in Claim 9, wherein the set of weighting values is further based on one or more of: a transmit power level, a data transmit rate, an antenna direction, quality of service data, or timing data (**see Crilly, paragraph [0011], "By way of example, the routing information may include transmit power level information, transmit data rate information, antenna pointing direction information, weighting information, constraints information, transmission null location information, transmission peak location information, Quality of Service (QoS) information, priority information, data packet lifetime information, frequency information, timing information, and/or keep out area information."**).

Regarding claim 14,

The combination of Crilly and Ishii discloses the method as recited in Claim 9, wherein the one or more beam-formed transmission signals comprise data configured to be used by the remote station to modify the placement of one or more transmission peaks and one or more transmission nulls in a subsequent signal transmission (**see Crilly, paragraph [0010]; "The logic is operatively coupled to the antenna array and configured to selectively control the placement of the transmission peaks and transmission nulls within the outgoing multi-beam electromagnetic signals."**).

Regarding claim 15,

The combination of Crilly and Ishii discloses the method as recited in Claim 9, wherein the processor is further configured to: determining a plurality of signal strength indications for the first signal transmission; determining a first signal strength average based on the plurality of signal strength indications for the first signal transmission; determining a plurality of signal strength indications for the second signal transmission ; determining a second signal strength average based on the plurality of signal strength indications for the second signal transmission; and determining a set of weighting values based on the first signal information and the second signal information, wherein the set of weighting values is configured to construct one or more beam-formed transmission signals (**see Crilly, paragraph [0012]; "All or part of this routing information may be stored in one or more routing tables. The routing table(s) may further include routing information such as, e.g., IP address information, MAC address information, protocol identifying information, modulation method identifying information, Connection ID (CID) information, node directional information, node transmit power level information, node received signal strength indicator (RSSI) level information, transmit channel information, backup transmit channel information, receive channel information, backup receive channel information, transmission data rate information, receive data rate information, and interference nulling information."**); and

generating the one or more beam-formed transmission signals based on the set of weighting values for transmission to the remote station (**see Crilly, paragraph**

[0016]; "The scheduler can establish one or more traffic schedules by determining at least one assignment for an outgoing data transmission.").

Regarding claim 16,

The combination of Crilly and Ishii discloses the method as recited in Claim 15, further comprising: causing the transceiver to transmit the fourth signal to the remote station via the antenna (**see Crilly, paragraph [0016]; "The scheduler can establish one or more traffic schedules by determining at least one assignment for an outgoing data transmission."**).

Regarding claim 17,

As shown in FIGS. 1-24, Crilly discloses an apparatus for use in a wireless communications system, the apparatus comprising:

- an antenna (**see Crilly, FIG. 4, antenna array 110**);
- a transceiver operatively coupled to the antenna (**see Crilly, FIG. 2, transmitter/receiver 114**); and
- a processor operatively coupled to the transceiver (**see Crilly, FIG. 4, control logic 112**), the processor configured to:
    - receive a first signal transmission from a remote station via the antenna, the first signal transmission comprising first signal information (**see Crilly FIG. 4, paragraph [0091]; These signals, both desired and undesired,**

are collected by receiving elements within antenna array 110 and are eventually provided to control logic 110.);

- receive a second signal transmission via the antenna, the second signal transmission comprising second signal information (**see Crilly FIG. 4, paragraph [0091]; These signals, both desired and undesired, are collected by receiving elements within antenna array 110 and are eventually provided to control logic 110.**);
- determine a set of weighting values based on the first signal information and the second signal information, wherein the set of weighting values is configured to be used by the remote station to construct one or more beam-formed transmission signals (**see Crilly, paragraph [0093]; The stored weighting values associated with each connection/source are utilized in a weighting matrix 166. Weighting matrix 166 operates so as to apply the latest weighting values to the received signals and also to transmitted signals. In this illustrative example, subsequently received signals will be processed using the most recent weighting values in the weighting matrix.**);
- cause the transceiver to generate a third signal comprising content based on the set of weighting values (**see Crilly, paragraph [0093]; The stored weighting values associated with each connection/source are utilized in a weighting matrix 166. Weighting matrix 166 operates so as to apply the latest weighting values to the received signals and**

also to transmitted signals. In this illustrative example, subsequently received signals will be processed using the most recent weighting values in the weighting matrix.).

Crilly does not specifically disclose "receive a first signal transmission from a remote station via the antenna and a second signal transmission from the remote station via the antenna."

However, Ishii in the same field of endeavor discloses receiving a first signal transmission from a remote station via the antenna and a second signal transmission from the remote station via the antenna (**see Ishii, col. 3, lines 9-30; "Signals received at different directional antennas 1-1 to 1-N are introduced into delay circuits 2-2 to 2-M. A directivity in a direction, for example, at every equal angle (360/N degrees) is assigned to each of antennas 1-1 to 1-N, respectively. Delay circuit 2-1 has a time delay of 0 and thus is omitted in the drawings. Delay circuits 2-2 to 2-M adaptively delay the received signals so that receivers 3-1 to 3-M may receive simultaneously the desired signal components incoming at different timings."**).

It would have been obvious to one of ordinary skill in the art at the time the present invention was made to modify the invention of Crilly as taught by Ishii and receive a first signal transmission from a remote station via the antenna and a second signal transmission from the remote station via the antenna.

Rationale: Applying a known technique to a known device (method, or product) ready for improvement to yield predictable results

To reject a claim based on this rationale, Office personnel must resolve the Graham factual inquiries. Then, Office personnel must articulate the following:

(1) a finding that the prior art contained a “base” device (method, or product) upon which the claimed invention can be seen as an “improvement;”

(2) a finding that the prior art contained a known technique that is applicable to the base device (method, or product);

(3) a finding that one of ordinary skill in the art would have recognized that applying the known technique would have yielded predictable results and resulted in an improved system; and

(4) whatever additional findings based on the Graham factual inquiries may be necessary, in view of the facts of the case under consideration, to explain a conclusion of obviousness. (MPEP § 2143).

In this case:

Crilly contains a “base" device of a receiver for use in a wireless communications system which the claimed invention can be seen as an “improvement” in that receiving a first signal transmission from a remote station via the antenna and a second signal transmission from the remote station via the antenna simultaneously.

Ishii contains known technique of a first signal transmission from a remote station via the antenna and a second signal transmission from the remote station via the antenna simultaneously that is applicable to the “base" device.

Ishii’s known technique a first signal transmission from a remote station via the antenna and a second signal transmission from the remote station via the antenna simultaneously would have been recognized by one of ordinary skill in the art as applicable to the “base” process of Crilly and the results would have been predictable and resulted in a receiver for use in a wireless communications system receiving a first signal transmission from a remote station via the antenna and a second signal transmission from the remote station via the antenna simultaneously which results in an improved process.

Therefore, the claimed subject matter would have been obvious to a person having ordinary skill in the art at the time the invention was made.

Regarding claim 18,

The combination of Crilly and Ishii discloses the apparatus as recited in Claim 17, wherein the first signal transmission and the second signal transmission comprise electromagnetic signals comprising one or more transmission peaks and one or more transmission nulls (**see Crilly, paragraph [0010]; “The logic is operatively coupled to the antenna array and configured to selectively control the placement of the transmission peaks and transmission nulls within the outgoing multi-beam electromagnetic signals.”**).

Regarding claim 19,

The combination of Crilly and Ishii discloses the apparatus as recited in Claim 17, wherein the first signal information comprises one or more of: a transmit power level, a data transmit rate, an antenna direction, quality of service data, or timing data (**see Crilly, paragraph [0011], "By way of example, the routing information may include transmit power level information, transmit data rate information, antenna pointing direction information, weighting information, constraints information, transmission null location information, transmission peak location information, Quality of Service (QoS) information, priority information, data packet lifetime information, frequency information, timing information, and/or keep out area information."**).

Regarding claim 20,

The combination of Crilly and Ishii discloses the apparatus as recited in Claim 17, wherein the antenna comprises a first antenna element and a second antenna element, and wherein the first antenna element and the second antenna element are directional antenna elements (**see Crilly, paragraph [0009]; In certain further implementations, the adaptive antenna is also configured to selectively receive at least one incoming electromagnetic signal directed through the coverage area.**).

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to GINA MCKIE whose telephone number is (571)270-5148. The examiner can normally be reached on Mon-Fri, 8:30 AM-5:00 PM EST.

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, Shuwang Liu can be reached on 571-272-3036. 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.

/GINA MCKIE/
Examiner, Art Unit 2631

/SHUWANG LIU/
Supervisory Patent Examiner, Art Unit 2631

Notice of References Cited	Application/Control No. 15/495,539	Applicant(s)/Patent Under Reexamination DA SILVA ET AL.	
	Examiner GINA MCKIE	Art Unit 2631	Page 1 of 1

U.S. PATENT DOCUMENTS

*		Document Number Country Code-Number-Kind Code	Date MM-YYYY	Name	CPC Classification	US Classification
*	A	US-2002/0158801 A1	10-2002	Crilly, William J. JR.	G01S13/74	342/378
*	B	US-6,714,584 B1	03-2004	Ishii; Naoto	H04B7/086	375/144
	C	US-				
	D	US-				
	E	US-				
	F	US-				
	G	US-				
	H	US-				
	I	US-				
	J	US-				
	K	US-				
	L	US-				
	M	US-				

FOREIGN PATENT DOCUMENTS

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	N					
	O					
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	Q					
	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.

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Page 000227

Index of Claims	Application/Control No.	Applicant(s)/Patent Under Reexamination
	15495539	DA SILVA ET AL.
	Examiner	Art Unit
	GINA MCKIE	2631

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

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

CLAIM		DATE								
Final	Original	06/21/2017								
	1	✓								
	2	✓								
	3	✓								
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	19	✓								
	20	✓								

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EAST Search History

EAST Search History (Prior Art)

Ref #	Hits	Search Query	DBs	Default Operator	Plurals	Time Stamp
L1	788	(multibeam "multi-beam") WITH directed	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2017/06/26 08:52
L2	93367	antenna NEAR2 array	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2017/06/26 09:16
L3	243	1 AND 2	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2017/06/26 09:16
L4	68324	remote NEAR2 station	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2017/06/26 09:17
L5	7	3 and 4	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2017/06/26 09:31
L6	3	"13855410"	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2017/06/26 09:42
L7	26335	(multibeam "multi-beam")	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2017/06/26 09:44
L8	101	2 AND 7 AND 4	US-PGPUB;	OR	OFF	2017/06/26

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			USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB			09:45
L9	3245	2 AND 7	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2017/06/26 09:52
L10	7875	(multibeam "multi-beam") AND simultaneously	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2017/06/26 10:12
L11	1537	2 AND (multibeam "multi-beam") AND simultaneously	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2017/06/26 10:12
L12	729	2 AND (multibeam "multi-beam") AND (simultaneously WITH receiv$3)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2017/06/26 10:16
L13	179	12 AND @ad<="20021104"	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2017/06/26 10:18
L14	12694	(first NEAR2 signal) WITH (second NEAR2 signal) WITH (simultaneously)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2017/06/26 10:22
L15	36	7 AND 14	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2017/06/26 10:23
L16	3560	(first NEAR2 signal) WITH (second NEAR2 signal) WITH receiv$3 WITH (simultaneously)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT;	OR	OFF	2017/06/26 10:23

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			IBM_TDB			
L17	1	1 AND 16	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2017/06/26 10:24
L18	83	2 AND 16	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2017/06/26 10:25
L19	16	7 AND 16	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2017/06/26 10:26
L20	53	13 AND weighting	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2017/06/26 10:29
S1	5665	375/376.CCLS.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2017/06/26 06:07
S2	9	("5293405" | "5384551" | "Us5703853" | "Us5850422" | "5959563" | "Us5999056" | "Us6038266" | "6046630" | "Us6282690" | "6570916" | "6624688" | "Us6658054" | "6717995" | "677172582" | "6888905" | "Us699285582" | "7058150" | "717399382" | "731559682").PN.	US-PGPUB; USPAT	OR	OFF	2017/06/26 06:10
S3	1	(sampl$3 NEAR2 voltage) WITH (edge NEAR2 crossing NEAR2 times)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2017/06/26 07:37
S4	20	(sampl$3 NEAR2 voltage) WITH (edge NEAR2 crossing)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2017/06/26 07:37
S5	19	S4 AND adjacent	US-PGPUB; USPAT; USOCR;	OR	OFF	2017/06/26 07:38

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			FPRS; EPO; JPO; DERWENT; IBM_TDB			
S6	13095	recovered NEAR2 clock	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2017/06/26 07:38
S7	5	S5 AND S6	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2017/06/26 07:38

EAST Search History (Interference)

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Search Notes	Application/Control No.	Applicant(s)/Patent Under Reexamination
	15495539	DA SILVA ET AL.
	Examiner	Art Unit
	GINA MCKIE	2631

CPC- SEARCHED		
Symbol	Date	Examiner
H04L7/042, H04L27/2675 (EAST keyword search)	6/22/2017	gmckie

CPC COMBINATION SETS - SEARCHED		
Symbol	Date	Examiner

US CLASSIFICATION SEARCHED			
Class	Subclass	Date	Examiner

SEARCH NOTES		
Search Notes	Date	Examiner
Performed double patenting search in EAST	6/21/2017	gmckie
Performed initial prior art search in EAST	6/21/2017	gmckie

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

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	Marcus DA SILVA
	Art Unit	TBD
	Examiner Name	TBD
	Attorney Docket Number	E1027.800(T).US1D1C1C3

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	4231040		1980-10-28	Walker	
	2	5327143		1994-07-05	Goetz et al.	
	3	5771017		1998-06-23	Dean et al.	
	4	5809141		1998-09-15	Dent et al.	
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	7	6091788		2000-07-18	Keskitalo et al.	
	8	6104935		2000-08-15	Smith et al.	

ALL REFERENCES CONSIDERED EXCEPT WHERE LINED THROUGH. /G.M.M/

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	First Named Inventor	Marcus DA SILVA
	Art Unit	TBD
	Examiner Name	TBD
	Attorney Docket Number	E1027.800(T).US1D1C1C3

	9	6108323		2000-08-22	Gray	
	10	6141335		2000-10-31	Kuwahara et al.	
	11	6169910		2001-01-02	Tamil et al.	
	12	6311075		2001-10-30	Bevan et al.	
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	14	6438376		2002-08-20	Elliott et al.	
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	Examiner Name	TBD
	Attorney Docket Number	E1027.800(T).US1D1C1C3

	20	6907269		2005-06-14	Yamaguchi et al.	
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	4	20030064752	A1	2003-04-03	Adachi et al.	
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	6	20030114196	A1	2003-06-19	Chitrapu	

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	First Named Inventor	Marcus DA SILVA
	Art Unit	TBD
	Examiner Name	TBD
	Attorney Docket Number	E1027.800(T).US1D1C1C3

	7	20040063468	A1	2004-04-01	Frank			

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	1	9921391	WO	A2	1999-04-29	Radio Design Innovation Tj Ab		

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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	Anastasi, et. al., "MAC Protocols for Widcband Wireless Local Access: Evolution Towards Wireless ATM", IEEE Personal Communications Magazine, pp. 53-64, Oct. 1998.	
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	3	Damoss, E. and L. Correia, eds., COST 231 Final Report--Digital Mobile Radio--Towards Future Generation Systems. European Commission, Directorate General XIII, Report No. RJR 18957 (ISBN 92-828-54167), 516 pages (1999).	
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	Examiner Name	TBD
	Attorney Docket Number	E1027.800(T).US1D1C1C3

	6	German et al., "Wireless Indoor Channel Modeling: Statistical Agreement of Ray Tracing Simulations and Channel Sounding Measurements," in Proceeding of 2001 IEEE International Conference on Acoustics, Speech, and Signal Processing, 4:2501-2504 (2001).
	7	Gucsalla, R., "Characterizing the Variability of Arrival Processes with Indexes of Dispersion", IEEE JSAC, 9(2):203-211 (1990).
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	11	Leland et. Al., "On the Self-Similar Nature of Ethernet Traffic," IEEE/ACM Transactions on Networking, 2(1):1-15 (1994).
	12	Medbo, J. and J. Berg, "Simple and accurate path loss modeling at 5 GHz in indoor environments with corridors," in Vehicular Technology Conference Fall 2000. IEEE VTS Fall VTC2000. 52nd Vehicular Technology Conference, 1:30-36 (2000).

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EXAMINER SIGNATURE

Examiner Signature	/GINA M MCKIE/	Date Considered	06/19/2017

*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.

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INFORMATION DISCLOSURE STATEMENT BY APPLICANT (Not for submission under 37 CFR 1.99)		
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	Art Unit	TBD
	Examiner Name	TBD
	Attorney Docket Number	E1027.800(T).US1D1C1C3

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	/Nicholas R. Transier/	Date (YYYY-MM-DD)	2017-04-24
Name/Print	Nicholas R. TRANSIER	Registration Number	68743

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:

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. /G.M.M/

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Petitioner's Exhibit 1002
Page 000240

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

BIB DATA SHEET

CONFIRMATION NO. 1050

SERIAL NUMBER	FILING or 371(c) DATE	CLASS	GROUP ART UNIT	ATTORNEY DOCKET NO.
15/495,539	04/24/2017 RULE	375	2631	E1027.800(T).US1D1C1C3

APPLICANTS

XR Communications, LLC D/B/A Vivato Technologies, Solana Beach, CA;

INVENTORS

Marcus Da Silva, Spokane, WA;
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Hujun Yin, Spokane, WA;
Bobby Jose, Veradale, WA;
Yang-Seok Choi, Liberty Lake, WA;
Vahid Tarokh, Cambridge, MA;
Praveen Mehrotra, Spokane, WA;

**** CONTINUING DATA ***************************

This application is a CON of 15/260,147 09/08/2016
which is a CON of 13/855,410 04/02/2013 PAT 9462589
which is a DIV of 10/700,329 11/03/2003 PAT 8412106
which claims benefit of 60/423,660 11/04/2002

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

**** IF REQUIRED, FOREIGN FILING LICENSE GRANTED **** ** SMALL ENTITY **

Foreign Priority claimed ☐ Yes ☑ No 35 USC 119(a-d) conditions met ☐ Yes ☑ No Verified and Acknowledged /GINA M MCKIE/ Examiner's Signature	☐ Met after Allowance Initials	STATE OR COUNTRY	SHEETS DRAWINGS	TOTAL CLAIMS	INDEPENDENT CLAIMS
		WA	18	20	3

ADDRESS

EIP US LLP
2468 Historic Decatur Road
Suite 200
San Diego, CA 92106
UNITED STATES

TITLE

DIRECTED WIRELESS COMMUNICATION

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

BIB (Rev. 05/07).

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Applicant:	XR Communications, LLC DBA Vivato Technologies
Application No.:	15/495,539
Filing Date:	April 24, 2017
Title:	DIRECTED WIRELESS COMMUNICATION
Examiner:	To be assigned
Art Unit:	2642
Confirmation No.:	1050

PRELIMINARY AMENDMENT

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

Dear Examiner:

Please amend this application according to the following:

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

Remarks begin on page 7 of this paper.

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Petitioner's Exhibit 1002
Page 000242

Electronic Acknowledgement Receipt

EFS ID:	29543034
Application Number:	15495539
International Application Number:	
Confirmation Number:	1050
Title of Invention:	DIRECTED WIRELESS COMMUNICATION
First Named Inventor/Applicant Name:	Marcus Da Silva
Customer Number:	114581
Filer:	Nicholas R. Transier/Jenny Stedman
Filer Authorized By:	Nicholas R. Transier
Attorney Docket Number:	E1027.800(T).US1D1C1C3
Receipt Date:	19-JUN-2017
Filing Date:	24-APR-2017
Time Stamp:	19:13:41
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	no

File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1		2017-06-19_Preliminary_Amendment_E1027_800T_US1D1C1C3.pdf	40221 2876db0b1df2253eedde10ea8311525fc3d751ae	yes	7

	Multipart Description/PDF files in .zip description		
	Document Description	**Start**	**End**
	Applicant Arguments/Remarks Made in an Amendment	7	7
	Claims	2	6
	Preliminary Amendment	1	1
Warnings:			
Information:			
	Total Files Size (in bytes):	40221	

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.

REMARKS

Claims 1-20 are currently pending in this application. By this paper, Applicant amends Claims 1, 2, 6-10, 14-17, and 20. No claims are cancelled and no new matter is added. Upon entry of these amendments, Claims 1-20 are pending for further review and consideration in light of the arguments presented below.

Discussion of Claim Amendments

Claims 1, 2, 6-10, 14-17, and 20 have been amended for clarity.

No Disclaimers or Disavowals

This response includes alterations to the claims. Applicant is not conceding in this Response that previously pending claims are not patentable. Rather, the alterations or characterizations are made for the purpose of facilitating expeditious prosecution of this application. Applicant reserves the right to pursue at a later date any previously pending claim, whether narrower or broader, that captures subject matter supported by this Application's disclosure. As a result, reviewers of this or any prosecution history of a related application should not infer that Applicant has made any disclaimers or disavowals of any subject matter supported by the present application.

CONCLUSION

Applicant respectfully requests entry of the claim amendments. Please charge any additional fees, including any fees for additional extension of time, or credit overpayment to Deposit Account No. 506237.

Respectfully submitted,

EIP US LLP

Dated: June 19, 2017

By: / Nicholas R. Transier /
Nicholas R. TRANSIER
Registration No. 68,743
Attorney of Record
Customer No. 114581
(619) 795-1300

LISTING OF CLAIMS

1. (**Currently Amended**) A receiver for use in a wireless communications system, the receiver comprising:

an ~~smart~~ antenna ~~comprising at least a first antenna element and a second antenna element~~;

a transceiver operatively coupled to the ~~smart~~ antenna and configured to transmit and receive electromagnetic signals using the ~~smart~~ antenna; and

a processor operatively coupled to the transceiver, the processor configured to:

receive a first signal transmission from a remote station via the ~~first~~ antenna ~~element~~ and a second signal transmission from the remote station via the ~~second~~ antenna ~~element~~ simultaneously;

determine first signal information for the first signal transmission;

determine second signal information for the second signal transmission, wherein the second signal information is different than the first signal information;

determine a set of weighting values based on the first signal information and the second signal information, wherein the set of weighting values is configured to be used by the remote station to construct one or more beam-formed transmission signals; and

cause the transceiver to generate ~~the one or more beam-formed transmission signals based on~~ a third signal comprising content based on the set of weighting values ~~for transmission to the remote station~~.

2. (**Currently Amended**) The receiver as recited in Claim 1,

wherein the antenna comprises a first antenna element and a second antenna element, and

wherein the processor is further configured to:

receive the first signal transmission from the remote station via the first antenna element and the second signal transmission from the remote station via the second antenna element simultaneously; and

cause the transceiver to transmit the ~~one or more beam-formed transmission~~ third signal[[s]] to the remote station via the ~~smart~~ antenna.

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3. (Original) The receiver as recited in Claim 1, wherein the first signal transmission and the second signal transmission comprise electromagnetic signals comprising one or more transmission peaks and one or more transmission nulls.

4. (Original) The receiver as recited in Claim 1, wherein the first signal transmission and the second signal transmission are directional transmissions.

5. (Original) The receiver as recited in Claim 1, wherein the set of weighting values is further based on one or more of: a transmit power level, a data transmit rate, an antenna direction, quality of service data, or timing data.

6. (**Currently Amended**) The receiver as recited in Claim 1, wherein the ~~one or more beam-formed transmission signals~~ content comprises data configured to be used by the remote station to modify the placement of one or more transmission peaks and one or more transmission nulls in a subsequent signal transmission.

7. (**Currently Amended**) The receiver as recited in Claim 1, wherein the processor is further configured to:

determine a plurality of signal strength indications for the first signal transmission;

determine a first signal strength average based on the plurality of signal strength indications for the first signal transmission;

determine a plurality of signal strength indications for the second signal transmission;

determine a second signal strength average based on the plurality of signal strength indications for the second signal transmission; and

cause the transceiver to generate ~~the one or more beam-formed transmission signals~~ a fourth signal based on the first signal strength average and the second signal strength average.

8. (**Currently Amended**) The receiver as recited in Claim [[8]]7, wherein the processor is further configured to: cause the transceiver to transmit the fourth signal ~~one or more beam-formed transmission signals~~ to the remote station via the ~~smart~~ antenna.

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9. (**Currently Amended**) A method in a wireless communications system, the method comprising:

receiving a first signal transmission from a remote station via a first antenna element of an ~~smart~~ antenna and a second signal transmission from the remote station via a second antenna element of the ~~smart~~ antenna simultaneously;

determining first signal information for the first signal transmission;

determining second signal information for the second signal transmission, wherein the second signal information is different than the first signal information;

determining a set of weighting values based on the first signal information and the second signal information, wherein the set of weighting values is configured to be used by the remote station to construct one or more beam-formed transmission signals; and

~~generating the one or more beam-formed transmission signals based on~~transmitting to the remote station a third signal comprising content based on the set of weighting values ~~for transmission to the remote station~~.

10. (**Currently Amended**) The method as recited in Claim 9, further comprising: transmitting the third signal ~~one or more beam-formed transmission signals~~ to the remote station via the ~~smart~~ antenna.

11. (Original) The method as recited in Claim 9, wherein the first signal transmission and the second signal transmission comprise electromagnetic signals comprising one or more transmission peaks and one or more transmission nulls.

12. (Original) The method as recited in Claim 9, wherein the first signal transmission and the second signal transmission are directional transmissions.

13. (Original) The method as recited in Claim 9, wherein the set of weighting values is further based on one or more of: a transmit power level, a data transmit rate, an antenna direction, quality of service data, or timing data.

14. (**Currently Amended**) The method as recited in Claim 9, wherein the ~~one or more beam-formed transmission signals~~ content comprises data configured to be used by the remote

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station to modify the placement of one or more transmission peaks and one or more transmission nulls in a subsequent signal transmission.

15. (**Currently Amended**) The method as recited in Claim 9, ~~wherein the processor is further configured to~~further comprising:

determining a plurality of signal strength indications for the first signal transmission;

determining a first signal strength average based on the plurality of signal strength indications for the first signal transmission;

determining a plurality of signal strength indications for the second signal transmission;

determining a second signal strength average based on the plurality of signal strength indications for the second signal transmission; and

generating ~~the one or more beam-formed transmission~~ a fourth signal[[s]] based on the first signal strength average and the second signal strength average.

16. (**Currently Amended**) The method as recited in Claim 15, ~~wherein the processor is further configured to~~further comprising: causing[[s]] the transceiver to transmit the ~~one or more beam-formed transmission~~ fourth signal[[s]] to the remote station via the ~~smart~~ antenna.

17. (**Currently Amended**) An apparatus for use in a wireless communications system, the apparatus comprising:

an antenna ~~smart antenna comprising at least a first antenna element and a second antenna element~~;

a transceiver operatively coupled to the ~~smart~~ antenna; and

a processor operatively coupled to the transceiver, the processor configured to:

receive a first signal transmission from a remote station via the ~~first~~ antenna ~~element~~, the first signal transmission comprising first signal information;

receive a second signal transmission from the remote station via the ~~second~~ antenna ~~element~~, the second signal transmission comprising second signal information;

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determine a set of weighting values based on the first signal information and the second signal information, wherein the set of weighting values is configured to be used by the remote station to construct one or more beam-formed transmission signals;

cause the transceiver to ~~transmit the one or more beam-formed transmission signals~~generate a third signal comprising content based on the set of weighting values ~~to the remote station~~.

18. (Original) The apparatus as recited in Claim 17, wherein the first signal transmission and the second signal transmission comprise electromagnetic signals comprising one or more transmission peaks and one or more transmission nulls.

19. (Original) The apparatus as recited in Claim 17, wherein the first signal information comprises one or more of: a transmit power level, a data transmit rate, an antenna direction, quality of service data, or timing data.

20. (**Currently Amended**) The apparatus as recited in Claim 17, wherein the antenna comprises a first antenna element and a second antenna element, and wherein the first antenna element and the second antenna element are directional antenna elements.

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EIP US LLP
2468 Historic Decatur Road
Suite 200
San Diego CA 92106

MAILED
MAY 05 2017
OFFICE OF PETITIONS

Doc Code: TRACK1.GRANT

Decision Granting Request for Prioritized Examination (Track I or After RCE)	Application No.: 15/495,539

In view of the specific circumstances surrounding this application and, in particular, the filing of the Track 1 Request requirements, the Office hereby waives, *sua sponte*, the Processing Fee date requirement of the Prioritized Examination, Track 1, program to the extent necessary to render the processing fee as timely paid and sufficient to fulfill such requirement.

1. THE REQUEST FILED April 24, 2017 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 Brian W. Brown at 571-272-5338.

/Brian W. Brown/
[*Signature*]

Petitions Examiner, Office of Petitions
(Title)

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www.uspto.gov

APPLICATION NUMBER	FILING or 371(c) DATE	GRP ART UNIT	FIL FEE REC'D	ATTY.DOCKET.NO	TOT CLAIMS	IND CLAIMS
15/495,539	04/24/2017	2642	730	E1027.800(T).US1D1C1C3	20	3

CONFIRMATION NO. 1050

FILING RECEIPT

114581
EIP US LLP
2468 Historic Decatur Road
Suite 200
San Diego, CA 92106



Date Mailed: 05/01/2017

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)

Marcus Da Silva, Spokane, WA;
William J. Crilly JR., Liberty Lake, WA;
James Brennan, Sammamish, WA;
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Siavash Alamouti, Spokane, WA;
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Bobby Jose, Veradale, WA;
Yang-Seok Choi, Liberty Lake, WA;
Vahid Tarokh, Cambridge, MA;
Praveen Mehrotra, Spokane, WA;

Applicant(s)

XR Communications, LLC D/B/A Vivato Technologies, Solana Beach, CA;

Power of Attorney: The patent practitioners associated with Customer Number 114581

Domestic Priority data as claimed by applicant

This application is a CON of 15/260,147 09/08/2016
which is a CON of 13/855,410 04/02/2013 PAT 9462589
which is a DIV of 10/700,329 11/03/2003 PAT 8412106
which claims benefit of 60/423,660 11/04/2002

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.

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Petitioner's Exhibit 1002
Page 000252

Permission to Access Application via Priority Document Exchange: Yes

Permission to Access Search Results: Yes

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

Projected Publication Date: 08/10/2017
Non-Publication Request: No
Early Publication Request: No
**** SMALL ENTITY ****
Title

DIRECTED WIRELESS COMMUNICATION

Preliminary Class

455

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,

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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).

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Title 37, Code of Federal Regulations, 5.11 & 5.15

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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).

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APPLICATION NUMBER	FILING OR 371(C) DATE	FIRST NAMED APPLICANT	ATTY. DOCKET NO./TITLE
15/495,539	04/24/2017	Marcus Da Silva	E1027.800(T).US1D1C1C3

CONFIRMATION NO. 1050

114581
EIP US LLP
2468 Historic Decatur Road
Suite 200
San Diego, CA 92106

37 CFR 1.48(f)
ACKNOWLEDGEMENT LETTER

OC000000090993971

Date Mailed: 05/01/2017

NOTICE OF ACCEPTANCE OF REQUEST UNDER 37 CFR 1.48(f)

This is in response to the applicant's request under 37 CFR 1.48(f) submitted on 04/27/2017.

The request under 37 CFR 1.48(f) to correct the inventorship, to correct or update the name of an inventor, or to correct the order of names of joint inventors is accepted.

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

/tpnguyen/

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Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NUMBER	FILING or 371(c) DATE	GRP ART UNIT	FIL FEE REC'D	ATTY.DOCKET.NO	TOT CLAIMS	IND CLAIMS
15/495,539	04/24/2017	2411	730	E1027.800(T).US1D1C1C3	20	3

CONFIRMATION NO. 1050

UPDATED FILING RECEIPT

114581
EIP US LLP
2468 Historic Decatur Road
Suite 200
San Diego, CA 92106



Date Mailed: 05/01/2017

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)

Marcus Da Silva, Spokane, WA;
William J. Crilly JR., Liberty Lake, WA;
James Brennan, Sammamish, WA;
Robert J. Conley, Liberty Lake, WA;
Siavash Alamouti, Spokane, WA;
Eduardo Casas, Vancouver, CANADA;
Hujun Yin, Spokane, WA;
Bobby Jose, Veradale, WA;
Yang-Seok Choi, Liberty Lake, WA;
Vahid Tarokh, Cambridge, MA;
Praveen Mehrotra, Spokane, WA;

Applicant(s)

XR Communications, LLC D/B/A Vivato Technologies, Solana Beach, CA;

Power of Attorney: The patent practitioners associated with Customer Number 114581

Domestic Priority data as claimed by applicant

This application is a CON of 15/260,147 09/08/2016
which is a CON of 13/855,410 04/02/2013 PAT 9462589
which is a DIV of 10/700,329 11/03/2003 PAT 8412106
which claims benefit of 60/423,660 11/04/2002

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.

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Permission to Access Application via Priority Document Exchange: Yes

Permission to Access Search Results: Yes

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

Projected Publication Date: 08/10/2017
Non-Publication Request: No
Early Publication Request: No
**** SMALL ENTITY ****
Title

DIRECTED WIRELESS COMMUNICATION

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,

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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.

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Page 000260

PATENT APPLICATION FEE DETERMINATION RECORD

Substitute for Form PTO-875

Application or Docket Number: 15/495,539

APPLICATION AS FILED - PART I

FOR	(Column 1) NUMBER FILED	(Column 2) NUMBER EXTRA	SMALL ENTITY RATE($)	SMALL ENTITY FEE($)	OR	OTHER THAN SMALL ENTITY RATE($)	OTHER THAN SMALL ENTITY FEE($)
BASIC FEE (37 CFR 1.16(a), (b), or (c))	N/A	N/A	N/A	70		N/A	
SEARCH FEE (37 CFR 1.16(k), (i), or (m))	N/A	N/A	N/A	300		N/A	
EXAMINATION FEE (37 CFR 1.16(o), (p), or (q))	N/A	N/A	N/A	360		N/A	
TOTAL CLAIMS (37 CFR 1.16(i))	20 minus 20 =	*	x 40 =	0.00	OR		
INDEPENDENT CLAIMS (37 CFR 1.16(h))	3 minus 3 =	*	x 210 =	0.00			
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	730		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	SMALL ENTITY RATE($)	SMALL ENTITY ADDITIONAL FEE($)	OR	OTHER THAN SMALL ENTITY RATE($)	OTHER THAN SMALL ENTITY ADDITIONAL FEE($)
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.

Document Description: Application Data Sheet to update/correct info
Doc Code: ADS.CORR

CORRECTED ADS FORM

Application Number	15495539
Title of Invention	DIRECTED WIRELESS COMMUNICATION

Inventor Information

****If no data is shown, no data has been corrected****

	Data of Record	Updated Data
Order Number	1	
Name	Marcus Da Silva	
Residence Information		
Residency	us-residency	
City	Spokane	
State	WA	
Country of Residence	US	
Mailing Address of Inventor		
Address 1	5510 East 25th	
Address 2		
City,State/Province, Postal Code	Spokane WA 99223	
Country	US	

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Document Description: Application Data Sheet to update/correct info
Doc Code: ADS.CORR

	Data of Record	Updated Data
Order Number	10	
Name	Vahid Tarokh	
Residence Information		
Residency	us-residency	
City	Cambridge	
State	MA	
Country of Residence	US	
Mailing Address of Inventor		
Address 1	157 Pleasant Street, Apt 305	
Address 2		
City,State/Province, Postal Code	Cambridge MA 02139	
Country	US	

Corrected ADS 1.0

Document Description: Application Data Sheet to update/correct info
Doc Code: ADS.CORR

	Data of Record	Updated Data
Order Number	11	
Name	Praveen Mehrotra	
Residence Information		
Residency	us-residency	
City	Spokane	
State	WA	
Country of Residence	US	
Mailing Address of Inventor		
Address 1	13303 East Mission Ave., Apt 75	
Address 2		
City,State/Province, Postal Code	Spokane WA 99216	
Country	US	

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Document Description: Application Data Sheet to update/correct info
Doc Code: ADS.CORR

	Data of Record	Updated Data
Order Number	2	
Name	~~William J. Crilly~~	William J. Crilly Jr.
Residence Information		
Residency	us-residency	
City	Liberty Lake	
State	WA	
Country of Residence	US	
Mailing Address of Inventor		
Address 1	23825 E. 2nd Avenue Ct.	
Address 2		
City,State/Province, Postal Code	Liberty Lake WA 99019	
Country	US	

Corrected ADS 1.0

Document Description: Application Data Sheet to update/correct info
Doc Code: ADS.CORR

	Data of Record	Updated Data
Order Number	3	
Name	James Brennan	
Residence Information		
Residency	us-residency	
City	Sammamish	
State	WA	
Country of Residence	US	
Mailing Address of Inventor		
Address 1	414 213th PL SE	
Address 2		
City,State/Province, Postal Code	Sammamish WA 98074	
Country	US	

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Page 000266

Document Description: Application Data Sheet to update/correct info
Doc Code: ADS.CORR

	Data of Record	Updated Data
Order Number	4	
Name	Robert J. Conley	
Residence Information		
Residency	us-residency	
City	Liberty Lake	
State	WA	
Country of Residence	US	
Mailing Address of Inventor		
Address 1	23326 E. 2nd Avenue	
Address 2		
City,State/Province, Postal Code	Liberty Lake WA 99019	
Country	US	

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Document Description: Application Data Sheet to update/correct info
Doc Code: ADS.CORR

	Data of Record	Updated Data
Order Number	5	
Name	Siavash Alamouti	
Residence Information		
Residency	us-residency	
City	Spokane	
State	WA	
Country of Residence	US	
Mailing Address of Inventor		
Address 1	2123 West 1st Ave., Apt 3	
Address 2		
City,State/Province, Postal Code	Spokane WA 99204	
Country	US	

Corrected ADS 1.0

Document Description: Application Data Sheet to update/correct info
Doc Code: ADS.CORR

	Data of Record	Updated Data
Order Number	6	
Name	Eduardo Casas	
Residence Information		
Residency	non-us-residency	
City	Vancouver	
State		
Country of Residence	CA	
Mailing Address of Inventor		
Address 1	7542 Ontario Street	
Address 2		
City,State/Province, Postal Code	Vancouver V5X3C2	
Country	CA	

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Document Description: Application Data Sheet to update/correct info
Doc Code: ADS.CORR

	Data of Record	Updated Data
Order Number	7	
Name	Hujun Yin	
Residence Information		
Residency	us-residency	
City	Spokane	
State	WA	
Country of Residence	US	
Mailing Address of Inventor		
Address 1	2415 N. Cherry Street, Apt. 23	
Address 2		
City,State/Province, Postal Code	Spokane WA 99216	
Country	US	

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Document Description: Application Data Sheet to update/correct info
Doc Code: ADS.CORR

	Data of Record	Updated Data
Order Number	8	
Name	Bobby Jose	
Residence Information		
Residency	us-residency	
City	Veradale	
State	WA	
Country of Residence	US	
Mailing Address of Inventor		
Address 1	15821 East 4th Ave., Apt F 125	
Address 2		
City,State/Province, Postal Code	Veradale WA 99037	
Country	US	

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Document Description: Application Data Sheet to update/correct info
Doc Code: ADS.CORR

	Data of Record	Updated Data
Order Number	9	
Name	Yang-Seok Choi	
Residence Information		
Residency	us-residency	
City	Liberty Lake	
State	WA	
Country of Residence	US	
Mailing Address of Inventor		
Address 1	22809 East Country Vista Drive, Apt 438	
Address 2		
City,State/Province, Postal Code	Liberty Lake WA 99019	
Country	US	

Application Information

	Data of Record	Updated Data
Title of Invention	DIRECTED WIRELESS COMMUNICATION	
Attorney Docket Number	E1027.800(T).US1D1C1C3	
Entity Type	Regular Undiscounted	

Domestic Benefit/National Stage Information

****If no data is shown, no data has been corrected****

This section allows for the applicant to either claim benefit under 35 U.S.C. 119(e), 120, 121,365(c), or 386(c) or indicate National Stage entry from a PCT application. Providing this information in the application data sheet constitutes the specific reference required by 35 U.S. C. 119(e) or 120, and 37 CFR 1.78(a).

Corrected ADS 1.0

		Data of Record	Updated Data
	Prior Application Status		
	Application Number		
	Continuity Type		
	Prior Application Number		
	Filing Date (YYYY-MM-DD)		
	Patent Number		
	Issue Date (YYYY-MM-DD)		

Foreign Priority Information

****If no data is shown, no data has been corrected****

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) 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).

		Data of Record	Updated Data
	Application Number		
	Country		
	Filing Date		
	Access Code		

Applicant Information

****If no data is shown, no data has been corrected****
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.

	Data of Record	Updated Data
Applicant Type		

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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		
Applicant is an Organization		
Name		
Organization Name		
Address 1		
Address 2		
City,State/Province,Postal Code		
Country		
Phone Number		
Fax Number		
Email Address		

Assignee Information including Non-Applicant Assignee Information

****If no data is shown, no data has been corrected****
Providing this information in the application data sheet does not substitute for compliance with any requirement of part 3 of Title 37 of the CFR to have an assignment recorded in the Office

	Data of Record	Updated Data
Order		
Applicant is an Organization		
Name		

Organization Name		

Mailing Address

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

Signature

NOTE: This Application Data Sheet must be signed in accordance with 37 CFR 1.33(b).

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	/Nicholas R. Transier/	Registration Number	68743
First Name	Nicholas	Last Name	TRANSIER

Doc code: Oath
Document Description: Oath or declaration filed

PTO/AIA/02 (07-13)
Approved for use through 04/30/2017. OMB 0651-0032
U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE
Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it displays a valid OMB control number.

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	Directed Wireless Communication

This statement is directed to:

[ ] The attached application,

OR

[x] United States application or PCT international application number 13/855,410 filed on 04/02/2013.

LEGAL NAME of inventor to whom this substitute statement applies:

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

William J. Crilly, Jr.

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

Liberty Lake	WA	United States of America
City	State	Country

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

23825 E. 2nd Avenue Ct.

Liberty Lake	WA	99019	United States of America
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),

[x] 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.

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PTO/SB/AIA02 (07-13)
Approved for use through 01/31/2014. 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.

SUBSTITUTE STATEMENT

Circumstances permitting execution of this substitute statement:

- [ ] Inventor is deceased,
- [ ] Inventor is under legal incapacity,
- [x] 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

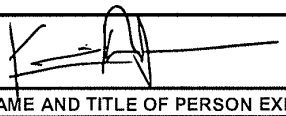
- [ ] An application data sheet under 37 CFR 1.76 (PTO/AIA/14 or equivalent) has not been submitted. Thus, a Substitute Statement Supplemental Sheet (PTO/AIA/11 or equivalent) naming the entire inventive entity and providing inventor information is attached. See 37 CFR 1.64(b).

WARNING:

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.

PERSON EXECUTING THIS SUBSTITUTE STATEMENT:

Name:	Date (Optional):
Kai Hansen	

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: XR Communications, LLC D/B/A Vivato Technologies

Title of Person Executing
This Substitute Statement:

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	State	Country
San Diego	CA	United States of America

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

6260 Sequence Drive; Suite 100

City	State	Zip	Country
San Diego	CA	92121	United States of America

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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IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Applicant:	XR Communications, LLC D/B/A Vivato Technologies
Application No.:	15/495,539
Filing Date:	April 24, 2017
Title:	DIRECTED WIRELESS COMMUNICATION
Examiner:	To be assigned
Art Unit:	To be assigned
Confirmation No.:	1050

GENERAL TRANSMITTAL

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

Dear Sir:

Applicant respectfully submits the following:

- Corrected ADS updating inventor name from William J. CRILLY to William J. CRILLY, JR.
- A copy of the Substitute Statement in Lieu of an Oath or Declaration for William J. CRILLY, JR., which was previously submitted with the original applications papers on April 24, 2017 at pages 3-4 of the Oath or Declaration document.
- The processing fee of $70 as set forth in § 1.17(i).

Please charge any additional fees, including any fees for additional extension of time, or credit overpayment to Deposit Account No. 506237.

Respectfully submitted,

EIP US LLP

Dated: April 27, 2017

By: / Nicholas R. Transier /

Nicholas R. TRANSIER
Registration No. 68,743
Attorney of Record
Customer No. 114581
(619) 795-1300

Electronic Patent Application Fee Transmittal

Application Number:	15495539
Filing Date:	
Title of Invention:	DIRECTED WIRELESS COMMUNICATION
First Named Inventor/Applicant Name:	
Filer:	Nicholas R. Transier/Jenny Stedman
Attorney Docket Number:	E1027.800(T).US1D1C1C3

Filed as Small Entity

Filing Fees for Utility under 35 USC 111(a)

Description	Fee Code	Quantity	Amount	Sub-Total in USD($)
Basic Filing:				
PROCESSING FEE, EXCEPT PROV. APPLS.	2830	1	70	70
Pages:				
Claims:				
Miscellaneous-Filing:				
Petition:				
Patent-Appeals-and-Interference:				
Post-Allowance-and-Post-Issuance:				

Description	Fee Code	Quantity	Amount	Sub-Total in USD($)
Extension-of-Time:				
Miscellaneous:				
		Total in USD ($)		**70**

Electronic Acknowledgement Receipt	
EFS ID:	29055642
Application Number:	15495539
International Application Number:	
Confirmation Number:	1050
Title of Invention:	DIRECTED WIRELESS COMMUNICATION
First Named Inventor/Applicant Name:	
Customer Number:	114581
Filer:	Nicholas R. Transier/Jenny Stedman
Filer Authorized By:	Nicholas R. Transier
Attorney Docket Number:	E1027.800(T).US1D1C1C3
Receipt Date:	27-APR-2017
Filing Date:	
Time Stamp:	19:56:52
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	yes
Payment Type	CARD
Payment was successfully received in RAM	$70
RAM confirmation Number	042817INTEFSW19565100
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	Application Data Sheet to update/ correct info	CorrectedADS.pdf	150800 4846588ad5983dff8943e701b076568775cc ffcea	no	14
Warnings:					
Information:					
2	Oath or Declaration filed	Crilly_Declaration.pdf	409199 58cba397c18d65b5ba635cd505a4d7a691f b70e7	no	2
Warnings:					
Information:					
3	Transmittal Letter	2017-04-27_Transmittal_C3.pdf	16840 a7d4ea963dc35a26567c0a87c746cc24046 08e2b	no	1
Warnings:					
Information:					
4	Fee Worksheet (SB06)	fee-info.pdf	30202 6c8c9904aa8f649609edf65d01906fd060ad bbd5	no	2
Warnings:					
Information:					
		Total Files Size (in bytes):	607041		

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.

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:	Marcus DA SILVA	Nonprovisional Application Number (if known):	
Title of Invention:	DIRECTED WIRELESS COMMUNICATION		

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 /Nicholas R. Transier/	Date April 24, 2017
Name (Print/Typed) Nicholas R. TRANSIER	Practitioner Registration Number 68743

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.

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.

Doc code: Oath
Document Description: Oath or declaration filed

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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	Directed Wireless Communication

This statement is directed to:

[ ] The attached application,

OR

[x] United States application or PCT international application number 13/855,410 filed on 04/02/2013.

LEGAL NAME of inventor to whom this substitute statement applies:

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

Marcus Da Silva

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

Spokane	WA	United States of America
City	State	Country

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

5510 East 25th

Spokane	WA	99223	United States of America
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),

[x] 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.

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Page 000286

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SUBSTITUTE STATEMENT

Circumstances permitting execution of this substitute statement:

- [ ] Inventor is deceased,
- [ ] Inventor is under legal incapacity,
- [x] 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

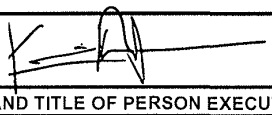
- [ ] An application data sheet under 37 CFR 1.76 (PTO/AIA/14 or equivalent) has not been submitted. Thus, a Substitute Statement Supplemental Sheet (PTO/AIA/11 or equivalent) naming the entire inventive entity and providing inventor information is attached. See 37 CFR 1.64(b).

WARNING:

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.

PERSON EXECUTING THIS SUBSTITUTE STATEMENT:

Name:	Date (Optional):
Kai Hansen	

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: XR Communications, LLC D/B/A Vivato Technologies

Title of Person Executing
This Substitute Statement:

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	State	Country
San Diego	CA	United States of America

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

6260 Sequence Drive; Suite 100

City	State	Zip	Country
San Diego	CA	92121	United States of America

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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Doc code: Oath
Document Description: Oath or declaration filed

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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	Directed Wireless Communication

This statement is directed to:

[ ] The attached application,

OR

[x] United States application or PCT international application number 13/855,410 filed on 04/02/2013.

LEGAL NAME of inventor to whom this substitute statement applies:

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

William J. Crilly, Jr.

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

Liberty Lake	WA	United States of America
City	State	Country

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

23825 E. 2nd Avenue Ct.

Liberty Lake	WA	99019	United States of America
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),

[x] 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.

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SUBSTITUTE STATEMENT

Circumstances permitting execution of this substitute statement:

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- [ ] Inventor is under legal incapacity,
- [x] 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

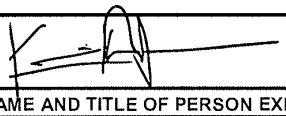
- [ ] An application data sheet under 37 CFR 1.76 (PTO/AIA/14 or equivalent) has not been submitted. Thus, a Substitute Statement Supplemental Sheet (PTO/AIA/11 or equivalent) naming the entire inventive entity and providing inventor information is attached. See 37 CFR 1.64(b).

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PERSON EXECUTING THIS SUBSTITUTE STATEMENT:

Name:	Date (Optional):
Kai Hansen	

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: XR Communications, LLC D/B/A Vivato Technologies

Title of Person Executing
This Substitute Statement:

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6260 Sequence Drive; Suite 100

City	State	Zip	Country
San Diego	CA	92121	United States of America

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

Title of Invention	Directed Wireless Communication

As the below named inventor, I hereby declare that:

This declaration is directed to:

- [ ] The attached application, or
- [x] United States application or PCT international application number 13/855,410 filed on April 2, 2013 .

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

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

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

WARNING:

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LEGAL NAME OF INVENTOR

Inventor: James Brennan Date (Optional): Nov. 5, 2015

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.

Doc code: Oath
Document Description: Oath or declaration filed

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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	Directed Wireless Communication

This statement is directed to:

☐ The attached application,

OR

☒ United States application or PCT international application number 13/855,410 filed on 04/02/2013.

LEGAL NAME of inventor to whom this substitute statement applies:

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

Robert J. Conley

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

Liberty Lake	WA	United States of America
City	State	Country

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

23326 E. 2nd Avenue

Liberty Lake	WA	99019	United States of America
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.

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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.

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SUBSTITUTE STATEMENT

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- [ ] Inventor is deceased,
- [ ] Inventor is under legal incapacity,
- [x] 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

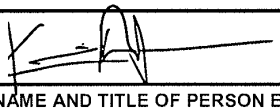
- [ ] An application data sheet under 37 CFR 1.76 (PTO/AIA/14 or equivalent) has not been submitted. Thus, a Substitute Statement Supplemental Sheet (PTO/AIA/11 or equivalent) naming the entire inventive entity and providing inventor information is attached. See 37 CFR 1.64(b).

WARNING:

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PERSON EXECUTING THIS SUBSTITUTE STATEMENT:

Name:	Date (Optional):
Kai Hansen	

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: XR Communications, LLC D/B/A Vivato Technologies

Title of Person Executing This Substitute Statement:

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	State	Country
San Diego	CA	United States of America

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

6260 Sequence Drive; Suite 100

City	State	Zip	Country
San Diego	CA	92121	United States of America

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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Petitioner's Exhibit 1002
Page 000292

Doc code: Oath
Document Description: Oath or declaration filed

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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	Directed Wireless Communication

This statement is directed to:

☐ The attached application,

OR

☒ United States application or PCT international application number 13/855,410 filed on 04/02/2013.

LEGAL NAME of inventor to whom this substitute statement applies:

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

Siavash Alamouti

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

Spokane	WA	United States of America
City	State	Country

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

2123 West 1st Ave., Apt 3

Spokane	WA	99204	United States of America
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.

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SUBSTITUTE STATEMENT

Circumstances permitting execution of this substitute statement:

- [ ] Inventor is deceased,
- [ ] Inventor is under legal incapacity,
- [x] 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

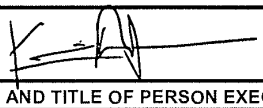
- [ ] An application data sheet under 37 CFR 1.76 (PTO/AIA/14 or equivalent) has not been submitted. Thus, a Substitute Statement Supplemental Sheet (PTO/AIA/11 or equivalent) naming the entire inventive entity and providing inventor information is attached. See 37 CFR 1.64(b).

WARNING:

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PERSON EXECUTING THIS SUBSTITUTE STATEMENT:

Name:	Date (Optional):
Kai Hansen	

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: XR Communications, LLC D/B/A Vivato Technologies

Title of Person Executing
This Substitute Statement:

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	State	Country
San Diego	CA	United States of America

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

6260 Sequence Drive; Suite 100

City	State	Zip	Country
San Diego	CA	92121	United States of America

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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Petitioner's Exhibit 1002
Page 000294

Doc code: Oath
Document Description: Oath or declaration filed

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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	Directed Wireless Communication

This statement is directed to:

[ ] The attached application,

OR

[x] United States application or PCT international application number 13/855,410 filed on 04/02/2013.

LEGAL NAME of inventor to whom this substitute statement applies:

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

Eduardo Casas

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

Vancouver	BC	Canada
City	State	Country

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

7542 Ontario Street

Vancouver		V5X3C2	Canada
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.

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[x] Assignee,

[ ] Person to whom the inventor is under an obligation to assign,

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[ ] Joint Inventor.

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SUBSTITUTE STATEMENT

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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

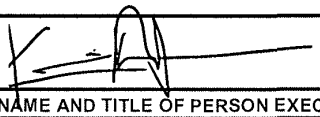
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PERSON EXECUTING THIS SUBSTITUTE STATEMENT:

Name:	Date (Optional):
Kai Hansen	

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: XR Communications, LLC D/B/A Vivato Technologies

Title of Person Executing
This Substitute Statement:

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	State	Country
San Diego	CA	United States of America

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

6260 Sequence Drive; Suite 100

City	State	Zip	Country
San Diego	CA	92121	United States of America

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Petitioner's Exhibit 1002
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Doc code: Oath
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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	Directed Wireless Communication

This statement is directed to:

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OR

☒ United States application or PCT international application number 13/855,410 filed on 04/02/2013.

LEGAL NAME of inventor to whom this substitute statement applies:

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

Hujun Yin

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

Spokane	WA	United States of America
City	State	Country

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

2415 N. Cherry Street, Apt. 23

Spokane	WA	99216	United States of America
City	State	Zip	Country

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☒ Assignee,

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PERSON EXECUTING THIS SUBSTITUTE STATEMENT:

Name:	Date (Optional):
Kai Hansen	

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: XR Communications, LLC D/B/A Vivato Technologies

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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	Directed Wireless Communication

As the below named inventor, I hereby declare that:

This declaration is directed to:
- [ ] The attached application, or
- [x] United States application or PCT international application number 13/855,410 filed on April 2, 2013 .

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.

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LEGAL NAME OF INVENTOR

Inventor: Bobby Jose Date (Optional): 21 NOV 2015

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.

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LEGAL NAME OF INVENTOR

Inventor: Yang-Seok Choi Date (Optional): _____

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.

PTO/AIA/01 (06-12)
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LEGAL NAME OF INVENTOR

Inventor: Vahid Tarokh Date (Optional): 11/02/2015

Signature: Vahid Tarokh

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.

PTO/AIA/01 (06-12)
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LEGAL NAME OF INVENTOR

Inventor: Praveen Mehrotra Date (Optional): 11/05/2015

Signature: Praveen

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.

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

PTO/AIA/82A (07-13)
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TRANSMITTAL FOR POWER OF ATTORNEY TO ONE OR MORE REGISTERED PRACTITIONERS

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

Application Number	
Filing Date	Herewith
First Named Inventor	Marcus DA SILVA
Title	Directed Wireless Communication
Art Unit	TBD
Examiner Name	TBD
Attorney Docket Number	E1027.800(T).US1D1C1C3

SIGNATURE of Applicant or Patent Practitioner

Signature	/Nicholas R. Transier/	Date (Optional)	
Name	Nicholas R. TRANSIER	Registration Number	68743
Title (if Applicant is a juristic entity)	Attorney of Record		
Applicant Name (if Applicant is a juristic entity)	XR Communications, LLC D/B/A Vivato Technologies		

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

☑ *Total of 1 forms are submitted.

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

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

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

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

POWER OF ATTORNEY BY APPLICANT

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

Application Number	Filing Date

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

☑ I hereby appoint the Patent Practitioner(s) associated with the following Customer Number as my/our attorney(s) or agent(s), and to transact all business in the United States Patent and Trademark Office connected therewith for the application referenced in the attached transmittal letter (form PTO/AIA/82A) or identified above: 114581

OR

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

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

☑ The address associated with the above-mentioned Customer Number

OR

☐ The address associated with Customer Number:

OR

Firm or Individual Name					
Address					
City		State		Zip	
Country					
Telephone		Email			

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

XR Communications, LLC D/B/A Vivato Technologies

☐ Inventor or Joint Inventor (title not required below)

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

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SIGNATURE of Applicant for Patent

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

Signature		Date (Optional)	1-24-19
Name	Kurt Hansen		
Title	Managing Member, XR Communications, LLC D/B/A Vivato Technologies		

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

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DIRECTED WIRELESS COMMUNICATION

CROSS-REFERENCE TO RELATED APPLICATIONS

[0001] This application is a continuation of U.S. Application No. 15/260,147, filed September 8, 2016, which is a continuation application of US. Patent Application No. 13/855,410, filed on April 2, 2013 (now U.S. Patent No. 9,462,589), which is a divisional application of U.S. Patent Application No. 10/700,329, filed on November 3, 2003 (now U.S. Patent No. 8,412,106), which claims the benefit of U.S. Provisional Application No. 60/423,660, filed on November 4, 2002. Each of the above-referenced patent applications is incorporated herein by reference in its entirety.

BACKGROUND

[0002] The following disclosure relates to directed wireless communication.

[0003] Computing devices and other similar devices implemented to send and/or receive data can be interconnected in a wired network or wireless network to allow the data to be communicated between the devices. Wired networks, such as wide area networks (WANs) and local area networks (LANs) for example, tend to have a high bandwidth and can therefore be configured to communicate digital data at high data rates. One obvious drawback to wired networks is that the range of movement of a device is constrained since the device needs to be physically connected to the network for data exchange, For example, a user of a portable computing device will need to remain near to a wired network junction to maintain a connection to the wired network.

[0004] An alternative to wired networks is a wireless network that is configured to support similar data communications but in a more accommodating manner. For example, the user of the portable computing device can move around within a region that is supported by the wireless network without having to be physically connected to the network. A limitation of conventional wireless networks, however, is their relatively low bandwidth which results in a much slower exchange of data than a wired network. Further, conventional wireless networks are implemented with multiple base stations, or access points, that relay communications between wireless-configured devices. These conventional access points have a limited communication range,

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typically 20 to 200 feet, and a wireless network requires a large number of these access points to cover and provide a communication link over a large area.

[0005] Many conventional wireless communication systems and networks implement omni-directional antennas to transmit data packets to a client device and receive data packets from or via an access point. With a standard wireless LAN, for example, a transmission is communicated equally in all directions from an omni-directional antenna, or point of emanation. Receiving devices located within range and positioned at any angle with respect to the emanating point can receive the wireless transmission.

[0006] However, standard omni-directional wireless LANs or omni-directional wireless wide area networks (WANs) have drawbacks and limitations. For example, transmission range is limited and electromagnetic interference associated with transmissions is unmanaged and can interfere with or otherwise restrict the use of other communicating devices that operate in the same frequency band within the transmission coverage area. Furthermore, inefficiencies and data corruption can occur if two or more centralized points of emanation are positioned proximate to have overlapping coverage areas.

SUMMARY

[0007] Directed wireless communication is described herein. In an implementation, a multi-beam directed signal system coordinates directed wireless communication with client devices. A transmit beam-forming network routes data communication transmissions to the client devices via directed communication beams that are emanated from an antenna assembly, and a receive beam-forming network receives data communication receptions from the client devices via the directed communication beams.

BRIEF DESCRIPTION OF THE DRAWINGS

[0008] The same numbers are used throughout the drawings to reference like features and components.

[0009] FIG. 1 illustrates an exemplary wireless communications environment.

[0010] FIG. 2 illustrates an exemplary directed wireless communication system.

[0011] FIG. 3 illustrates an exemplary communication beam array which can be generated with the exemplary directed wireless communication system shown in FIG. 2.

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[0012] FIG. 4 illustrates an exemplary antenna array for an antenna assembly as shown in FIG. 3.

[0013] FIG. 5 illustrates an exemplary implementation of the directed wireless communication system shown in FIG. 2.

[0014] FIG. 6 illustrates an exemplary set of communication beams that emanate from an antenna array of an antenna assembly as shown in FIG. 3.

[0015] FIG. 7 illustrates an exemplary multi-beam directed signal system that establishes multiple access points.

[0016] FIGS. 8A and 8B illustrate various components of a multi-beam directed signal system and an antenna assembly of the directed wireless communication system shown in FIG. 2.

[0017] FIG. 9 illustrates an exemplary multi-beam directed signal system that includes various components such as medium access controllers (MACs), baseband units, and MAC coordinator logic.

[0018] FIG. 10 further illustrates various components of the exemplary multi-beam directed signal system shown in FIG. 9.

[0019] FIG. 11 illustrates a state transition diagram for a medium access controller (MAC).

[0020] FIG. 12 illustrates a multi-beam directed signal system receiving and weighting various communication signals.

[0021] FIG. 13 illustrates an exemplary multi-beam directed signal system that includes various component implementations.

[0022] FIG. 14 further illustrates a component implementation of the multi-beam directed signal system for complementary beam-forming.

[0023] FIG. 15 illustrates a graph depicting a signal level output (dB) for the component implementation shown in FIG. 14.

[0024] FIG. 16 illustrates a state transition diagram for a roaming client device in wireless communication with a multi-beam directed signal system as shown in FIG. 2.

[0025] FIG. 17 is a flow diagram of an exemplary method for a directed wireless communication system implemented with a multi-beam directed signal system and antenna assembly.

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[0026] FIG. 18 is a flow diagram of an exemplary method for a directed wireless communication system implemented with a multi-beam directed signal system and antenna assembly.

[0027] FIG. 19 is a flow diagram of an exemplary method for client device roaming in a directed wireless communication system.

DETAILED DESCRIPTION OF CERTAIN EMBODIMENTS

[0028] Directed wireless communication is described in which a multi-beam directed signal system is implemented to communicate over a wireless communication link via an antenna assembly with client devices implemented for wireless communication within the wireless system. The directed wireless communication system can be implemented to communicate with multiple devices, such as portable computers, computing devices, and any other type of electronic and/or communication device that can be configured for wireless communication. Further, the multiple electronic and/or computing devices can be configured to communicate with one another within the wireless communication system. Additionally, a directed wireless communication system can be implemented as a wireless local area network (WLAN), a wireless wide area network (WAN), a wireless metropolitan area network (MAN), or as any number of other similar wireless network configurations.

[0029] The following description identifies various systems and methods that may be included in such directed wireless communication systems and networks. It should be noted, however, that these are merely exemplary and that not all of the techniques described herein need be implemented in a given wireless system or network. Furthermore, many of the exemplary systems and methods described herein are also applicable and/or adaptable for use in other communication systems and networks.

[0030] Directed wireless communication provides improved performance over conventional wireless network arrangements by utilizing multi-beam receiving and/or transmitting adaptive antennas, when practical. In an implementation, simultaneous transmission and reception may occur at a wireless routing device by applying multi-channel techniques. In a described implementation, a multi-beam directed signal system (e.g., also referred to as an access point or Wi-Fi switch) is a long-range packet switch designed to support 802.11b clients in accordance with an 802.11 standard. An increase in communication range is achieved by beam-forming

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directed communication beams which simultaneously transmit directed signals and receive communication signals from different directions via receive and transmit beam-forming networks.

[0031] The multi-beam directed signal system establishes multiple point-to-point links (e.g., directed communication beams) by which data packets can be communicated. The point-to-point links have a communication range that covers a much larger area than conventional access points, eliminating the need for multiple communication access points and significantly reducing the complexity and cost of a wireless LAN (WLAN) network. Further, a client device can use a conventional wireless card to communicate with the multi-beam directed signal system over long distances with no modification of the client device. Accordingly, directed wireless communication as described herein represents a significant improvement over conventional wireless networks that use switched beam and/or omni-directional antennas.

[0032] FIG. 1 illustrates an exemplary wireless communications environ merit 100 that is generally representative of any number of different types of wireless communications environments, including but not limited to those pertaining to wireless local area networks (LANs) or wide area networks (WANs) (e.g., Wi-Fi compatible) technology, cellular technology, trunking technology, and the like. In wireless communications environment 100, an access station 102 communicates with remote client devices 104(1), 104(2), . . . , 104(N) via wireless communication or communication links 106(1), 106(2), . . . , 106(N), respectively. Although not required, access station 102 is typically fixed, and remote client devices 104 may be fixed or mobile. Although only three remote client devices 104 are shown, access station 102 can wirelessly communicate with any number of different client devices 104.

[0033] A directed wireless communication system, Wi-Fi communication system, access station 102, and/or remote client devices 104 may operate in accordance with any IEEE 802.11 or similar standard. With respect to a cellular system, for example, access station 102 and/or remote client devices 104 may operate in accordance with any analog or digital standard, including but not limited to those using time division/demand multiple access (TDMA), code division multiple access (CDMA), spread spectrum, some combination thereof, or any other such technology.

[0034] Access station 102 can be implemented as a nexus point, a trunking radio, a base station, a Wi-Fi switch, an access point, some combination and/or derivative thereof, and so forth. Remote client devices 104 may be, for example, a hand-held device, a desktop or laptop computer, an expansion card or similar that is coupled to a desktop or laptop computer, a personal digital

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assistant (FDA), a mobile phone, a vehicle having a wireless communication device, a tablet or hand/palm-sized computer, a portable inventory-related scanning device, any device capable of processing generally, some combination thereof, and the like. Further, a client device 104 may be any device implemented to receive and/or transmit information (e.g., in the form of data packets) via the applicable wireless communication links 106. Remote client devices 104 may also operate in accordance with any standardized and/or specialized technology that is compatible with the operation of access station 102.

[0035] FIG. 2 illustrates an exemplary directed wireless communication system 200 that can be implemented in any form of a wireless communications environment 100 as described with reference to FIG. 1. The directed wireless communication system 200 includes an access station 102 and remote client devices 202 and 204. The access station 102 includes a multi-beam directed signal system 206 coupled to an antenna assembly 208 via a communication link 210. In this example implementation, access station 102 is coupled to an Ethernet backbone 212.

[0036] The antenna assembly 208 can be implemented as two or more antennas, and optionally as a phased array of antenna elements, to emanate multiple directed communication beams 214(1), 214(2), . . . , 214(N). The antenna assembly 208 is an unobtrusive indoor or outdoor Wi-Fi antenna panel that can include various operability components such as RF devices and components, a central processing unit, a power supply, and other logic components. The antenna assembly can be implemented as a lightweight and thin structure that can be mounted on a wall or in a corner of a room to provide wireless communication over a broad coverage area, such as throughout a building and surrounding area, or over an expanded region, such as a college campus or an entire corporate or manufacturing complex. While the antenna assembly may be applicable or adaptable for use in many other communication systems, the antenna assembly is described in the context of an exemplary wireless communications environment 100 (FIG. 1).

[0037] The multi-beam directed signal system 206 can transmit and/or receive (i.e., transceive) information (e.g., in the form of data packets) by way of one or more directed communication beams 214 as a wireless communication via the antenna assembly 208. Additionally, wireless communication(s) are transmitted and/or received from (i.e., transceived with respect to) a remote client device, such as client devices 202 and 204. The wireless communications may be transceived directionally with respect to one or more particular communication beams 214. The multi-beam directed signal system 206 can be implemented for

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multi-channel directed wireless communication. For example, client device 202 can communicate via directed communication beam 214(1) with a first channel of the multi-beam directed signal system 206, and client device 204 can communicate via directed communication beam, 214(N) with a second channel of the multi-beam directed signal system 206.

[0038] In the exemplary directed wireless communication system 200, signals may be sent from a transmitter to a receiver using electromagnetic waves that emanate from one or more antenna elements of the antenna assembly 208 which are focused in one or more desired directions. For example, the multi-beam directed signal system generates a directed wireless communication for transmission to wireless client device 202 via directed communication beam 214(1). This is in contrast to conventional omni-directional transmission systems that transmit a communication in all directions from an omni-directional antenna (e.g., example omni-directional transmission area 216 emanating from a central transmission point with reference to antenna assembly 208 and shown only for comparison). Although not to scale, the illustration depicts that the power to transmit over the omni-directional transmission area 216 can be directed as one or more communication beams over a farther distance 218 from a point of transmission (e.g., antenna assembly 208).

[0039] When the electromagnetic waves are focused in a desired direction, the pattern formed by the electromagnetic wave is termed a "beam" or "beam pattern", such as a directed communication beam 214. The production and/or application of such electromagnetic beams 214 is typically referred to as "beam-forming." Beam-forming provides a number of benefits such as greater range and/or coverage per unit of transmitted power, improved resistance to interference, increased immunity to the deleterious effects of multi-path transmission signals, and so forth. For example, a single communication beam 214(1) can be directed for communication with a specific wireless-configured client device 202 and can be transmitted over a much greater distance 218 than would be covered by a conventional omni-directional antenna (e.g., example omni-directional transmission area 216 shown only for comparison).

[0040] FIG. 3 illustrates an exemplary communication beam array 300 of directed communication beams 214(1), 214(2), ... 214(N) that emanate from an antenna array 302 which is part of the antenna assembly 208. Antenna assembly 208 is also referred to herein as an "adaptive antenna" which describes an arrangement that includes the antenna array 302 having a plurality of antenna elements, and operatively supporting mechanisms and/or components (e.g., circuits, logic,

etc.) that are part of a wireless routing device and configured to produce a transmission pattern that selectively places transmission nulls and/or peaks in certain directions within an applicable coverage area.

[0041] A transmission peak of a directed communication beam 214 occurs in the transmission pattern 300 when a generated and particular amount of energy is directed in a particular direction. Transmission peaks are, therefore, associated with the signal path and/or communication beam to a desired receiving node, such as another wireless routing device or a wireless client device. In some cases, sidelobes to a communication beam may also be considered to represent transmission peak(s).

[0042] Conversely, a transmission null (e.g., not a communication beam) occurs in the transmission pattern when no transmission of energy occurs in a particular direction, or a relatively insignificant amount of energy is transmitted in a particular direction. Thus, a transmission null is associated with a signal path or lack of a communication beam towards an undesired, possibly interfering, device and/or object. Transmission nulls may also be associated with the intent to maximize power in another direction (i.e., associated with a transmission peak), to increase data integrity or data security, and/or to save power, for example. A determination to direct a transmission null and/or a transmission peak (e.g., a communication beam 214) in a particular direction can be made based on collected or otherwise provided routing information which may include a variety of data associated with the operation of the multi-beam directed signal system 206, wireless routing device, and other devices at other locations or nodes within the wireless network.

[0043] One or more of the communication beams 214(1), 214(2), . . . , 214(N) are directed out symmetrically from antenna array 302 to communicate information (e.g., in the form of data packets) with one or more wireless client devices. The communication beam array 300 shown in FIG. 3 is merely exemplary and other communication beam arrays, or patterns, may differ in width, shape, number, angular coverage, azimuth, and so forth. Further, although all of the directed communication beams 214 are shown emanating from antenna array 302 at what would appear as a same time, transmission and reception via one or more communication beams 214 is controlled and coordinated with signal control and coordination logic 304 of the multi-beam directed signal system 206.

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[0044] The signal control and coordination logic 304 can monitor each of the directed communication beams 214 as an individual access point. Further, the signal control and coordination logic 304 can control a directed wireless transmission to a first client device and a directed wireless transmission from a second client device such that the directed wireless transmission does not interfere with the directed wireless reception. Optionally, a directed wireless transmission and a directed wireless reception can be simultaneous.

[0045] As used herein, the term "logic" (e.g., signal control and coordination logic 304) refers to hardware, firmware, software, or any combination thereof that may be implemented to perform the logical operations associated with a given task. Such, logic can also include any supporting circuitry that may be required to complete a given task including supportive non-logical operations. For example, "logic" may also include analog circuitry, memory, input/output (I/O) circuitry, interface circuitry, power providing/regulating circuitry, etc.

[0046] The directed communication beams 214 of antenna array 302 can be directionally controllable, such as steerable in an analog implementation or stepable in a digital implementation. For example, a directed communication beam 214 can be directionally stepable by the width (e.g., degrees) of the communication beam to "steer" or "aim" addressable data packets when communicating with a client device. Further, a communication beam 214 can be directionally controllable such that only an intended client device will receive a directed wireless communication via the communication beam 214, and such that an unintended recipient will not be able to receive the directed wireless communication.

[0047] Although data signals (e.g., information as data packets) can be directed to and from a particular client device (e.g., client devices 202 and 204) via one or more directed communication beams 214, interference between communications beams 214 can occur. For example, a downlink signal transmission from antenna assembly 208 via communication beam 214(2) can corrupt an uplink signal reception at antenna assembly 208 via communication beam 214(3). The signal control and coordination logic 304 coordinates uplink and downlink signal transmissions across (e.g., between and/or among) the different communication beams 214 so as to avoid, or at least reduce, the frequency at which downlink directed signals are transmitted via a first communication beam (e.g., communication beam 214(2)) while uplink directed signals are being received via a second communication beam (e.g., communication beam 214(3)).

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[0048] FIG. 4 illustrates an exemplary antenna array 302 (also referred to herein as an adaptive antenna) that is formed with an array of antenna elements 400. Each antenna element 400 has multiple communication signal transfer slots 402 (e.g., transfer slots 402(1) and 402(2)) that are formed into a front surface 404 of an antenna element 400. The antenna array 302 transmits and receives data as electromagnetic communication signals via the transfer slots 402 in each antenna element 400.

[0049] In an exemplary implementation, the communication signal transfer slots 402 in an antenna element 400 are formed into two parallel slot rows 406(1) and 406(2) in which the transfer slots 402(1) in slot row 406(1) are staggered, or otherwise offset, in relation to the transfer slots 402(2) in slot row 406(2). Each transfer slot 402(1) in slot row 406(1) is offset from each transfer slot 402(2) in slot row 406(2) in a direction 408 and a distance 410. For example, transfer slot 402(1) in slot row 406(1) is offset from transfer slot 402(2) in slot row 408(2) in a direction that is parallel to the slot rows 406 (e.g., the direction 408) over a distance that is approximately the length of one rectangular transfer slot 402 (e.g., the distance 410). The distance 410 between transfer slots 402 in a slot row 406 is approximately the antenna element wavelength $\lambda_g/2$ apart.

[0050] The gain of an adaptive antenna (e.g., antenna array 302) is dependent on the implementation of the multi-beam directed signal system 206. However, for a uniformly illuminated antenna array, the antenna gain is related to its effective aperture by an equation:

$$G_R = \frac{4\pi \cdot A_{eff}}{\lambda^2}$$

Assuming A_{eff} is equal to a cross-sectional area of the antenna array:

$$G_R = \frac{4\pi \cdot w \cdot h}{\lambda^2}$$

where w is the width of the antenna, h is the height of the antenna, and λ is the wavelength. For an example indoor implementation of an antenna array where $w=8\lambda$ and $h=4\lambda$, the antenna gain is determined by the equation:

$$G_R = \frac{4\pi \cdot 8\lambda \cdot 4\lambda}{\lambda^2} = 128\pi = 26 \text{ dBi}$$

For an example outdoor implementation of an antenna array where $w=8\lambda$ and $h=8\lambda$, the antenna gain is determined by the equation:

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$$G_R = \frac{4\pi \cdot 8\lambda \cdot 8\lambda}{\lambda^2} = 256\pi = 29.1 \text{ dBi}$$

When dissipation losses are zero, the antenna gain is equivalent to directivity. The effective aperture may include the effect of losses, and therefore the formulas may be used to calculate the gain. When the actual dimensions of the antenna array 302 are used as the "effective area", the losses are assumed to be zero (e.g., for an ideal implementation).

[0051] In this example illustration, the antenna array 302 is shown configured for indoor use with sixteen antenna elements (e.g., sixteen of antenna elements 400 formed or otherwise positioned together) each having two parallel rows of four communication signal transfer slots each (e.g., slot rows 406(1) and 406(2)). The antenna array 302 can be configured for outdoor use with thirty-two antenna elements (e.g., multiple antenna elements 400) each having two parallel rows of eight communication signal transfer slots each, or can be configured as a larger antenna array or antenna panel with more antenna elements having more communication signal transfer slots per slot row. The antenna array 302 can be configured with as many antenna elements 400 having any number of transfer slots 402 per slot row 406 as needed to provide communication signal transfer (e.g., wireless communication) over a region or desired coverage area.

[0052] FIG. 5 illustrates an exemplary implementation 500 of a directed wireless communication system (e.g., directed wireless communication system 200 shown in FIG. 2) that includes antenna assembly 208 and antenna array 302 as shown in FIG. 4. In this example, antenna array 302 is positioned outside of a building 502 and mounted on an adjacent building 504 to provide wireless communication throughout building 502 and throughout a region 506 outside of building 502. The antenna array 302 is coupled to the multi-beam directed signal system 206 (FIG. 2) which can be communicatively coupled via a LAN connection, for example, to a server computing device positioned in building 504. The server computing device can be implemented to administrate and control the associated functions and operations of the directed wireless communication system 200. Alternatively, antenna array 302 can be mounted within building 502 to provide wireless communication throughout building 502 and throughout the region 506 outside of building 502. For example, antenna array 302 can be mounted in a corner between two interior perpendicular walls to provide wireless communication coverage throughout the coverage area (e.g., building 502 and region 506 outside of the building).

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[0053] The directed wireless communication system 200 (e.g., shown in implementation 500) provides wireless communication of information (e.g., in the form of data packets) via directed communication beams 508(1), 508(2), . . . , 508(N) to any number of electronic and/or computing client devices that are configured to recognize and receive transmission signals from the antenna array 302. Any one or more of the electronic and computing client devices may also transmit information via the directed communication beams 508. Such electronic and computing devices can include printing devices, desktop and portable computing devices such as a personal digital assistant (PDA), cellular phone, and similar mobile communication devices, and any other type of electronic devices configured for wireless communication connectivity throughout building 502, as well as portable devices outside of building 502, such as computing device 510 within region 506. One or more of the electronic and computing client devices may also be connected together via a wired network and/or communication link.

[0054] FIG. 6 illustrates an exemplary set or array of communication beams 600 that emanate from an antenna array 302 as shown in FIGS. 3 and 4. In a described implementation, antenna array 302 can include sixteen antenna elements 400(0, 1, . . . , 14, and 15) (not explicitly shown in FIGS. 4 and 6). From the sixteen antenna elements 400(0-15), sixteen different communication beams 602(0), 602(1), . . . , 602(15) are formed as the wireless communication signals emanating from antenna elements 400(0-15) which may add and/or subtract from each other during electromagnetic propagation.

[0055] Communication beams 602(1), 602(15) spread out, or are directed out, symmetrically from a central communication beam 602(0). The narrowest beam is the central beam 602(0), and the beams become wider as they spread outward from the central beam. For example, beam 602(15) adjacent beam 602(0) is slightly wider than beam 602(0), and beam 602(5) is wider than beam 602(15). Also, beam 602(10) is wider still than beam 602(5). The communication beam pattern of the set of communication beams 600 illustrated in FIG. 6 are exemplary only and other communication beam pattern sets may differ in width, shape, number, angular coverage, azimuth, and so forth.

[0056] Due to implementation effects of the interactions between and among the wireless signals as they emanate from antenna array 302 (e.g., assuming a linear antenna array in a described implementation), communication beam 602(8) is degenerate such that its beam pattern is formed on both sides of antenna array 302. These implementation effects also account for the

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increasing widths of the other beams 602(1-7) and 602(15-9) as they spread outward from the central communication beam 602(0). In addition to the implementation effects of the interactions between and among the wireless signals, an obliquity effect explains that an azimuth beamwidth is related to the projected horizontal dimension of the array, as viewed from an oblique angle. Accordingly, the array appears narrower when viewed from an oblique angle, and therefore has a wider beamwidth as compared to a beamwidth viewed from a perpendicular angle. Beamwidth and directivity are inversely proportional and an obliquity factor (i.e., cos(azimuth angle)) defines a reduction in antenna array directivity at oblique angles and thus an increase in beamwidth. In a further implementation, communication beams 602(7) and 602(9) may be too wide for efficient and productive use. Hence, communication beams 602(7), 602(8), and 602(9) are not used and the implementation utilizes the remaining thirteen communication beams 602 (e.g., communication beams 602(0-6) and beams 602(10-15)).

[0057] FIG. 7 illustrates an exemplary implementation 700 of the multi-beam directed signal system 206 which establishes multiple access points 702(1), 702(2), 702(N). The multi-beam directed signal system 206 establishes any number access points 702 which can each correspond to, for example, an individual access point in accordance with an IEEE 802.11-based standard. Additionally, a wireless coverage area or region for each respective access point 702 may correspond to, for example, a respective directed communication beam 214 as shown in FIGS. 2 and 3, or a respective communication beam 602 as shown in FIG. 6.

[0058] Although communication signals directed into (or obtained from) different access points 702 may be directed at particular or specific coverage areas, interference between access points 702 can occur. For example, a downlink signal transmission for access point 702(2) can destroy an uplink signal reception for access point 702(1). Generally, signal control and coordination logic 304 coordinates uplink signal receptions and downlink signal transmissions across (e.g., between and/or among) different access points 702 so as to avoid, or at least reduce, the frequency at which downlink signals are transmitted at a first access point while uplink signals are being received at a second access point.

[0059] Specifically, signal control and coordination logic 304 is adapted to monitor the multiple access points 702(1), 702(2), . . . , 702(N) to ascertain when a signal, or communication of information, is being received. When an access point 702 is ascertained to be receiving a signal, the signal control and coordination logic 304 limits (e.g., prevents, delays, etc.) the transmission

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of signals on the other access points 702 such that signal transmission does not interfere with signal reception. The monitoring, ascertaining, and restraining of signals can be based on and/or responsive to many factors. For example, the signals can be coordinated (e.g., analyzed and controlled) based on a per-channel basis.

[0060] FIGS. 8A and 8B illustrate various components of the multi-beam directed signal system 206 and the antenna assembly 208 both shown in FIGS. 2 and 3. FIG. 8A illustrates antenna array 302 which includes the sixteen antenna elements 400(0, 1, . . . , 15) as described with reference to FIG. 6. The antenna assembly 208 includes RF (radio frequency) components which are shown as a left transmit antenna board 800, a right transmit antenna board 802, a left receive antenna board 804, and a right receive antenna board 806. The multi-beam directed signal system 206 includes a transmit beam-forming network 808 and a receive beam-forming network 810.

[0061] The left transmit antenna board 800 includes transmission logic 812(0, 1, 7) and the right transmit antenna board 802 includes transmission logic 812(8, 9, . . . , 15). Each transmission logic 812 (e.g., circuit, component, etc.) corresponds to an antenna element 400(0-15) of the antenna array 302 and corresponds to a signal connection (e.g., node, port, channel, etc.) of the transmit beam-forming network 808(0-15). Similarly, the left receive antenna board 804 includes reception logic 814(0, 1, . . . , 7) and the right receive antenna board 806 includes reception logic 814(8, 9, 15). Each reception logic 814 (e.g., circuit, component, etc.) corresponds to an antenna element 400(0-15) of the antenna array 302 and corresponds to a signal connection (e.g., node, port, channel, etc.) of the receive beam-forming network 810(0-15).

[0062] Generally, a beam-forming network 808 and 810 may include multiple ports for connecting to antenna array 302 and multiple ports for connecting to the multiple RF components, such as the transmit and receive antenna boards 800-806. One or more active components (e.g., a power amplifier (PA), a low-noise amplifier (LNA), etc.) may also be coupled to the multiple ports on the antenna array side of a beam-forming network. Thus, antenna array 302 may be directly or indirectly coupled to a beam-forming network 808 and 810.

[0063] Specifically, a beam-forming network 808 and 810 may include at least "N" ports for each of the multiple RF transmission and receive logic components 812 and 814, respectively. For example, each directed communication beam 214 (FIG. 2) or 602 (FIG. 6) emanating from antenna array 302 corresponds to an RF logic component 812 and/or 814. Each RF logic component 812 and 814 can be implemented as, for example, a transmit and/or receive signal

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processor operating at one or more radio frequencies, with each frequency corresponding to a different channel. It should be noted that channels may be defined alternatively (and/or additionally) using a mechanism other than frequency, such as a code, a time slot, some combination thereof, and so forth.

[0064] FIG. 8B further illustrates various components of the multi-beam directed signal system 206 which includes the signal control and coordination logic 304, a multi-beam controller 816, one or more memory components 818, communication interface(s) 820, a scanning receiver 822, and receiver/transmitters (Rx/Tx) 824(0, 1, . . . , 15). The multi-beam controller 816 (e.g., any of a processor, controller, logic, circuitry, etc.) can be implemented to control channel assignments for communication signals and data communication coordinated by the signal control and coordination logic 304.

[0065] The channel assignments coordinated by the signal control and coordination logic 304 provides the best channel assignment for a signal based on given measurement information. Parameters of a channel assignment algorithm include:

[0066] *ChannelAssignmentCycle* which identifies a duration between changes in the channel assignment;

[0067] *HeavyInterference* which identifies an interference activity threshold. If, for example, interference activity is determined to be above this value, a particular channel may be considered deficient for the duration of time that the interference can be detected;

[0068] *BadChannelThreshold* which identifies a number of measurement periods (e.g., a *MeasurementDuration*) that a channel has interference activity above the *HeavyInterference* threshold; and

[0069] *JamInterference* which identifies an interference activity threshold above the *HeavyInterference* parameter.

[0070] Further, channel assignment internal parameters can include:

[0071] *MeasurementCycle* which identifies a time duration (e.g., twenty-four hours) in which a measurement is completed;

[0072] *MeasurementDuration* which identifies a time duration (e.g., minutes) between two measurement points;

[0073] *PeakLoadLimit* which identifies a maximum load allowed on one channel; and

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[0074] *ChannelSixBiasFactor* which is a bias factor to compensate for transmission on channel six to reduce inter-modulation.

[0075] The scanning receiver 822 and the receiver/transmitters (Rx/Tx) 824 measure metrics of channel activity every specified *MeasurementDuration* during a cycle of *MeasurementCycle*. The metrics can include a number of associated client devices, throughput and packet error rates (PER) of each receiver/transmitter 824, interference and channel utilization of each communication beam (e.g., frequency, or channel), and/or any number of other metrics. The channel activity metrics include:

[0076] $N_i(t)$ which is a number of associated clients of the *i*th Rx/Tx 824 and which is averaged over the *MeasurementDuration* period;

[0077] $S_i(t)$ which is the throughput of the *i*th Rx/Tx 824 measured in packets/second or bytes/second, and which is averaged over the *MeasurementDuration* period;

[0078] $P_i(t)$ which is a packet error rate (PER) of the *i*th Rx/Tx 824 and which is averaged over the *MeasurementDuration* period;

[0079] $D_i(t)$ which is a delay of the *i*th Rx/Tx 824 and which is averaged over the *MeasurementDuration* period;

[0080] $\rho_{ij}(t)$ which is channel utilization of the *i*th beam on the *j*th channel and which is measured by both the Rx/Tx 824 and scanning receiver 822 and averaged over the *MeasurementDuration* period. This is also referred to as a Channel Utilization Factor (CUF);

[0081] $Ns_j(t)$ which is a number of downlink data packets transmitted on the *j*th channel and which is averaged over the *MeasurementDuration* period;

[0082] $Nr_{ij}(t)$ which is a number of correctly received uplink data packets transmitted by client devices associated with the *i*th beam on the *j*th channel, and which is averaged over the *MeasurementDuration* period;

[0083] $Nn_{ij}(t)$ which is a number of uplink data packets transmitted by client devices associated with other communication beams, and which are correctly received by the *i*th beam on the *j*th channel. This is measured by the scanning receiver 822 and is averaged over the *MeasurementDuration* period. This is also referred to as the Self Interference Metric (SIM);

[0084] $No_{ij}(t)$ which is a number of uplink data packets transmitted by the client devices from overlapping subnets and which are correctly received by the *i*th beam on the *j*th channel. This

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is measured by the scanning receiver 822 and is averaged over the *MeasurementDuration* period. This is also referred to as the Overlapping Subnet Interference (OSI);

[0085] $Ne_{ij}(t)$ which is a number of uplink data packets with PLCP or data CRC errors in the *i*th beam on the *j*th channel and which is measured by the scanning receiver 822 and averaged over the *MeasurementDuration* period. This is also referred to as the Unidentified Interference Metric (UIM); and

[0086] $I_{ij}(t)$ which is the interference of the *i*th beam on the *j*th channel and which is measured by the scanning receiver 822.

[0087] These and other metrics can be maintained with a memory component 818 in a data table (or similar data construct) within the *MeasurementCycle*. When the cycle restarts, the data table can either be cleared or updated with some aging factor to identify past metrics.

[0088] The metric $I_{ij}(t)$ can be derived from other measurements when the receiver/transmitters 824 are on the same channel. In such cases, $I_{ij}(t)$ can be estimated by first estimating a total number of packets from any overlapping subnets by an equation:

$$NI_{ij}(t) = No_{ij}(t) + Ne_{ij}(t) \cdot \frac{No_{ij}(t)}{Nr_{ij}(t) + Nn_{ij}(t) + No_{ij}(t)}$$

Further, $I_{ij}(t)$ may be estimated by:

$$I_{ij}(t) = \frac{NI_{ij}(t)}{NS_i(t) + Nr_{ij}(t) + Nn_{ij}(t) + No_{ij}(t) + Ne_{ij}(t)} \cdot \rho_{ij}(t)$$

[0089] For channel assignment pre-processing, a channel that has interference activity which exceeds *HeavyInterference* for a *BadChannelThreshold* is not used. The interference activity is averaged over intervals of the *MeasurementDuration* period. In an implementation, a *MeasurementCycle* can include forty-eight measurement intervals. A channel can be eliminated if the interference activity *HeavyInterference* exceeds the *BadChannelThreshold* for a specified number of periods.

[0090] The total number of active users (e.g., client devices) associated with any one directed communication beam 214 (FIG. 2) or 602 (FIG. 6) can be estimated by dividing the number of associated users of that communication beam by the percentage of time available to those users. The total number of users on beam *i* and channel *j* may therefore be described by:

$$N_{ij}(t) = \frac{N_i(t)}{1 - I_{ij}(t)}$$

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where $\tilde{I}_{ij}(t) = \min\{I_{ij}(t), HeavyInterference\}$ which is the interference activity limited to a maximum allowable interference on a given communication beam. This ensures that the estimate does not provide large peaks due to an unusual period of high interference.

[0091] A block-based channel assignment algorithm assigns adjacent communication beams to the same frequency channel which minimizes the hidden beam problem as described further with reference to FIG. 14. The algorithm allocates the thirteen communication beams into a maximum of three blocks, with each block assigned to one frequency channel (e.g., channels 1, 6, or 11) so that the peak load on each channel is minimized. To determine an optimal solution, the boundaries between the assignment blocks (i.e. the number of communication beams in each block) and the frequency channel of each block is determined.

[0092] There are sixty-six possible combinations that divide thirteen communication beams into three blocks. For each of these possible combinations, the three blocks would be assigned to the three different channels. The number of channel permutations is six and the best channel-beam combination from three hundred, ninety-six (66×6=396) possible combinations can be determined. A factor $L_j(t)$ is denoted as the total load on the jth frequency channel at time (t) such that. $L_j^*=\max\{L_j(t)\}$ where t is of the set $[0,T]$ which is the peak load on the jth channel in the last measurement period, and where T is the measurement cycle (i.e., *MeasurementCycle*). A combination can be determined that minimizes the peak load on all of the channels which can be described as $\min\{\max\{L_j^*\}\}$ where j is of the set $[f_1 f_6 f_{11}]$.

[0093] In an event that the overall network communication load, or traffic, is minimal, fewer than the three frequency channels may be used. A parameter *PeakLoadLimit* identifies a communication load limit below which only two of the frequency channels (e.g., channel 1 and channel 11, for example) are used. If the peak communication load on either of the two channels exceeds the *PeakLoadLimit*, then the three frequency channels can be utilized.

[0094] The block-based channel assignment algorithm can be implemented to utilize two or three frequency channels. Initially, the thirteen communication beams are divided into two blocks of which there are twelve possible combinations. For each combination, the channel selections can be $f_1 f_6$, $f_1 f_{11}$, $f_6 f_1$, $f_6 f_{11}$, $f_{11} f_1$, or $f_{11} f_6$ such that there are a total of seventy-two block and channel combinations. Assuming that the kth block-channel combination has a configuration as follows:

[0095] Block 1: communication beams 0 to b_k (0 to N–2) are assigned to channel C_1; and

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[0096] Block 2: communication beams b_k +1 to N–1 (1 to N–1) are assigned to channel C_2 Then the communication traffic load of channels C_1 and C_2 are:

$$L^{ki}_{C1}(t) = \sum_{i=0}^{b_k} N_{iC1}(t)$$

$$L^{k}_{C2}(t) = \sum_{i=b_k+1}^{N-1} N_{iC2}(t)$$

[0097] The peak communication load on the first block for combination k is denoted by:

$$PL_1(k) = \max\{L^k_{C1}(t)\} \text{ where } t \text{ is of the set } [0,T]$$

$$PL_2(k) = \max\{L^k_{C2}(t)\} \text{ where } t \text{ is of the set } [0,T],$$

[0098] And the peak communication load for the busiest block (e.g., channel) is:

$$PL_{max}(k) = \max\{PL_1(k), PL_2(k)\}$$

[0099] A combination index R with the least peak communication load is then selected such that $PL_{max}(R)$=min $\{PL_{max}(k)\}$ where $(0 \leq k \leq 71)$ which is the combination of channels and beams that minimize the peak load on any channel. If the peak load on a channel is not less than the *PeakLoadLimit*, then a three channel assignment can be implemented. Initially, the thirteen communication beams are divide into three blocks of which there are sixty-six possible combinations. For each combination, the channel selections can be $f_1f_6f_{11}$, $f_1f_{11}f_6$, $f_6f_1f_{11}$, $f_6f_{11}f_1$, $f_{11}f_1f_6$, or $f_{11}f_6f_1$ such that there are a total of three-hundred, ninety-six block and channel combinations. Assuming that the kth block-channel combination has a configuration as follows:

[0100] Block 1: communication beams 0 to b_k (0 to N–3) are assigned to channel C_1; and

[0101] Block 2: communication beams b_k +1 to p_k (1 to N–2) are assigned to channel C_2; and

[0102] Block 3: communication beams p_k +1 to N–1 (2 to N–1) are assigned to channel C_3;

[0103] Then the communication traffic load of channels C_1, C_2, and C_3 are:

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$$L_{C1}^{ki}(t) = \sum_{i=0}^{b_k} N_{iC1}(t)$$

$$L_{C2}^{k}(t) = \sum_{i=b_k+1}^{p_k} N_{iC2}(t)$$

$$L_{C3}^{k} = \sum_{i=p_k+1}^{N-1} N_{iC3}(t)$$

[0104] The peak communication load on the first block for combination k is denoted by:

$$PL_1(k) = \max\{L^k_{C1}(t)\} \text{ where } t \text{ is of the set } [0,T]$$

$$PL_2(k) = \max\{L^k_{C2}(t)\} \text{ where } t \text{ is of the set } [0,T],$$

$$PL_3(k) = \max\{L^k_{C3}(t)\} \text{ where } t \text{ is of the set } [0,T],$$

[0105] and the peak communication load for the busiest block (e.g., channel) is:

$$PL_{max}(k) = \max\{PL_1(k), PL_2(k), PL_3(k)\}$$

[0106] A combination index R with the least peak communication load is then selected such that $PL_{max}(R)=\min\{PL_{max}(k)\}$ where $(0\leq k\leq 395)$ which is the combination of channels and beams that minimize the peak load on any channel.

[0107] When taking into account intermodulation such that channel combinations f_1f_6 and f_6f_{11} are to be avoided, then f_6 is avoided. Initially, the thirteen communication beams are divide into two blocks of which there are twelve possible combinations. For each combination, the channel selections can be f_1f_{11} and $f_{11}f_1$ such that there are a total of twenty-four block and channel combinations. Assuming that the kth block-channel combination has a configuration as follows:

[0108] Block 1: communication beams 0 to b_k (0 to N–2) are assigned to channel C_1; and

[0109] Block 2: communication beams b_k+1 to N–1 (1 to N–1) are assigned to channel C_2 Then the communication traffic load of channels f_1 and f_{11} is the sum of the loads of the communication beams assigned to those channels as follows:

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$$L_{f1}^{k}(t) = \sum_{f_1} N_{if1}(t) \quad \forall\, (i \in f_1)$$

$$L_{f11}^{k}(t) = \sum_{f_{11}} N_{if11}(t) \quad \forall\, (i \in f_{11})$$

[0110] The peak communication load on the first block for combination k is denoted by:

$$PL_1(k) = \max\{L^k_{f1}(t)\} \text{ where } t \text{ is of the set } [0,T]$$

$$PL_2(k) = \max\{L^k_{f11}(t)\} \text{ where } t \text{ is of the set } [0,T],$$

[0111] and the peak communication load for the busiest block (e.g., channel) is:

$$PL_{max}(k) = \max\{PL_1(k), PL_2(k)\}$$

[0112] A combination index R with the least peak communication load is then selected such that $PL_{max}(R)$=min $\{PL_{max}(k)\}$ where (0≤k≤71) which is the combination of channels and beams that minimize the peak load on any channel. If the peak load on a channel is not less than the *PeakLoadLimit*, then a three channel assignment can be implemented.

[0113] Memory component(s) 818 can maintain routing and signal information which can include transmit power level information, transmit data rate information, antenna pointing direction information, weighting information, constraints information, null/zero location information, peak location information, quality of service (QoS) information, priority information, lifetime information, frequency information, timing information, user and node authentication information, keep out area information, etc., that is associated with each sending and receiving communication channel of the wireless communication system and within the multi-beam directed signal system 206. In an implementation, at least some of routing information can be maintained with memory component(s) 818 within one or more routing tables or similar data structure(s).

[0114] The routing table(s) or similar data structure(s) provide an information basis for each routing decision within the wireless communication system (e.g., multi-beam directed signal system 206). By way of example, routing table(s) entries may include all or part of the following information: IP address (e.g., IPv6) of a node in the wireless network—e.g., as an index; 48-bit unique address—e.g., IEEE 802.1 MAC address; Protocol ID—e.g., IEEE 802.11, 802.16.1, etc.; Modulation method; Connection ID (CID) of a node—e.g., as used in an IEEE 802.16.1 MAC; Nominal direction to a node—e.g., one or two dimension; Nominal transmit power level to a node; Nominal received signal strength indicator (RSSI) level from a node; Nominal channel to transmit

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on, and perhaps a backup channel; Nominal channel to receive on, and perhaps a backup channel; Nominal transmission data rate, e.g., 6 Mbps-54 Mbps, or as available; Nominal receive data rate, e.g., 6 Mbps-54 Mbps, or as available; Known station interference nulls; and Unknown station interference nulls.

[0115] In an exemplary implementation, and within the structure of signal control/coordination logic 304, the routing table(s) are configured to receive or include data and/or primitives (e.g., function calls) from an Internet Protocol (IP) layer and a medium access control (MAC) layer, and to instruct a physical (PHY) layer to provide media access through the MAC layer. Therefore, in some examples, a routing table is more than simply a data table (or other similar structure) since it may also perform or otherwise support controlling and/or scheduling functions.

[0116] The communication interface(s) 820 can be implemented as any one of a serial, parallel, network, or wireless interface that communicatively couples the multi-beam directed signal system 206 with other electronic and/or computing devices. For example, the multi-beam directed signal system 206 can be coupled with a wired connection (e.g., an input/output cable) via a communication interface 820 to a network switch that communicates digital information corresponding to a communication signal to a server computing device. Any of the communication interfaces 820 can also be implemented as an input/output connector to couple digital, universal serial bus (USB), local area network (LAN), wide area network (WAN), metropolitan area network (MAN), and similar types of information and communication connections.

[0117] The scanning receiver 822 scans each directed communication beam (e.g., directed communication beams 214 shown in FIGS. 2 and 3) consecutively and monitors for client devices and associated information such as the transmit power of a client device, roaming status, and the many other communication factors to update data that is maintained about each client device that is in communication via a communication beam. In an implementation, the scanning receiver 822 can be described in two operating states: a scan mode and a roaming mode. While operating in the scan mode, the scanning receiver 822 periodically scans the thirteen communication beams on the three channels and collects activity information to be maintained with the client device data.

[0118] FIG. 9 illustrates an exemplary multi-beam directed signal system 206 that includes various components such as medium access controllers (MACs) 900, baseband units (BB) 902, and MAC coordinator logic 904. The multi-beam directed signal system 206 also includes radio

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frequency (RF) components 906 such as the left and right transmit antenna boards 800 and 802 (shown in FIG. 8), respectively, and the left and right receive antenna boards 804 and 806, respectively. This example also illustrates the antenna array 302, the transmit beam-forming network 808 and the receive beam-forming network 810, and an Ethernet switch and/or router 908.

[0119] As described in the implementation with reference to FIG. 8, antenna array 302 (e.g., via antenna assembly 208) is coupled to the beam-forming networks 808 (transmit) and 810 (receive). The beam-forming networks 808 and 810 are coupled to multiple RF components 906(1), 906(2), . . . , 906(N). Respective RF components 906(1), 906(2), . . . , 906(N) are each coupled to a respective baseband unit 902(1), 902(2), . . . , 902(N) which are coupled to MAC coordinator logic 904. The Ethernet switch/router 908 is coupled to the multiple MACs 900(1), 900(2), . . . , 900(N) which are also each coupled to MAC coordinator logic 904.

[0120] In operation generally, each MAC 900 is associated with a respective baseband unit 902. Although not specifically shown in FIG. 9, each respective MAC 900 may also be communicatively coupled to a corresponding baseband unit 902. MAC coordinator logic 904 is configured to coordinate the activities of the multiple MACs 900 with regard to at least one non-associated respective baseband unit 902. For example, MAC coordinator logic 904 may forward an instruction to MAC 900(1) responsive, at least partly, to an indicator provided from baseband unit 902(2). MAC coordinator logic 904 can be implemented as hardware, software, firmware, and/or some combination thereof.

[0121] The Ethernet switch/router 908 is coupled to Ethernet backbone 212 (FIG. 2) and is configured to relay incoming packets from Ethernet backbone 212 to the appropriate MAC 900 to which they correspond. Ethernet switch/router 908 is also configured to relay outgoing packets from the multiple MACs 900 to Ethernet backbone 212. Ethernet switch/router 908 may be implemented using, for example, a general purpose central processing unit (CPU) and memory. The CPU and memory can handle layer-2 Internet protocol (IP) responsibilities, flow control, and so forth. When receiving packets from Ethernet backbone 212, Ethernet switch/router 908 obtains the destination port for the destination MAC 900 address. In this manner, an Ethernet switch and/or router may be realized using software (or hardware, firmware, some combination thereof, etc.).

[0122] The beam-forming networks 808 and 810, in conjunction with antenna array 302, form the multiple directed communication beams 214 (FIGS. 2 and 3), A beam-forming network can be implemented as an active or passive beam-former. Examples of such active and passive

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beam-formers include a tuned vector modulator (multiplier), a Butler matrix, a Rotman lens, a canonical beam-former, a lumped-element beam-former with static or variable inductors and capacitors, and so forth. Alternatively, communication beams may be formed using full adaptive beam-forming.

[0123] As described with reference to FIGS. 8A and 8B, a beam-forming network 808 and 810 may include multiple ports for connecting to antenna array 302 and additional ports for connecting to the multiple RF components 906. One or more active components (e.g., a power amplifier (PA), a low-noise amplifier (LNA), etc.) may also be coupled to the multiple ports on the antenna array side of the beam-forming networks 808 and 810. Thus, antenna array 302 may be directly or indirectly coupled to the beam-forming networks 808 and 810.

[0124] The beam-forming networks 808 and 810 may include at least "N" parts for each of the multiple RF components 906(1, 2, . . . , N). In an example implementation, each communication beam 214 emanating from antenna array 302 corresponds to an RF component 906. Each RF component 906 can be implemented as a transmit and/or receive signal processor operating at radio frequencies and each RF component 906 can operate at one or more frequencies, with each frequency corresponding to a different channel. It should be noted that channels may be defined alternatively (and/or additionally) using a mechanism other than frequency, such as a code, a time slot, a signal node, some combination thereof, and so forth.

[0125] As described above, each respective RF component 906(1, 2, . . . , N) is coupled to a respective baseband unit 902(1, 2, N) and each respective MAC 900(1, 2, . . . , N) is associated with a corresponding baseband unit 902(1, 2, . . . , N). Although not illustrated in this example or required, each MAC 900 and associated respective baseband unit 902 may be located on individual respective electronic cards. Additionally, the respective RF component 906 to which each respective baseband unit 902 is coupled may also be located on the individual respective electronic cards.

[0126] Each respective MAC 900 and corresponding baseband unit 902 may be associated with a different respective access point, such as access points 702(1, 2, . . . , N) (FIG. 7). Each respective RF component 906, along with signal nodes (e.g., ports, communication nodes, etc.) of the beam-forming networks 808 and 810, and/or antenna array 302, and respective communication beams 214 may also correspond to the different respective access points 702. The MACs 900 are configured to control access to the media that is provided, at least partially, by baseband units 902.

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In this case, the media corresponds to the signals transmitted and/or received via communication beams 214 (FIGS. 2 and 3). These signals can be analog, digital, and so forth. In a described implementation, digital signals comprise one or more data packets.

[0127] In a packet-based environment, a data packet arriving at the multi-beam directed signal system 206 (or at access station 102) via a particular communication beam 214 from a particular remote client device 202 (FIG. 2) is received via the antenna array 302 and the beam-forming networks 808 and/or 810. The data packet is processed through a particular RF component 906 and a corresponding baseband unit 902. The data packet is then forwarded from baseband unit 902 to a corresponding MAC 900 which facilitates data packet communication via the Ethernet backbone 212 (FIG. 2) by Ethernet switch/router 908. Data packets arriving at the multi-beam directed signal system 206 (or at access station 102) via Ethernet switch/router 908 are transmitted to a remote client device 202 and/or 204 via directed communication beam(s) 214 in an opposite communication path. The transmission and reception of data packets via directed communication beams 214, as well as the forwarding of packets within the multi-beam directed signal system 206 is controlled at least partially by the MACs 900.

[0128] In a typical MAC-baseband environment, a MAC controls the associated baseband circuitry using input solely from the associated baseband circuitry. For example, if baseband circuitry indicates to its associated MAC that it is receiving a packet, then the associated MAC does not initiate the baseband circuitry to transmit a packet, which can jeopardize the integrity of the packet being received.

[0129] With co-located access points 702 (e.g., as in FIG. 7) and/or co-located pairs of MACs 900 and associated baseband units 902, a first access point 702(1) and/or a first MAC 900(1)/baseband unit 902(1) pair are unaware of the condition or state (e.g., transmitting, receiving, idle, etc.) of a second access point 702(2) and/or a second MAC 900(2)/baseband unit 902(2) pair, and vice versa. As a result, absent additional control and/or logic, a data packet being received by the first access point 702(1) and/or the first MAC 900(1)/baseband unit 902(1) pair can be corrupted (e.g., altered, destroyed, interfered with, rendered unusable for its intended purpose, etc.) by a transmission from the second access point 702(2) and/or the second MAC 900(2)/baseband unit 902(2) pair. This corruption may occur even though the packet reception and the packet transmission are effectuated using different communication beams 214(3) and 214(2), respectively, when the reception and transmission occur on the same channel. Effectively, an

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incoming data packet reception via a first communication beam 214 can be rendered unsuccessful by an outgoing data packet transmission via a second communication beam 214 that occurs on the same channel and is overlapping.

[0130] As described above, MAC coordinator logic 904 is coupled to the multiple baseband units 902(1, 2, . . . , N) and to the multiple MACs 900(1, 2, . . . , N). The MAC coordinator logic 904 is configured to prevent MACs 900(1, 2, . . . , N) from generating or otherwise causing a transmission if at least one and optionally if any of the baseband units 902(1, 2, . . . , N) are receiving. For example, if baseband unit 902(2) indicates that it is receiving a data packet, MAC coordinator logic 904 initiates that MACs 900(1, 2, . . . , N) refrain from generating or otherwise causing a data packet transmission during the data packet reception. Factors that can modify, tune, tweak, extend, etc. this data packet transmission restraint may include one or more of the MACs 900 enabling transmissions on different channel(s) from that of baseband unit 902(2) which is receiving.

[0131] More specifically, each baseband unit 902 forwards a corresponding receive indicator to MAC coordinator logic 904 which monitors the baseband units 902. The MAC coordinator logic 904 analyzes the receive indicators to generate constructive receive indicators that are communicated, or otherwise provided, to each of the MACs 900. In a described implementation, each baseband unit 902 forwards a receive indicator that reflects whether and/or when a baseband unit 902 is currently receiving a signal. Optionally, not physically forwarding an indicator may constitute a receive indicator that reflects no signal is being received. After processing the different receive indicators, MAC coordinator logic 904 forwards the same constructive receive indicator to each MAC 900 based on multiple, and possibly all, receive indicators. The MAC coordinator logic 904 may provide different constructive receive indicators to at least different subsets of the MACs 900.

[0132] The receive indicators forwarded to MAC coordinator logic 904 may be comprised of any one or more different indications from the baseband units 902. For example, the receive indicators may comprise clear channel assessment (CCA) or busy/non-busy indications. Alternatively, the receive indicators may comprise indications of signal reception based on energy signals, cross-correlation signals, data signals, other transmit and/or control signals, seine combination thereof, and so forth. Furthermore, a receive indicator may comprise an analog or

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digital indication (of one or more bits), the driving of one or more lines, the presentation of one or more messages, some combination thereof, and so forth.

[0133] The MAC coordinator logic 904 is configured to accept the receive indicators from the baseband units 902 and combine them in some manner to generate or otherwise produce the constructive receive indicator(s). For example, MAC coordinator logic 904 may "OR" the receive indicators together to generate the constructive receive indicator(s). Consequently, if any receive indicator from baseband units 902 indicates that a baseband unit is receiving a signal, then, the constructive receive indicator indicates to each MAC 900 that a reception is occurring on a directed communication beam 214 (and/or access point 702) of the multi-beam directed signal system 206. As a result, the MACs 900 that are provided with an affirmative constructive receive indicator do not cause their respective associated baseband units 902 to transmit.

[0134] The constructive receive indicators provided from MAC coordinator logic 904 may be comprised of any one or more different indications interpretable by the MACs 900. For example, the constructive receive indicators may comprise an indication for one or more predetermined inputs, such as a CCA or busy/non-busy input of the MACs 900. Alternatively, the constructive receive indicators may be input to a different type of do-not-transmit input, a specially-designed input, a message-capable input, some combination thereof, and so forth. Furthermore, a constructive receive indicator may comprise an analog or digital indication (of one or more bits), the driving of one or more lines, the presentation of one or more messages, some combination thereof, and the like.

[0135] FIG. 10 further illustrates various components of the multi-beam directed signal system 206 shown in FIG. 9 which includes the MACs 900, baseband units 902, and MAC coordinator logic 904. In this example, the exemplary multi-beam directed signal system 206 includes thirteen MACs 900(1, 2, . . . , 13) and thirteen baseband units 902(1, 2, . . . , 13) that are associated respectively therewith. Thirteen baseband units 902(1, 2, . . . , 13) and thirteen MACs 900(1, 2, . . . , 13) are utilized in this exemplary multi-beam directed signal system 206 to comport with the efficiently usable communication beams 602(0-6) and 602(10-15) of the exemplary set of communication beams shown in FIG. 6. However, the elements and features described with reference to FIG. 10 are applicable to multi-beam directed signal systems 206 and/or access stations 102 with more than or fewer than thirteen MACs 900 and associated baseband units 902.

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[0136] The baseband units 902(1, 2, . . . , 13) are configured to communicate with MACs 900(1, 2, . . . , 13), and vice versa, directly or indirectly without MAC coordinator logic 904 input. Specifically, control data may be transferred there between which may include, for example, data packets for wireless communication on communication beams 214 (FIGS. 2 and 3), carrier sense multiple access/collision avoidance (CSMA/CA) type information, and so forth. The media access technique in 802.11 is based on a Carrier Sense Multiple Access (CSMA) operation in which a each station transmits only when it determines that no other station is currently transmitting. This tends to avoid collisions that occur when two or more stations transmit at the same time where a collision would typically require that a transmitted packet be retransmitted.

[0137] In this example, the baseband units 902(1, 2, . . . , 13) forward receive indicators (1, 2, . . . , 13) to MAC coordinator logic 904. The MAC coordinator logic 904 includes a receive indicators combiner 1000 which may be comprised of one or more of program coding, a field-programmable gate array, discrete logic gates, and so forth, and which may be implemented as hardware, software, firmware, and/or some combination thereof. Receive indicators combiner 1000 combines receive indicators (1, 2, . . . , 13) to generate constructive receive indicators (1, 2, . . . , 13). For example, receive indicators (1, 2, . . . , 13) may be combined using a logical "OR" functionality which ensures that if any one or more receive indicators of receive indicators (1, 2, . . . , 13) is indicating that a signal is being received, then the associated constructive receive indicators of constructive receive indicators (1, 2, . . . , 13) also indicate that a signal is being received.

[0138] The constructive receive indicators (1, 2, . . . 13) are provided or otherwise communicated to MACs 900(1, 2, . . . 13), respectively, so that. MACs 900(1, 2, . . . , 13) do not cause baseband units 902(1, 2, . . . , 13) to transmit a signal while another signal is being received. The baseband units 902(1, 2, . . . , 13) and the MACs 900(1, 2, . . . , 13) may be segmented or grouped by a characteristic and/or state, such as by wireless communication channels. When segmented or grouped, a constructive receive indicator of a given segment or group indicates to a MAC that a signal is being received and that no signal should therefore be transmitted when any receive indicator of that given segment or group indicates that a signal is being received (or when multiple receive indicators of that given segment or group indicate that multiple signals are being received).

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[0139] The MAC coordinator logic 904 can be modified, adjusted, expanded, etc. based on any number of different factors that include channel assignment information 1002, receive indicator enable information 1004, timer logic 1006, and scanning logic 1008. Although illustrated as separate components, any one or combination of the channel assignment information 1002, receive indicator enable information 1004, timer logic 1006, and/or scanning logic 1008 can be implemented together and/or as part of MAC coordinator logic 904 or as another component of a multi-beam directed signal system 206.

[0140] Channel assignment information 1002 enables receive indicators (1, 2, . . . , 13) to be combined by the receive indicators combiner 1000 on a per-channel basis. As a result, constructive receive indicators (1, 2, . . . , 13) restrain signal transmissions from MAC 900 and baseband unit 902 pairs when a signal reception is occurring on the same channel, even if by a different MAC 900 and baseband unit 902 pair. A downlinked data packet that is transmitted on one channel while an uplinked data packet is being received on another channel does not usually cause the uplinked data packet to be corrupted. On the other hand, a downlinked data packet that is transmitted on a channel while an uplinked data packet is being received on the same channel does usually cause the uplinked data packet to be corrupted (e.g., indistinguishable, non-communicative, etc.), even if the transmission and reception occur via different communication beams 214 (FIGS. 2 and 3).

[0141] Channel assignment information 1002 may be implemented as, for example, a vector that relates each MAC 900 and associated baseband unit 902 to one of two or more channels. Hence, prior to a combination generated by the receive indicators combiner 1000, each respective receive indicator (1, 2, . . . , 13) can be mapped to a channel segmentation or grouping based on a wireless communication channel used by a corresponding MAC 900 and baseband unit 902 pair.

[0142] Receive indicator enable information 1004 provides information for receive indicators combiner 1000 that stipulates which receive indicators (1, 2, . . . , 13) are to be used in a combination operation to produce the constructive receive indicators (1, 2, . . . , 13). Thus, certain receive indicators may be excluded from the combination operation for one or more operational considerations. The receive indicator enable information 1004 may be implemented as, for example, a masking register 1010 that comprises a register with exclusionary bits for masking one or more of the receive indicators (1, 2, . . . , 13) from a combination operation of the receive indicators combiner 1000. In a described implementation, masking register 1010 includes thirteen

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bits that correspond to the thirteen receive indicators (1, 2, . . . , 13), which correspond to the thirteen baseband units 902(1, 2, . . . , 13).

[0143] Timer logic 1006 can be used for one or more factors and, although only shown once, may alternatively be implemented as multiple components in an exemplary multi-beam directed signal system 206 to account for multiple timer functions, or one implementation may be capable of handling multiple timer functions. Timer logic 1006 includes a watchdog timer 1012 and optionally watchdog interrupt enable information 1014.

[0144] For a first factor, timer logic 1006 relates to individual receive indicators (1, 2, …, 13). A duration of watchdog timer 1012 is set equal to a maximum data packet duration (e.g., a maximum-allowed length of a data packet). Watchdog timer 1012 is started when a particular receive indicator begins indicating that a signal is being received and stopped when the particular receive indicator ceases indicating that the signal is being received. If watchdog timer 1012 is not tolled by an indication of signal reception cessation prior to its expiration, then the signal being received is likely to not be intended for multi-beam directed signal system 206. In this case, timer logic 1006 may indicate that the baseband unit 902 corresponding to the particular receive indicator is not to be used in a combination operation. This exclusion indication may be effectuated using receive indicator enable information 1004 (e.g., by setting a bit in masking register 1010).

[0145] For a second factor, timer logic 1006 relates to constructive receive indicators (1, 2, . . . , 13) on a per-channel basis. A duration of watchdog timer 1012 is set with consideration of a temporal threshold beyond which a problem or error should be contemplated to have occurred and hence investigated. Watchdog timer 1012 is started when a particular constructive receive indicator (or indicators) for a given channel begins indicating that a signal is being received on the given channel and stopped when the particular constructive receive indicator ceases indicating that the signal is being received on the given channel. If watchdog timer 1012 is not tolled by an indication of signal reception cessation prior to its expiration, then there is a likelihood that an error has occurred.

[0146] Watchdog interrupt enable information 1014 is used for this second factor, and it stipulates which channel(s) (and thus which constructive receive indicators) are enabled for interruption. If watchdog timer 1012 expires and the given channel is enabled in accordance with watchdog interrupt enable information 1014, an interrupt is generated and provided to MAC coordinator logic 904 or another component of the multi-beam directed signal system 206.

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[0147] Scanning logic 1008 may act independently or interactively with any one or more of channel assignment information 1002, receive indicator enable information 1004, and timer logic 1006. For example, scanning logic 1008 can scan across communication beams 214 using different channels on receive to detect which channel or channels have the least or lowest interference levels. This scanning may occur once, periodically, continuously, and the like. A channel assignment vector or similar for channel assignment information 1002 may be configured responsive to such scanning and interference determinations of scanning logic 1008.

[0148] As another example, scanning logic 1008 may scan across communication beams 214 to detect the presence of other access points (e.g., non-co-located access points) that are causing interference on a regular or constant basis. The existence of an access point may be inferred by receiving a basic service set identifier (BSSID) being broadcast by another access point. When another access point is detected within a coverage area of a particular communication beam 214 (e.g., when an overlapping subnet is detected), scanning logic 1008 may interact with receive indicator enable information 1004 to mask out a corresponding receive indicator from a baseband unit 902 that corresponds to the particular communication beam 214. As a result, frequent receptions from the overlapping subnet do not constantly prevent baseband unit 902 and MAC 900 pairs on the same channel from transmitting.

[0149] In an exemplary implementation, multi-beam directed signal system 206 can be configured such that the receive indicators (1, 2, . . . , 13) correspond to the state of the clear channel assessment (CCA) output as detected by baseband units 902(1, 2, . . . , 13), and the constructive receive indicators (1, 2, . . . , 13) correspond to the state of the clear channel assessment input to MACs 900(1, 2, . . . , 13). Based on the values for receive indicators (1, 2, . . . , 13), channel assignment information 1002, and receive indicator enable information 1004, MAC coordinator logic 904 determines the constructive receive indicators (1, 2, . . . , 13) for each RF component 906 (FIG. 9) (as provided via MACs 900, baseband units 902, etc.).

[0150] In an exemplary implementation, MAC coordinator logic 904 is configured to operate such that an indicator "channel_wide_busy" for each channel is defined, where channel_wide_busy is affirmative (e.g., active) if the receive indicator from any baseband units operating on that channel indicates that a signal is being received, excluding those baseband units whose receive indicator enable information is not set (e.g., in masking register 1010). Further, MAC coordinator logic 904 sets the constructive receive indicator for a particular MAC 900 and

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baseband unit 902 pair to affirmative (e.g., busy) if the receive indicator for that baseband unit 902 indicates affirmative (e.g., busy), or if "channel_wide_busy" for the channel of the particular MAC 900 and baseband unit 902 pair is affirmative (e.g., active).

[0151] FIG. 11 illustrates a state transition diagram 1100 for a MAC controller 900 as shown in FIGS. 9 and 10. MAC controller states include Defer 1102, BackOff 1104, Idle 1106, TransmissionRTS (TxRTS) 1108, WaitCTS 1110, Transmission Data (TxData) 1112, Wait Acknowledgement (WaitACK) 114, Receive 1116, Transmission Acknowledgement (TxACK) 1118, and TransmissionCTS (TxCTS) 1120. The state transition diagram 1100 also includes received frame types Data 1126 and RTS 1128, as well as procedures Transmission okay (TxOK( )) 1122 and Transmission fail (TxFail( )) 1124.

[0152] The TxOK( ) procedure 1122 removes bytes transmitted from an outgoing queue and resets retry counter(s) and a contention window. The TxFail( ) procedure 1124 increments a retry counter, checks that the number of retries has not been exceeded, and increases the contention window. The Receive state 1116 ends if there is a transmission or check error, if the carrier is lost, or when a duration indicated in a header has elapsed. If there is an error, the Defer state 1102 timeout is set to initiate. If a frame did not have an error and is not addressed to a particular station, and it's duration field is greater than the current timer value, then the timer is set to the value of the frame's duration field.

[0153] At the BackOff state 1104, a backoff counter is decremented every slot time and a backoff count is saved if this state is exited due to a channel becoming busy. When the backoff counter decrements to zero and MAC service data units are queued to transmit, the contention window and retry counts are reset. A MAC service data unit is the payload carried by a MAC (e.g., in an 802.11 implementation which will typically be an Ethernet frame). The MAC 900 adds a MAC header and a 32-bit CRC to the MAC service data unit to form a MAC protocol data unit.

[0154] Additionally, the state transition diagram 1100 includes various functions that return logical value(s) to control state transitions such as data( ), short( ), more( ), busy( ), error( ), notforus( ), and nav( ). The diagram 1100 also includes PHY indications that initiate a state transition such as busy, timeout, new, transmission end (txend), and receive end (rxend). The PHY indications are asynchronous events (e.g., interrupts) that terminate states for a MAC controller 900. An indication receive end (rxend) identifies that a receiver has detected the end of a frame or an error. An indication transmission end (txend) identifies that a receiver has completed sending a

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frame. A busy indication is a receiver indication that a channel is busy. A timeout indication is generated when a transition state timer has expired. A new indication identifies that a new frame has been queued.

[0155] A busy( ) function returns a receiver indication that a channel is busy, and an error( ) function indicates that a received frame had a CRC error. A notforus( ) function indicates that a frame was not addressed to a particular station, and a nay( ) function indicates that a timer has not expired. A data( ) function indicates that data is queued to send, and a short( ) function indicates that a MAC protocol data unit is shorter than an RTS Threshold and that there are additional data fragments to be sent from a current MAC controller. A more( ) function facilitates obtaining the additional data fragments.

[0156] FIG. 12 illustrates an exemplary implementation 1200 of the multi-beam directed signal system 206 that weighs signals received via antenna array 302. Communication and/or data transfer signals are received from sources 1202 (e.g., sources A and B). The signals received from sources 1202 are considered desired signals because they are from nodes within the wireless routing network. Further, signals such as noise and WLAN interference associated with another external wireless system 1204 are not desired.

[0157] These signals, both desired and undesired, are received via antenna array 302 and are provided to the signal control and coordination logic 304 (shown in FIG. 3) from the receiver/transmitters (Rx/Tx) 824(0), 824(1), . . . , 824(N) (also shown in FIG. 8B). In this example, the signal control and coordination logic 304 includes the scanning receiver 822 that is configured to update routing information 1206 with regard to the received signals. For example, scanning receiver 822 may identify information about different classes of interferers (e.g., known and unknown types) within the routing information 1206. In this example, routing information 1206 includes connection indexed routing table(s) based on identification information, such as address information, CID, and the like. The routing table includes identifiers of the desired sources and other identifiers for the interferers ("Int"). Further, the routing table includes stored weighting values (w) each associated with a particular signal source 1202 (e.g., sources A and B). Other information such as "keep out" identifiers may also be included in this exemplary routing table.

[0158] A description of the received signal(s) can be stored in the routing table in the form of the pattern or weighting of the signal(s). In this example, a polynomial expansion in z, $w(z)=w_0+w_1z+w_2z^2+ w_3z^3+ w_4z^4+ \ldots + w_iz^i$ can be utilized to establish the values of the weights

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(w_i) to be applied to a weight vector. The routing table(s) may store such weighing patterns as a function of θ, or the zeroes of the polynomial, for example. One advantage of zero storage is that the zeros represent directions for communication that should be nulled out to prevent self-interference or interfering with other nodes or possibly other known wireless communication systems, such as WLAN 1204 that is not part of the wireless routing network, but is operating within at least a portion of a potential coverage area 1208 and frequency bands.

[0159] The polynomial expansion in *z*, *w(z)*, and the zeroes may be calculated from each other and each may be stored. Updates can be generated frequently (e.g., in certain implementations, about every millisecond), and a zero storage system may be more advantageous in most wireless network environments because only a few values will change at a given time. Storing the weighting values will in general require changes to all of the weighting values *w(i)* when any change in the pattern occurs. Note that *w(i)* and *A(θ)* may be expressed as Fourier transform pairs (discrete due to the finite antenna element space). The *w(i)* is equivalent to a time domain impulse response (e.g., a time domain unit sample response) and the *A(θ)* is equivalent to the frequency response (e.g., an evaluation of *w(z)* sampled along a unit circle).

[0160] The stored weighting values associated with each connection, data signal, and/or source are utilized in a weighting matrix 1210 which operates to apply the latest weighting values to the received signals and also to transmitted signals. In this illustrative example, subsequently received signals will be processed using the most recent weighting values in the weighting matrix 1210. Thus, as described herein, the multi-beam directed signal system 206 is configured to control the transmission amplitude frequency band and directionality of data packets to other nodes and assist in reducing the effects associated with received noise and interference (e.g., self interference and/or external interference). This is accomplished with the signal control and coordination logic 304 within the multi-beam directed signal system 206.

[0161] FIG. 13 illustrates an exemplary multi-beam directed signal system 206 that includes an antenna array 302 and a Butler matrix 1300 implemented as a beam-forming network (e.g., transmit beam-forming network 808 and/or receive beam-forming network 810 shown in FIGS. 8A and 8B). The multi-beam directed signal system 206 also includes multiple signal processors (SPs) 1302 and one or more baseband processors (e.g., baseband units 902 described with reference to FIGS. 9 and 10). Baseband processors 902 accept communication signals from and provide communication signals to the multiple receiver/transmitters 824 (FIG. 8B). A separate

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baseband processor 902 may be assigned to each signal processor 1302, or a single baseband processor 902 may be assigned to any number of the multiple signal processors 1302.

[0162] Exemplary Butler matrix 1300 is a passive device that forms, in conjunction with antenna array 302, communication beams 214 using signal combiners, signal splitters, and/or signal phase shifters. Butler matrix 1300 includes a first side with multiple antenna ports (designated by "A") and a second side with multiple transmit and/or receive signal processor ports (designated by "Tx/Rx"). The number of antenna ports and transmit/receive ports indicate the order of the Butler matrix 1300, which in this example, includes sixteen antenna ports and sixteen transmit/receive ports. Thus, Butler matrix 1300 has an order of sixteen.

[0163] Although Butler matrix 1300 is so illustrated, the antenna ports and transmit/receive ports need not be distributed on separate, much less opposite, sides of a Butler matrix. Also, although not necessary, Butler matrices typically have an equal number of antenna ports and transmit and/or receive signal processor ports. Furthermore, although Butler matrices are typically of an order that is a power of two (e.g., 2, 4, 8, 16, 32, 64, . . . , 2^n), they may alternatively be implemented with any number of ports.

[0164] The sixteen antenna ports of Butler matrix 1300 are identified or otherwise numbered from A(0, 1, . . . , 15). Similarly, the sixteen transmit/receive ports are numbered from Tx/Rx(0, 1, . . . , 15). Antenna ports A(0-15) are coupled to and populated with sixteen antenna elements 400(0), 400(1), . . . , 400(15), respectively. Likewise, transmit/receive ports Tx/Rx(0-15) are coupled to and populated with sixteen signal processors 1302(0), 1302(1), . . . , 1302(15), respectively. These signal processors 1302 are also directly or indirectly coupled to baseband processors 902. It should be noted that one or more active components (e.g., a power amplifier (PA), a low-noise amplifier (LNA), etc.) may also be coupled on the antenna port side of Butler matrix 1300.

[0165] In an exemplary transmission operation, communication signals are provided from baseband processors 902 to the multiple transmit and/or receive signal processors 1302. The multiple signal processors 1302 forward the communication signals to the transmit/receive ports Tx/Rx(0-15) of Butler matrix 1300. After signal processing (e.g., signal combination, signal splitting, signal phase shifting, and the like), Butler matrix 1300 outputs communication signals on the antenna ports A(0-15). Individual antenna elements 400 wirelessly transmit the communication signals, as altered by Butler matrix 1300, from the antenna ports A(0-15) in

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predetermined communication beam patterns. The communication beam patterns are predetermined by the shape, orientation, constituency, etc. of antenna array 302 and by the Butler matrix 1300 signal processing. In addition to transmissions, wireless signals such as wireless communications 106 (FIG. 1) are received responsive to the communication beams 214 formed by antenna array 302 in conjunction with Butler matrix 1300 in an inverse process.

[0166] FIG. 14 further illustrates an exemplary modified Butler matrix 1300 for a complementary beam-forming, post-combining implementation, Complementary beam-forming is a technique to reduce the effect of communication beam nulls and increase sidelobe levels without a severe power penalty to the main beam. This is done to reduce the effect of the "hidden beam." As described below, increasing the range of 802.11 networks without increased transmit power and using standard clients is possible with adaptive antenna arrays, such as, for example, directional high-gain antennas. Using high gain antennas, it is possible to direct the energy in a given direction and hence increase the range in that direction.

[0167] Forming directional transmit communication beams has the side effect of hiding the transmitted energy from some client devices in a CSMA network (i.e., negatively impacting the carrier sense mechanism in the network). A client device measures the energy transmitted from access points and from other client devices. If the client device cannot detect the presence of other transmissions, it attempts to access the medium. Therefore, when directional communication beams are used, many client devices detect the medium as idle when in fact it is busy. This has an effect on the performance of the network and is referred to as the "hidden beam" problem.

[0168] In practice, a communication beam (e.g., directional beam) has a main beam whose width can be controlled by the size of the antenna aperture, and sidelobes which vary in different directions. However, these communication beams may have nulls in certain directions that affect the wireless network with a hidden beam. Since a given receiver's energy detect threshold is usually lower than it's decoding threshold, it is possible to direct a high power signal towards an intended client device and yet ensure a minimum transmit power towards other clients in the network so that the signal may be detected by other clients.

[0169] Complementary beam-forming ensures a minimum transmit power in all directions while preserving the shape of the main communication beam. The complementary beam-forming techniques also ensure that multiple transmit beams in arbitrary directions are complemented by

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another beam in all other directions. The complementary beam does not interfere with the intended beams and increases the probability that other users in the network can detect the signal.

[0170] The modified Butler matrix 1300 includes the antenna ports 400(0, 1, . . . , N–1, N) and a gain mechanism 1400 configured to modify the signal at output port 400(0). A transmit signal is input to a corresponding input port of the Butler matrix and, in conjunction with the gain mechanism 1400, a complementary beam is formed due to the increase in gain. The result is a directional communication beam from the antenna in a given direction. A complementary beam-forming, pre-combining implementation can also be implemented.

[0171] Mathematically, a complementary beam-forming, post-combining implementation may be described as:

$$y_i = \begin{cases} \gamma y_i & i = 0 \\ y_i & \gamma \geq 1 \end{cases} \qquad 0 \leq i \leq N\text{-}1$$

[0172] where y_i is the power applied to antenna element i and γ is the gain value contained in the gain mechanism 1400. To ensure the same output power as with no complementary beam-forming, the output voltage on all of the Butler matrix ports can be adjusted by a scaling factor:

$$G_s = \sqrt{\frac{N}{\gamma^2 + N - 1}}$$

[0173] The power for the main communication beam will then be:

$$\Delta P = \frac{(\gamma + N - 1)^2}{N(\gamma^2 + N - 1)}$$

[0174] or stated in terms of dB:

$$\Delta P_{dB} = 10 \log \left\{ \frac{(\gamma + N - 1)^2}{N(\gamma^2 + N - 1)} \right\}$$

[0175] For example, for a sixteen element antenna array 302, if γ=3.5, then the power loss is approximately 1 dB.

[0176] FIG. 15 illustrates a graph 1500 depicting the signal level output (dB) for certain ports of the modified Butler Matrix 1300 shown in FIG. 14. Graph 1500 depicts the shape of a

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transmit communication beam 1502 without complementary beam-forming and a transmit communication beam 1504 with complementary beam-forming applied. In this example, the transmit communication beam is derived from a signal at port 400(0) of Butler Matrix 1300. As shown, the output with complementary beam-forming (e.g., transmit communication beam 1504) has higher sidelobes in all directions and removes all of the deep nulls except for the nulls on the main communication beam. The peak power of the main communication beam is approximately one dB lower than that without complementary beam-forming.

[0177] FIG. 16 illustrates a transition diagram 1600 for a roaming client device that transitions from one communication location within a wireless network system to another. For example, client device 202 (FIG. 2), while in wireless communication with access station 102 via directed communication beam 214(1) may roam (e.g., move, relocate, transition, etc.) such that communication with access station 102 would be facilitated via directed communication beam 214(2). A client device initially associates to one directed signal of the multi-beam directed signal system 206 by selecting the signal (e.g., communication beam) with the best signal at the time of association. However, because the client device may be portable and/or the wireless environment may change (e.g., due to device transitions, interference, etc.), the initially selected directed signal may not provide a continuous, or the best, communication channel over which to communicate information (e.g., in the data packets) and hence the client may have to roam and/or be associated with another directed communication beam.

[0178] Roaming is dependent on client device implementation, is initiated by a client device, and may not be directly controlled by the multi-beam directed signal system 206. In most commercially available client devices, roaming is triggered when the channel quality (SNR) falls below a threshold. The channel quality assessment (SNR measurement) is based on received strength of a directed communication beam. To ensure that a client device is associated with the best signal, the multi-beam directed signal system 206 directs the client device to roam to the directed communication beam with the best signal quality using a beam-switching algorithm.

[0179] Additionally, to ensure seamless roaming between communication beams, the multi-beam directed signal system 206 implements Inter-Access Point Protocol (IAPP) which is defined by IEEE 802.11f to support interoperability, mobility, handover messaging between directed communication beams 214, and coordination between access stations 102 in a wireless communications environment. Beam-switching can be implemented by the multi-beam controller

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816 (FIG. 8B) in the multi-beam directed signal system 206 to ensure that client devices are associated with the directed communication beam 214 having the best signal level and IAPP to ensure client-initiated seamless roaming.

[0180] The beam-switching algorithm disassociates a client device once it moves out of an associated main communication beam. However, such movement of a client device is difficult to detect in the wireless environment and disassociation may result in data packet loss and a long association procedure. The effect is particularly significant for client devices located between adjacent directed communication beams. Hence, the beam-switching algorithm will disassociate a client device when there is a determinable difference between signal qualities on different communication beams.

[0181] With reference to FIG. 16, a client device may be described as being in a monitor state 1602, a correct beam test state 1604, and a force roam state 1606. In the monitor state 1602, a client device is associated with a directed communication beam 214 while the multi-beam directed signal system 206 (e.g., access station 102) continues to sample and collect receive strength signal indications (RSSI) values for each data packet received from the client device. The multi-beam controller 816 recalculates a new measure identified as a smoothed RSSI value (*SmoothedRSSIValue*) over an RSSI window size (*RSSIWindowSize*) and compares it to an RSSI lower control limit threshold (*RSSILowerControlLimit*).

[0182] In the correct beam test state 1604, the scanning receiver 822 measures the RSSIs and calculates a smoothed RSSI value (*SmoothedRSSIValue*) for the client device on each of the adjacent ports (e.g., communication beams). Samples of the RSSI window size (*RSSIWindowSize*) for the two adjacent ports are averaged and compared to the same parameter for the current communication beam to determine the best, or most effective, communication beam. In the force roam state 1606, the client device is temporarily disassociated so that it cannot associate to the current directed communication beam.

[0183] An association transition 1608 to the correct beam test state 1604 occurs when a client device associates a directed communication beam 214. From the correct beam test state 1604, a correct beam transition 1610 indicates that a current communication beam is the best communication link between the client device and the multi-beam directed signal system. New RSSI values are sampled and a new lower control limit (*LowerControlLimit*) is recalculated. A scan timeout transition 1612 from the correct beam test state 1604 indicates that the scanning

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receiver 822 has been monitoring the adjacent communication beams for more than a roaming scan timeout duration (*RoamingScanTimeout*) without any decision about the correct beam.

[0184] From the monitor state 1602, a sample RSSI transition 1614 indicates that the smoothed RSSI value (*SmoothedRSSIValue*) and the RSSI lower control limit (*RSSILowerControlLimit*) are re-calculated. A smoothed RSSI drop transition 1616 from the monitor state 1602 drops the smoothed RSSI value (*SmoothedRSSIValue*) to an RSSI lower control limit (*RSSILowerControlLimit*). A wrong beam transition 1618 from the correct beam test state 1604 indicates a better communication beam is identified that has an RSSI that exceeds the RSSI of the current communication beam by a signal drop threshold dB (*SignalDropThreshold*). The client device is disassociated from the current communication beam and a timeout transition 1620 occurs after a roaming time out (*RoamingTimeOut*). The state information corresponding to the client device is then removed (e.g., deleted, discarded, etc.).

[0185] The lower control limit parameter (*LowerControlLimit*) is calculated using both the mean and the standard deviation of RSSI as follows:

$$LowerControlLimit = \overline{RSSI} - 2\sigma$$

$$\overline{RSSI} = \frac{1}{N}\sum_{i=0}^{N-1} RSSI_i \qquad N = RSSIWindow\ Size \text{ in frames}$$

$$\sigma = \sqrt{\frac{1}{N}\sum_{i=0}^{N-1}\left(RSSI_i - \overline{RSSI}\right)^2}$$

[0186] The $RSSI_i$ is the RSSI value reported for frame *i*. The $N-1th$ frame is the most recent frame. The smoothed RSSI value (*SmoothedRSSIValue* (S)) is calculated when RSSI values are sample when a data packet is received. The smoothed RSSI value is calculated as $S_j=0.1*RSSI_j + 0.9*S_{j-1}$. This value is then compared to the lower control limit (*LowerControlLimit*) and if it is larger than the limit, the client device enters the correct beam test state 1604. The IAPP seamless roaming enables seamless client-initiated roaming between communication beams within an

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antenna panel, between antenna panels, and between an antenna panel and third party access points (e.g., access stations, multi-beam directed signal system, etc.).

[0187] Methods for directed wireless communication may be described in the general context of computer-executable instructions. Generally, computer-executable instructions include routines, programs, objects, components, data structures, and the like that perform particular functions or implement particular abstract data types. Methods for directed wireless communication may also be practiced in distributed computing environments where functions are performed by remote processing devices that are linked through a communications network. In a distributed computing environment, computer-executable instructions may be located in both local and remote computer storage media, including memory storage devices.

[0188] FIG. 17 illustrates a method 1700 for directed wireless communication. The order in which the method is described is not intended to be construed as a limitation, and any number of the described method blocks can be combined in any order to implement the method. Furthermore, the method can be implemented in any suitable hardware, software, firmware, or combination thereof.

[0189] At block 1702, a directed wireless communication is generated for data communication with a client device. At block 1704, the directed wireless communication is received at an antenna assembly, and at block 1706, a directed communication beam is emanated for the data communication with the client device. For example, the multi-beam directed signal system 206 (shown in FIG. 2) generates a directed wireless communication for data communication with client device 202. Antenna assembly 208 receives the generated wireless communication and emanates a directed communication beam 214(1) for the data communication with client device 202. In an embodiment, the directed communication beam can be emanated from two or more antenna elements of the antenna assembly as an electromagnetic signal that includes transmission peaks and transmissions nulls within a coverage area of the directed communication beam 214(1).

[0190] At block 1708, the data communication is transmitted to the client device via the directed communication beam. At block 1710, a second directed communication beam is emanated for data communication reception from a second client device, and at block 1712, a second data communication is received from the second client device via the second directed communication beam. For example, an additional directed communication beam 214(N) can be emanated from

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antenna assembly 208 for data communication reception from client device 204. The data communication transmission (at block 1708) can be controlled so as not to interfere with receiving the second data communication (at block 1712) and optionally, transmitting the data communication and receiving the second directed data communication is simultaneous.

[0191] FIG. 18 illustrates a method 1800 for directed wireless communication. The order in which the method is described is not intended to be construed as a limitation, and any number of the described method blocks can be combined in any order to implement the method. Furthermore, the method can be implemented in any suitable hardware, software, firmware, or combination thereof.

[0192] At block 1802, directed wireless communication is coordinated with client devices via directed communication beams emanated from an antenna assembly. For example, wireless communications are coordinated by the signal control and coordination logic 304 (shown in FIG. 3) with client devices 202 and 204 (FIG. 2) via directed communication beams 214(1) and 214(N), respectively, which are emanated from antenna assembly 208. A directed communication beam can be emanated as an electromagnetic signal that includes transmission peaks and transmission nulls within a coverage area of the directed communication beam. Further, energy can be transmitted on a side lobe of a directed communication beam corresponding to a first client device such that a second client device will detect the side lobe energy and recognize that a data communication transmission is being emanated to the first client device via the directed communication beam.

[0193] The directed wireless communication can be coordinated such that only client device 202 receives a first directed wireless communication via communication beam 214(1), and such that only client device 204 receives a second directed wireless communication via communication beam 214(N). Coordinating directed wireless communication can include simultaneous data communication transmission to client device 202 via directed communication beam 214(1) and a data communication reception from client device 204 via directed communication beam 214(N). Further, the data communication transmission is coordinated so as not to interfere with the data communication reception.

[0194] At block 1804, data communication transmissions are routed through a transmit beam-forming network to antenna elements of the antenna assembly such that a data communication transmission is communicated to a client device via a directed communication

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beam. At block 1806, the directed communication beams are monitored for data communication receptions from the client devices. At block 1808, data communication receptions are received through a receive beam-forming network from the antenna elements of the antenna assembly such that a data communication reception is received from a client device via a directed communication beam. For example, a data communication reception can be received from a client device with scanning receiver 822 (shown in FIG. 8B).

[0195] At block 1810, a determination is made as to which of multiple channels provides acceptable data communication transmission and/or reception with a client device. At block 1812, information is maintained corresponding to one or more of the client devices. The information can include a transmit power level, a data transmit rate, an antenna direction, quality of service data, and timing data. Further, coordinating a directed wireless communication with a client device (as described in block 1802) can be based on the information that is maintained (at block 1812).

[0196] FIG. 19 illustrates a method 1900 for directed wireless communication. The order in which the method is described is not intended to be construed as a limitation, and any number of the described method blocks can be combined in any order to implement the method. Furthermore, the method can be implemented in any suitable hardware, software, firmware, or combination thereof.

[0197] At block 1902, a client device is associated with a directed communication beam. For example, a portable client device 202 (shown in FIG. 2) is associated with communication beam 214(1) (shown in FIGS. 2 and 3). At block 1904, signal strength indications are received for data packets received from the client device via the directed communication beam. At block 1906, a signal strength average for the client device is calculated from the received signal strength indications.

[0198] At block 1908, adjacent signal strength indications are sampled for an adjacent directed communication beam. At block 1910, a second signal strength average is calculated for the adjacent directed communication beam. For example, signal strength indications are sampled for an adjacent directed communication beam 214(2) (shown in FIGS. 2 and 3), and a signal strength average is calculated for the adjacent directed communication beam 214(2).

[0199] At block 1912, the signal strength average is compared to the second signal strength average and a determination is made as to which provides a more effective, or better, communication link. If the second signal strength average does not indicate that the adjacent

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directed communication beam would provide a better communication link than the directed communication beam (i.e., no from block 912), then the client device association with the initial directed communication beam is maintained at block 914.

[0200] If the second signal strength average indicates that the adjacent directed communication beam would provide a better communication link than the directed communication beam (i.e., no from block 912), then the client device is disassociated with the directed communication beam at block 916. At block 918, the client device is re-associated with the adjacent directed communication beam. The method 1900 can then continue and be reiterated from block 1902. Additionally, the method 1900 can be implemented for any number of client devices in wireless communication with a directed wireless communication system.

[0201] Although wireless communication system(s) have been described in language specific to structural features and/or methods, it is to be understood that the subject of the appended claims is not necessarily limited to the specific features or methods described. Rather, the specific features and methods are disclosed as exemplary implementations of wireless communication system(s).

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WHAT IS CLAIMED IS:

1. A receiver for use in a wireless communications system, the receiver comprising:

a smart antenna comprising at least a first antenna element and a second antenna element;

a transceiver operatively coupled to the smart antenna and configured to transmit and receive electromagnetic signals using the smart antenna; and

a processor operatively coupled to the transceiver, the processor configured to:

receive a first signal transmission from a remote station via the first antenna element and a second signal transmission from the remote station via the second antenna element simultaneously;

determine first signal information for the first transmission;

determine second signal information for the second transmission, wherein the second signal information is different than the first signal information;

determine a set of weighting values based on the first signal information and the second signal information, wherein the set of weighting values is configured to construct one or more beam-formed transmission signals; and

cause the transceiver to generate the one or more beam-formed transmission signals based on the set of weighting values for transmission to the remote station.

2. The receiver as recited in Claim 1, wherein the processor is further configured to: cause the transceiver to transmit the one or more beam-formed transmission signals to the remote station via the smart antenna.

3. The receiver as recited in Claim 1, wherein the first signal transmission and the second signal transmission comprise electromagnetic signals comprising one or more transmission peaks and one or more transmission nulls.

4. The receiver as recited in Claim 1, wherein the first signal transmission and the second signal transmission are directional transmissions.

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5. The receiver as recited in Claim 1, wherein the set of weighting values is further based on one or more of: a transmit power level, a data transmit rate, an antenna direction, quality of service data, or timing data.

6. The receiver as recited in Claim 1, wherein the one or more beam-formed transmission signals comprise data configured to be used by the remote station to modify the placement of one or more transmission peaks and one or more transmission nulls in a subsequent signal transmission.

7. The receiver as recited in Claim 1, wherein the processor is further configured to:

determine a plurality of signal strength indications for the first signal transmission;

determine a first signal strength average based on the plurality of signal strength indications for the first signal transmission;

determine a plurality of signal strength indications for the second signal transmission;

determine a second signal strength average based on the plurality of signal strength indications for the second signal transmission; and

cause the transceiver to generate the one or more beam-formed transmission signals based on the first signal strength average and the second signal strength average.

8. The receiver as recited in Claim 8, wherein the processor is further configured to: cause the transceiver to transmit the one or more beam-formed transmission signals to the remote station via the smart antenna.

9. A method in a wireless communications system, the method comprising:

receiving a first signal transmission from a remote station via a first antenna element of a smart antenna and a second signal transmission from the remote station via a second antenna element of the smart antenna simultaneously;

determining first signal information for the first transmission;

determining second signal information for the second transmission, wherein the second signal information is different than the first signal information;

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determining a set of weighting values based on the first signal information and the second signal information, wherein the set of weighting values is configured to construct one or more beam-formed transmission signals; and

generating the one or more beam-formed transmission signals based on the set of weighting values for transmission to the remote station.

10. The method as recited in Claim 9, further comprising: transmitting the one or more beam-formed transmission signals to the remote station via the smart antenna.

11. The method as recited in Claim 9, wherein the first signal transmission and the second signal transmission comprise electromagnetic signals comprising one or more transmission peaks and one or more transmission nulls.

12. The method as recited in Claim 9, wherein the first signal transmission and the second signal transmission are directional transmissions.

13. The method as recited in Claim 9, wherein the set of weighting values is further based on one or more of: a transmit power level, a data transmit rate, an antenna direction, quality of service data, or timing data.

14. The method as recited in Claim 9, wherein the one or more beam-formed transmission signals comprise data configured to be used by the remote station to modify the placement of one or more transmission peaks and one or more transmission nulls in a subsequent signal transmission.

15. The method as recited in Claim 9, wherein the processor is further configured to:

determining a plurality of signal strength indications for the first signal transmission;

determining a first signal strength average based on the plurality of signal strength indications for the first signal transmission;

determining a plurality of signal strength indications for the second signal transmission;

determining a second signal strength average based on the plurality of signal strength indications for the second signal transmission; and

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generating the one or more beam-formed transmission signals based on the first signal strength average and the second signal strength average.

16. The method as recited in Claim 15, wherein the processor is further configured to: cause the transceiver to transmit the one or more beam-formed transmission signals to the remote station via the smart antenna.

17. An apparatus for use in a wireless communications system, the apparatus comprising:

a smart antenna comprising at least a first antenna element and a second antenna element;

a transceiver operatively coupled to the smart antenna; and

a processor operatively coupled to the transceiver, the processor configured to:

receive a first signal transmission from a remote station via the first antenna element, the first signal transmission comprising first signal information;

receive a second signal transmission from the remote station via the second antenna element, the second signal transmission comprising second signal information;

determine a set of weighting values based on the first signal information and the second signal information, wherein the set of weighting values is configured to construct one or more beam-formed transmission signals;

cause the transceiver to transmit the one or more beam-formed transmission signals based on the set of weighting values to the remote station.

18. The apparatus as recited in Claim 17, wherein the first signal transmission and the second signal transmission comprise electromagnetic signals comprising one or more transmission peaks and one or more transmission nulls.

19. The apparatus as recited in Claim 17, wherein the first signal information comprises one or more of: a transmit power level, a data transmit rate, an antenna direction, quality of service data, or timing data.

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20. The apparatus as recited in Claim 17, wherein the first antenna element and the second antenna element are directional antenna elements.

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DIRECTED WIRELESS COMMUNICATION

ABSTRACT

Disclosed herein are methods and apparatuses configured to direct wireless communication. In some embodiments, a network apparatus is configured to: receive a first signal transmission from a remote station via a first antenna element of an antenna and a second signal transmission from the remote station via a second antenna element of the antenna simultaneously; determine first signal information for the first transmission; determine second signal information for the second transmission, wherein the second signal information is different than the first signal information; determine a set of weighting values based on the first signal information and the second signal information, wherein the set of weighting values is configured to construct one or more beam-formed transmission signals; and generate the one or more beam-formed transmission signals based on the set of weighting values for transmission to the remote station.

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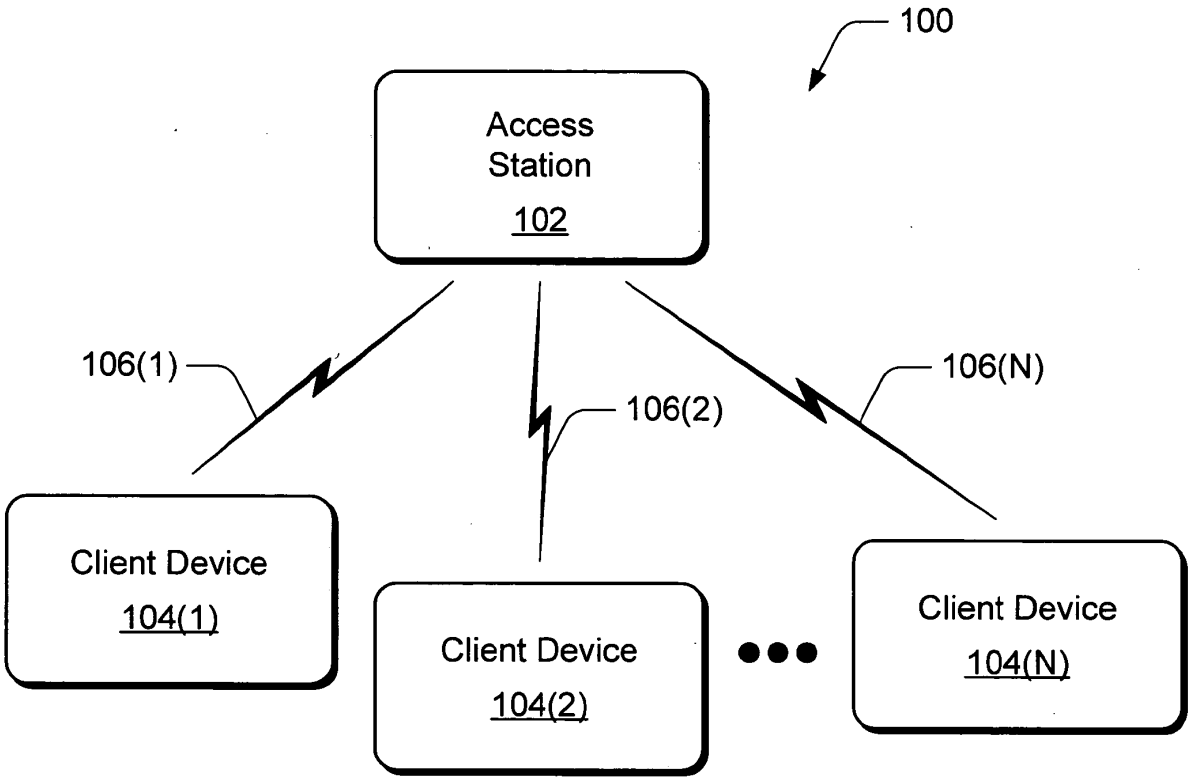

100
Access Station 102
106(1)
106(2)
106(N)
Client Device 104(1)
Client Device 104(2)
Client Device 104(N)

Fig. 1

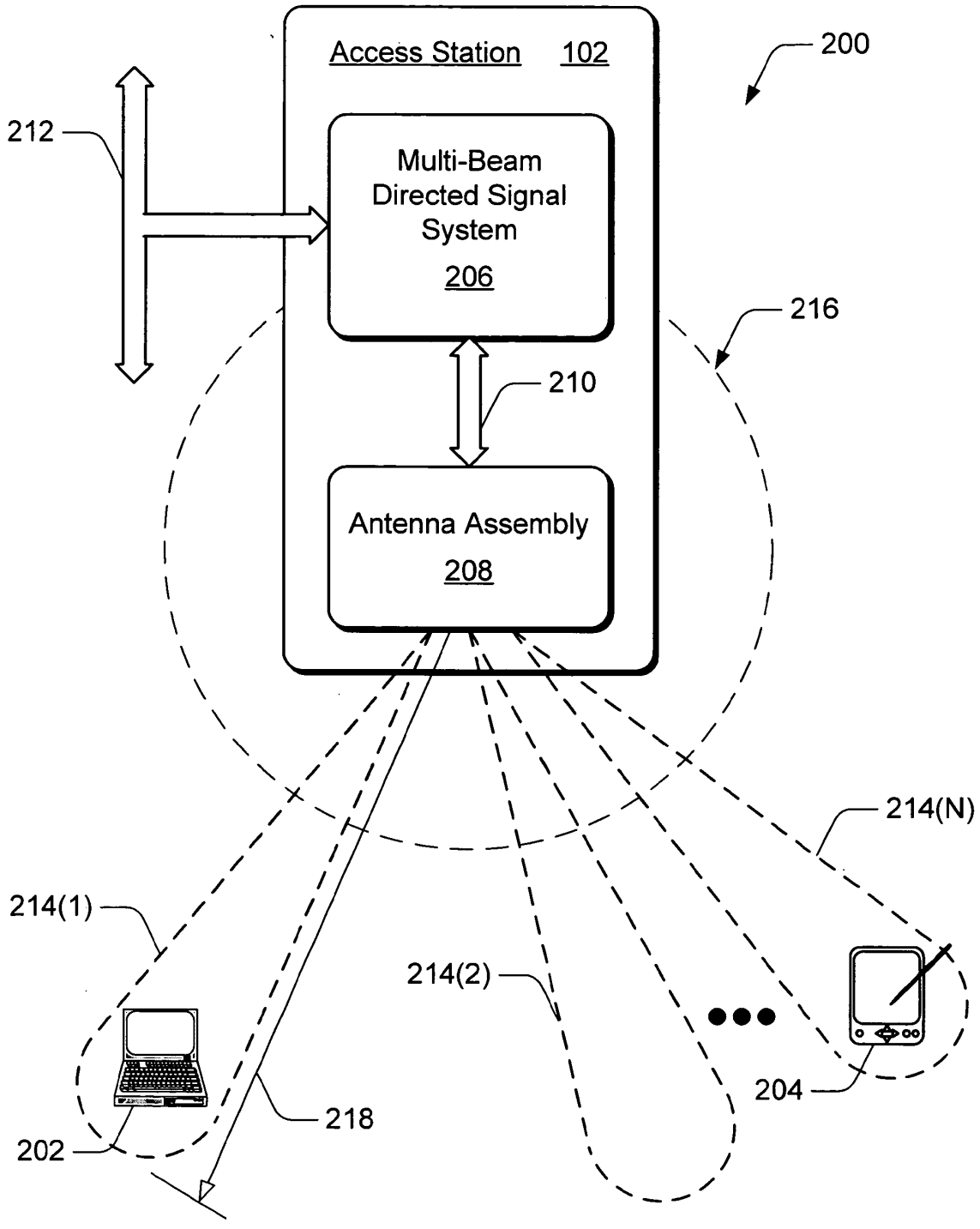

Access Station 102
200
212
Multi-Beam Directed Signal System 206
216
210
Antenna Assembly 208
214(N)
214(1)
214(2)
204
218
202

Fig. 2

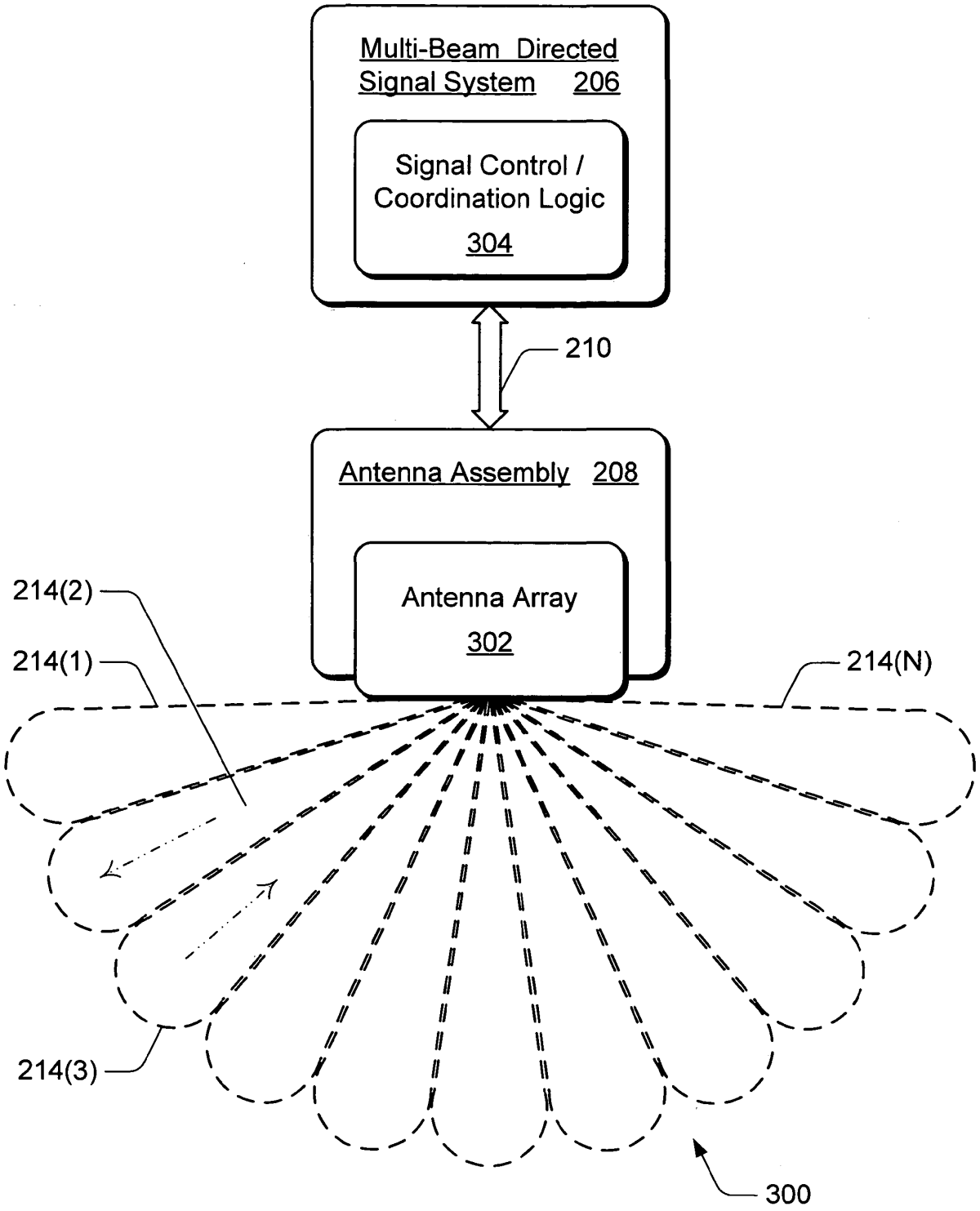

Multi-Beam Directed Signal System 206
Signal Control / Coordination Logic 304
210
Antenna Assembly 208
Antenna Array 302
214(2)
214(1)
214(N)
214(3)
300

Fig. 3

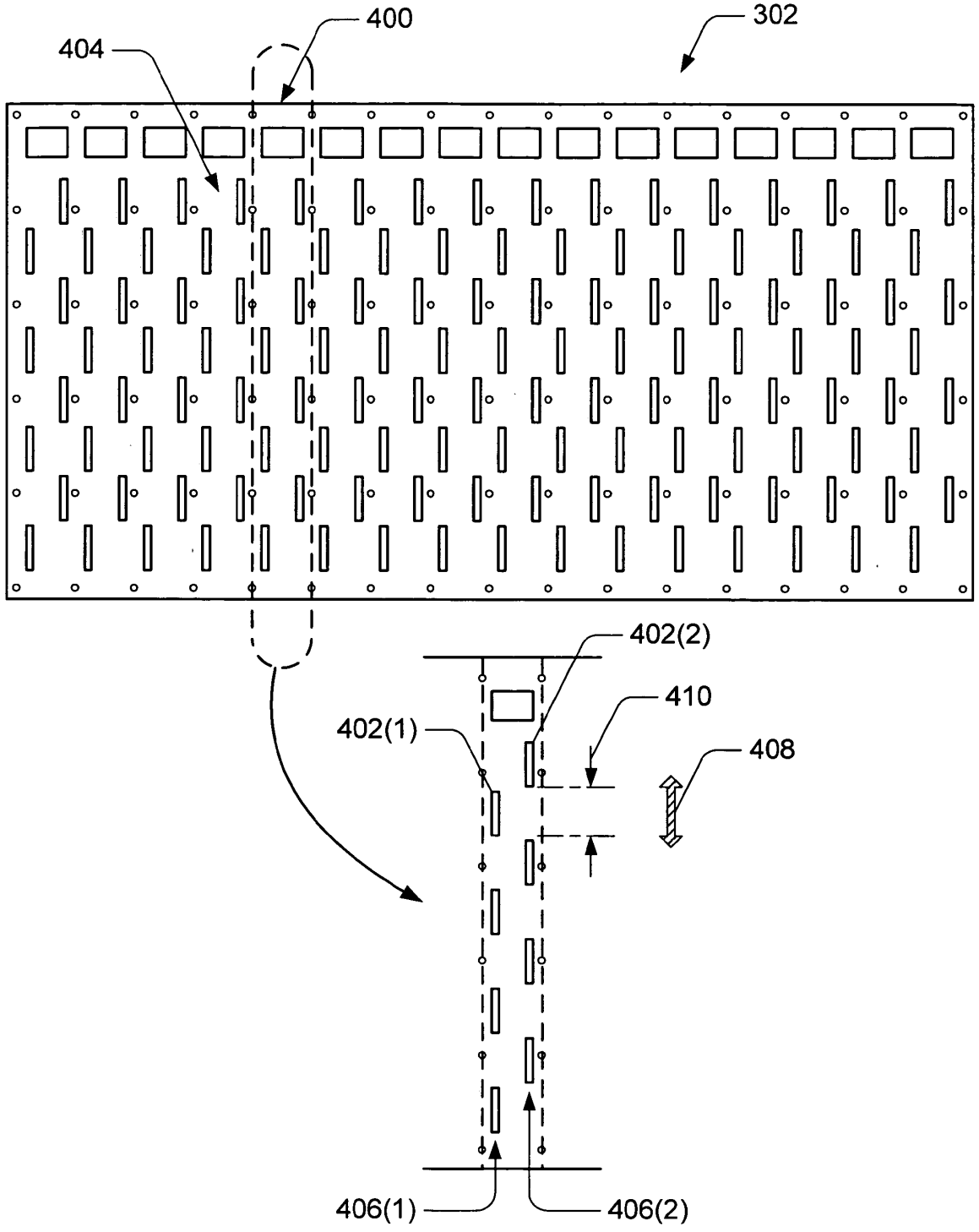


Fig. 4

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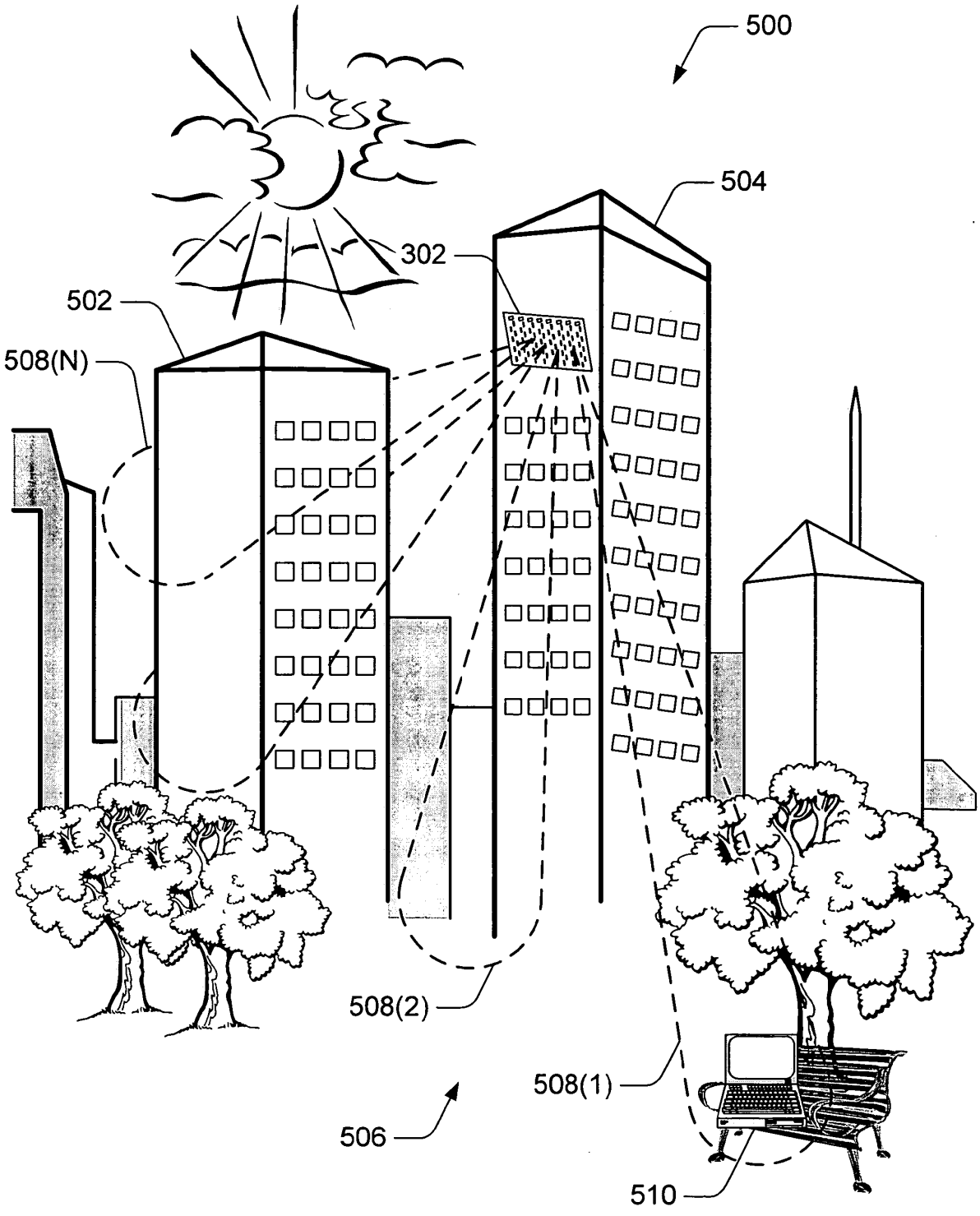


Fig. 5

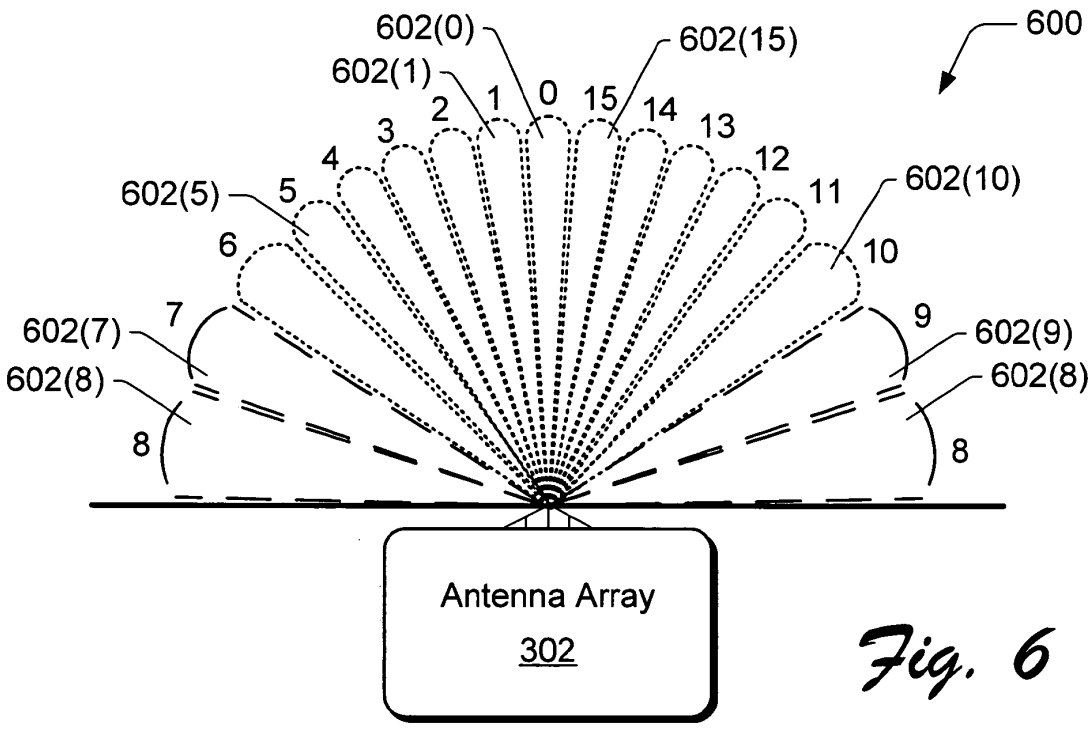

600
602(0)
602(1)
602(15)
602(5)
602(10)
602(7)
602(9)
602(8)
602(8)
0
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
8
Antenna Array
302

Fig. 6

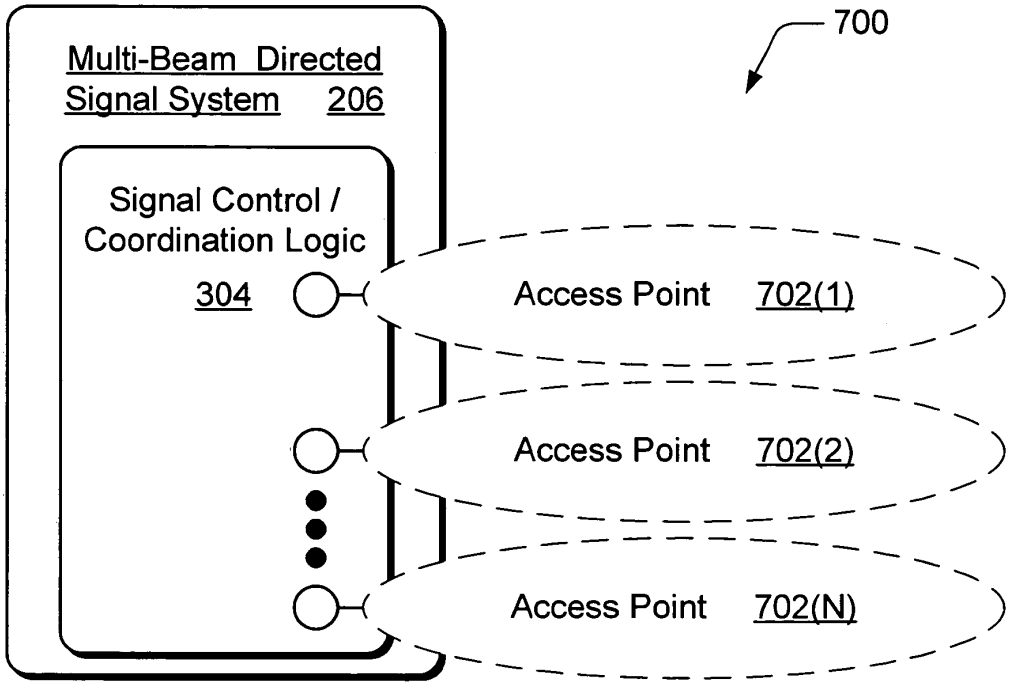

700
Multi-Beam Directed
Signal System 206
Signal Control /
Coordination Logic
304
Access Point 702(1)
Access Point 702(2)
Access Point 702(N)

Fig. 7

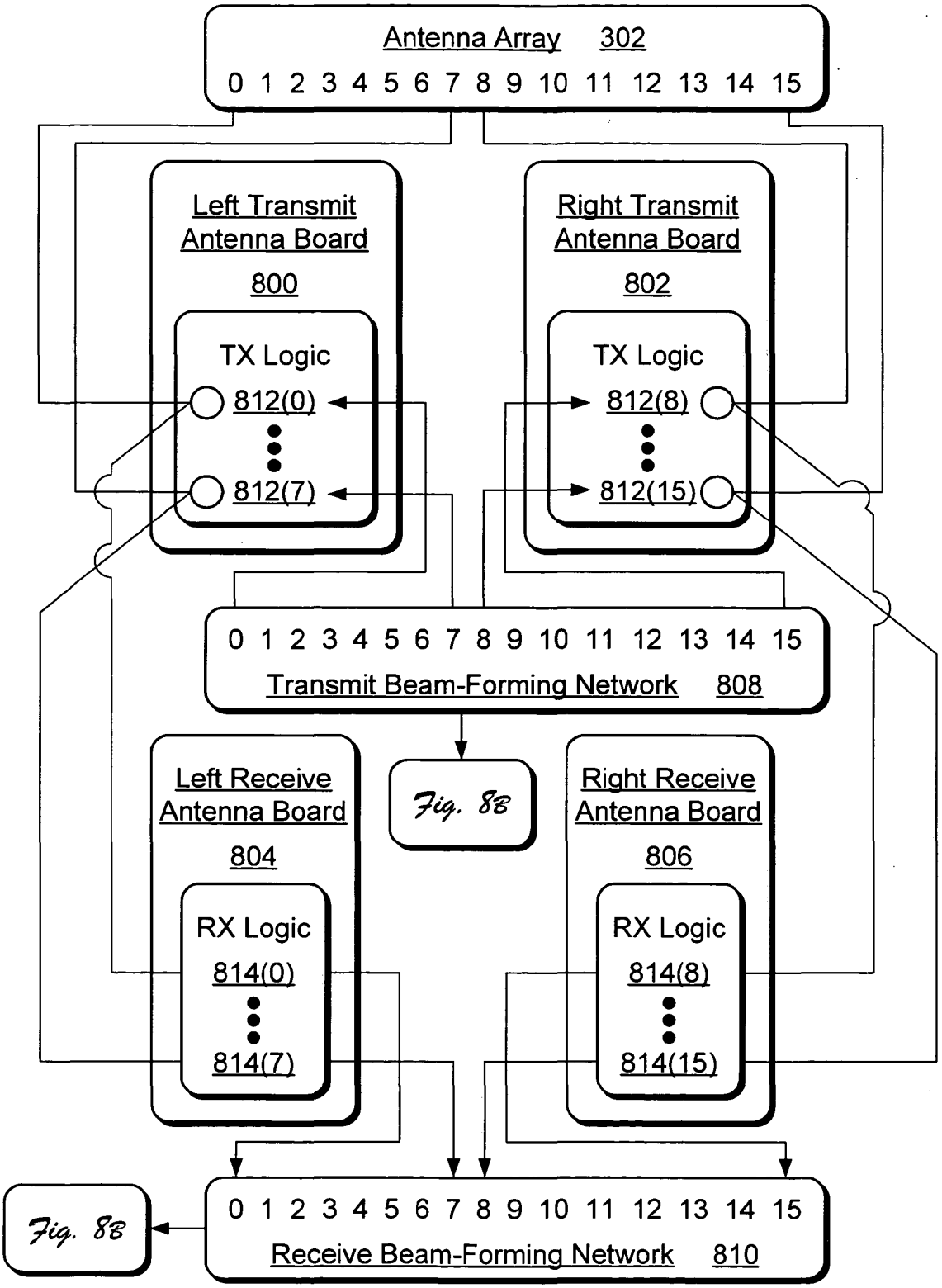

Antenna Array 302
0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15
Left Transmit Antenna Board 800
TX Logic
812(0)
812(7)
Right Transmit Antenna Board 802
TX Logic
812(8)
812(15)
0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15
Transmit Beam-Forming Network 808
Fig. 8B
Left Receive Antenna Board 804
RX Logic
814(0)
814(7)
Right Receive Antenna Board 806
RX Logic
814(8)
814(15)
Fig. 8B
0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15
Receive Beam-Forming Network 810

Fig. 8A

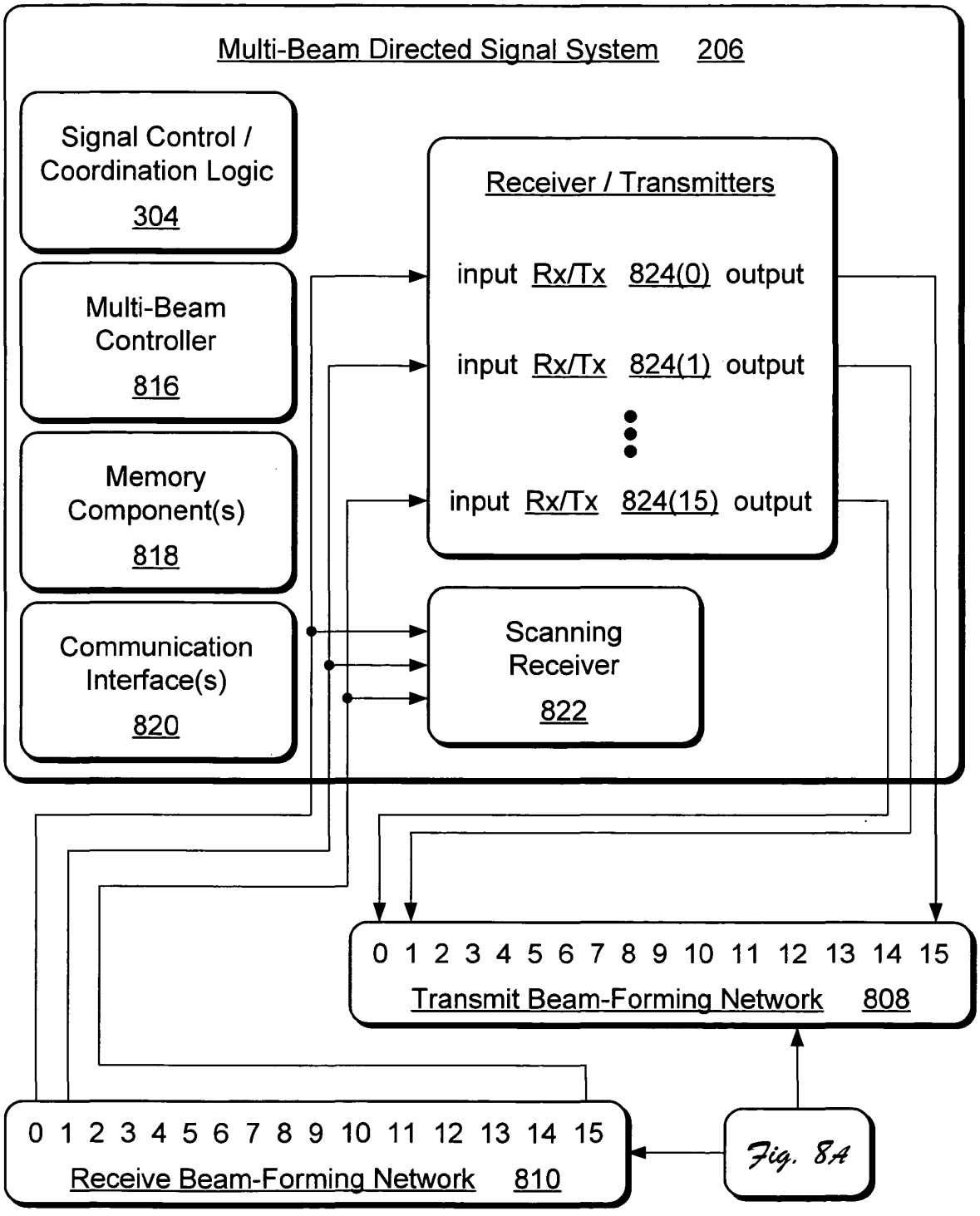

Multi-Beam Directed Signal System 206
Signal Control / Coordination Logic 304
Multi-Beam Controller 816
Memory Component(s) 818
Communication Interface(s) 820
Receiver / Transmitters
input Rx/Tx 824(0) output
input Rx/Tx 824(1) output
input Rx/Tx 824(15) output
Scanning Receiver 822
0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15
Transmit Beam-Forming Network 808
0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15
Receive Beam-Forming Network 810
Fig. 8A

Fig. 8B

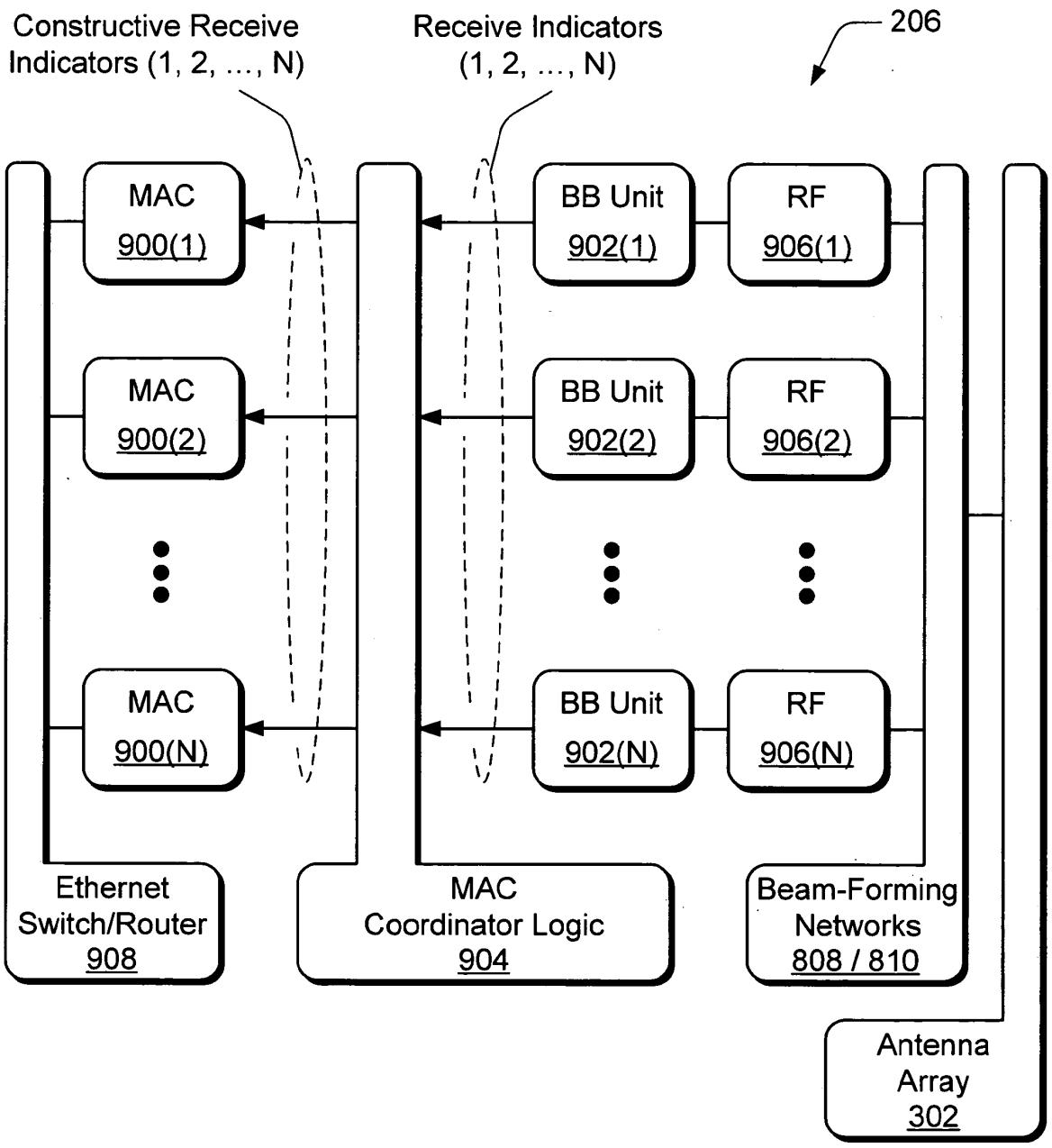

Constructive Receive Indicators (1, 2, ..., N)
Receive Indicators (1, 2, ..., N)
206
MAC 900(1)
MAC 900(2)
MAC 900(N)
BB Unit 902(1)
BB Unit 902(2)
BB Unit 902(N)
RF 906(1)
RF 906(2)
RF 906(N)
Ethernet Switch/Router 908
MAC Coordinator Logic 904
Beam-Forming Networks 808 / 810
Antenna Array 302

Fig. 9

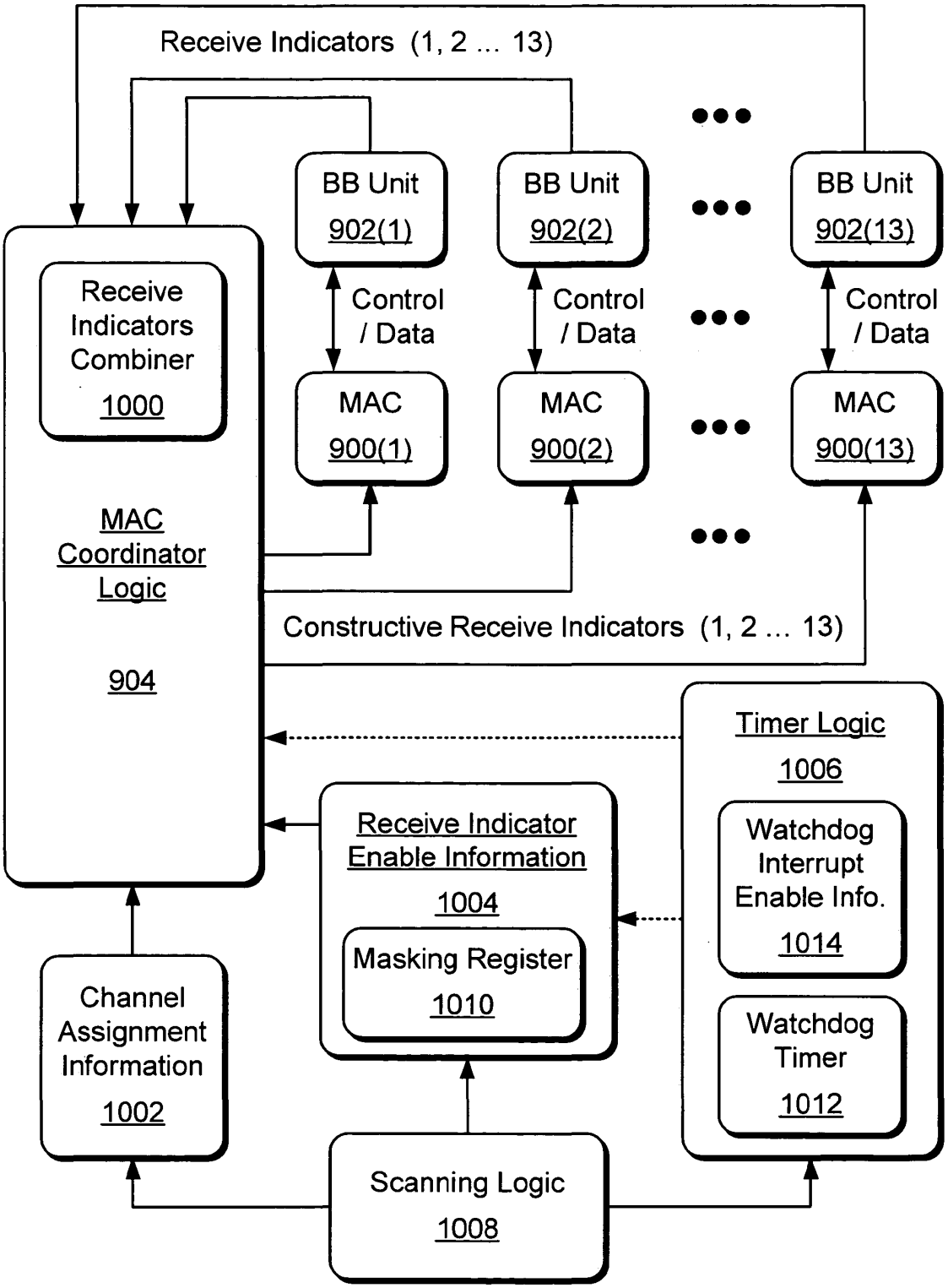

Receive Indicators (1, 2 ... 13)
BB Unit 902(1)
BB Unit 902(2)
BB Unit 902(13)
Control / Data
Control / Data
Control / Data
Receive Indicators Combiner 1000
MAC 900(1)
MAC 900(2)
MAC 900(13)
MAC Coordinator Logic 904
Constructive Receive Indicators (1, 2 ... 13)
Timer Logic 1006
Receive Indicator Enable Information 1004
Masking Register 1010
Watchdog Interrupt Enable Info. 1014
Watchdog Timer 1012
Channel Assignment Information 1002
Scanning Logic 1008

Fig. 10

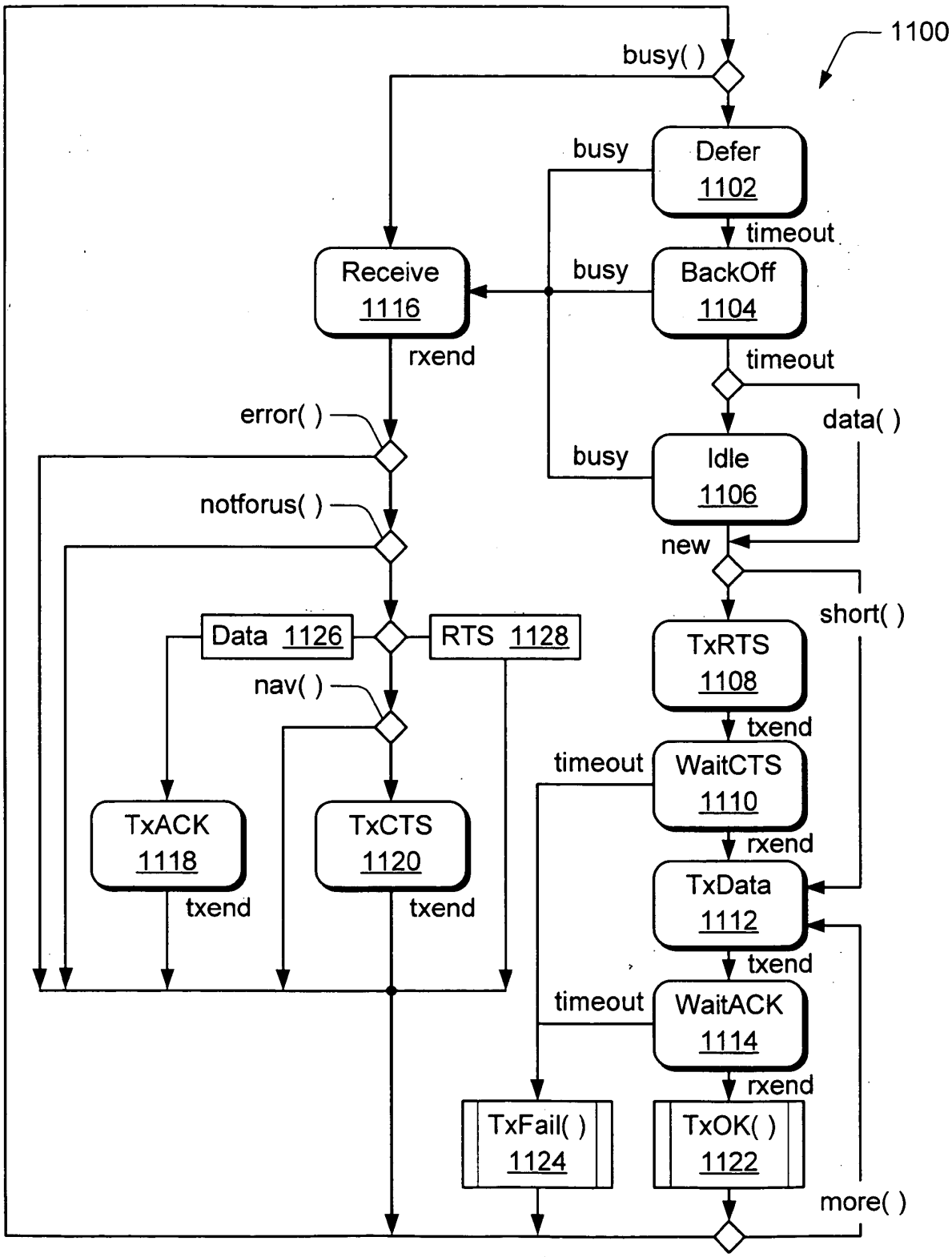

1100
busy( )
busy
Defer
1102
timeout
Receive
1116
busy
BackOff
1104
rxend
timeout
error( )
data( )
busy
Idle
1106
notforus( )
new
short( )
Data 1126
RTS 1128
TxRTS
1108
nav( )
txend
timeout
WaitCTS
1110
TxACK
1118
TxCTS
1120
rxend
TxData
1112
txend
txend
txend
timeout
WaitACK
1114
rxend
TxFail( )
1124
TxOK( )
1122
more( )

Fig. 11

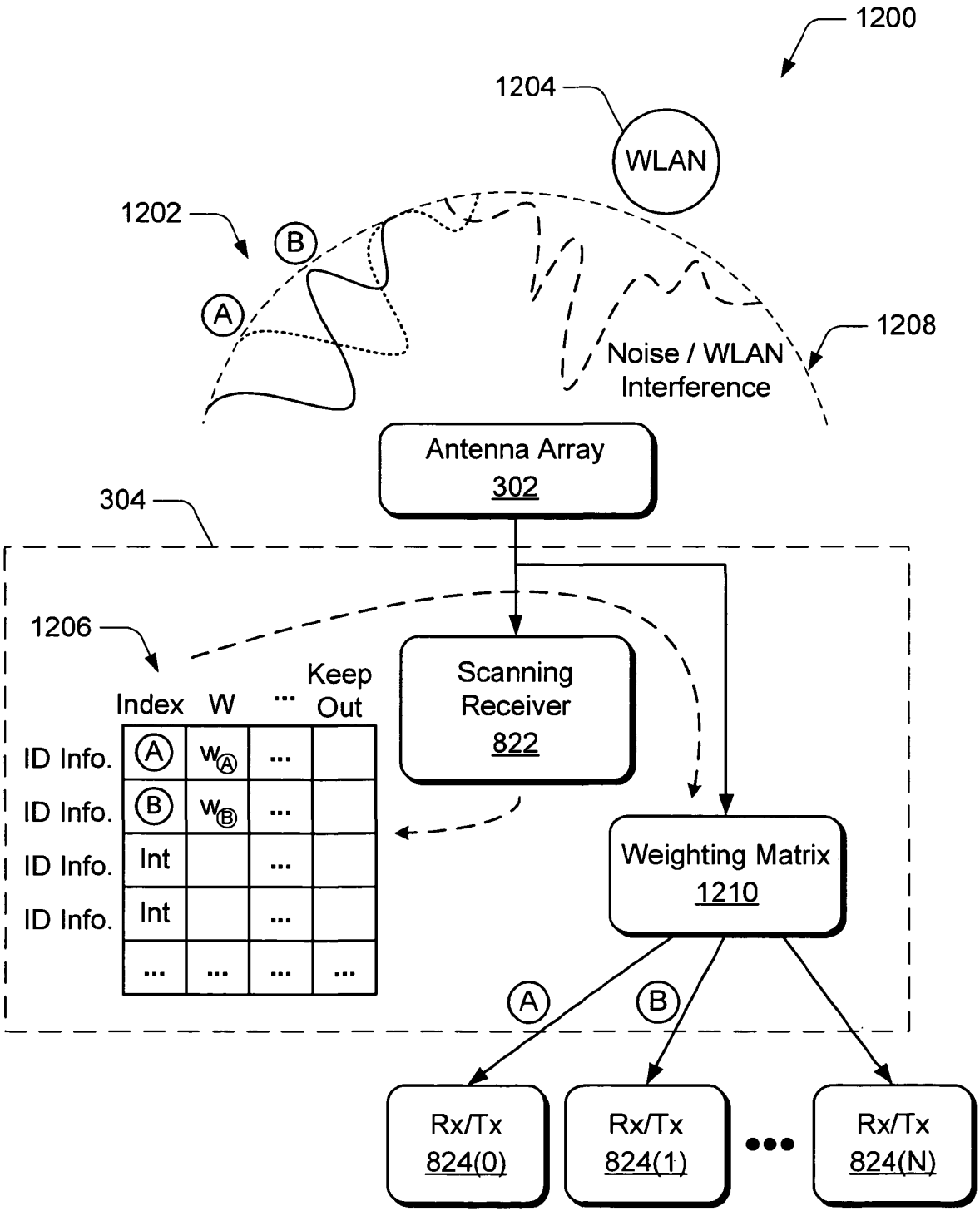

1200
1204
WLAN
1202
B
A
1208
Noise / WLAN
Interference
Antenna Array
302
304
1206
Index
W
...
Keep
Out
ID Info.
ID Info.
ID Info.
ID Info.
A
B
Int
Int
...
Scanning
Receiver
822
Weighting Matrix
1210
A
B
Rx/Tx
824(0)
Rx/Tx
824(1)
Rx/Tx
824(N)

Fig. 12

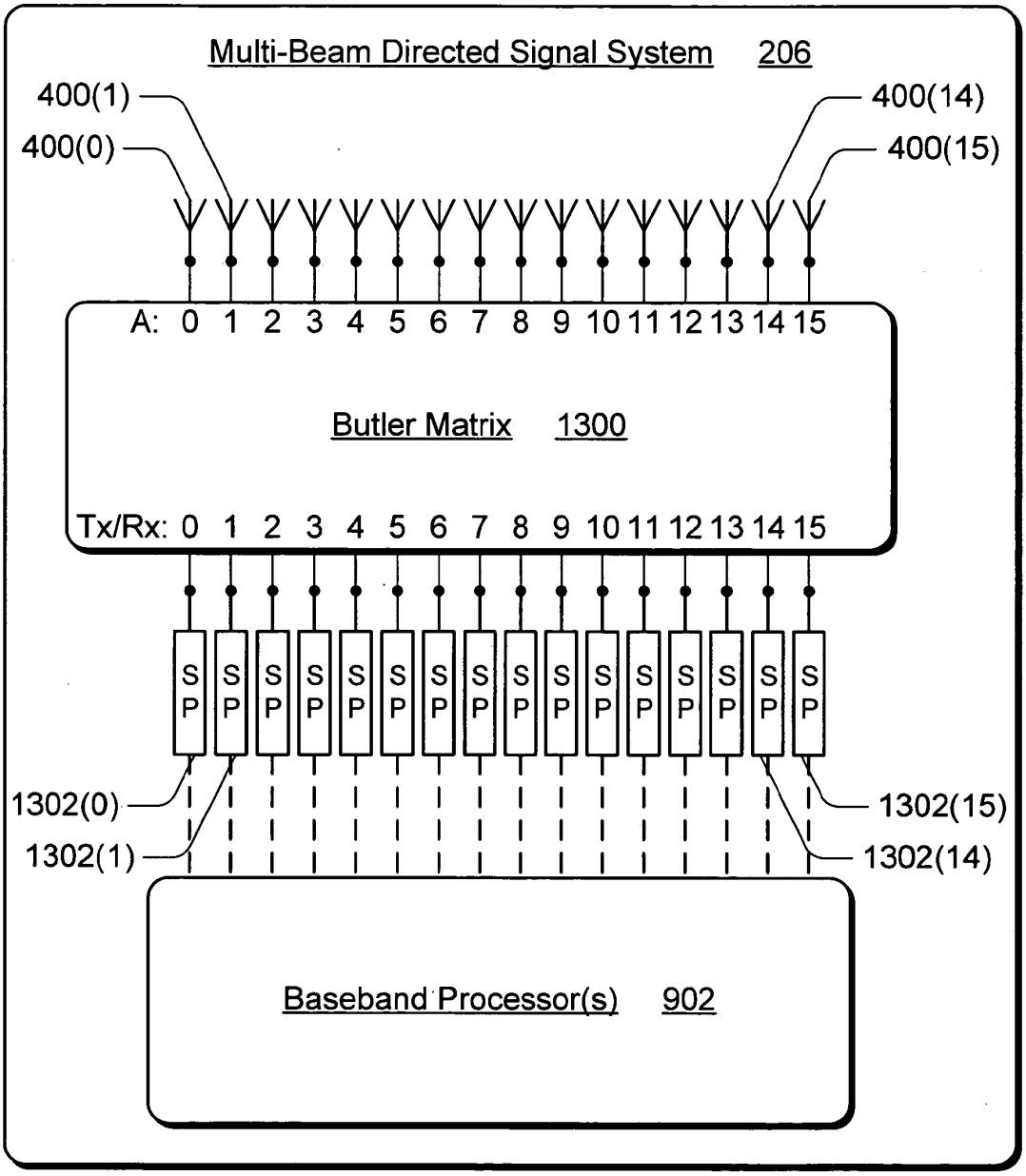

Multi-Beam Directed Signal System 206
400(1)
400(0)
400(14)
400(15)
A: 0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15
Butler Matrix 1300
Tx/Rx: 0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15
SP
1302(0)
1302(1)
1302(15)
1302(14)
Baseband Processor(s) 902

Fig. 13

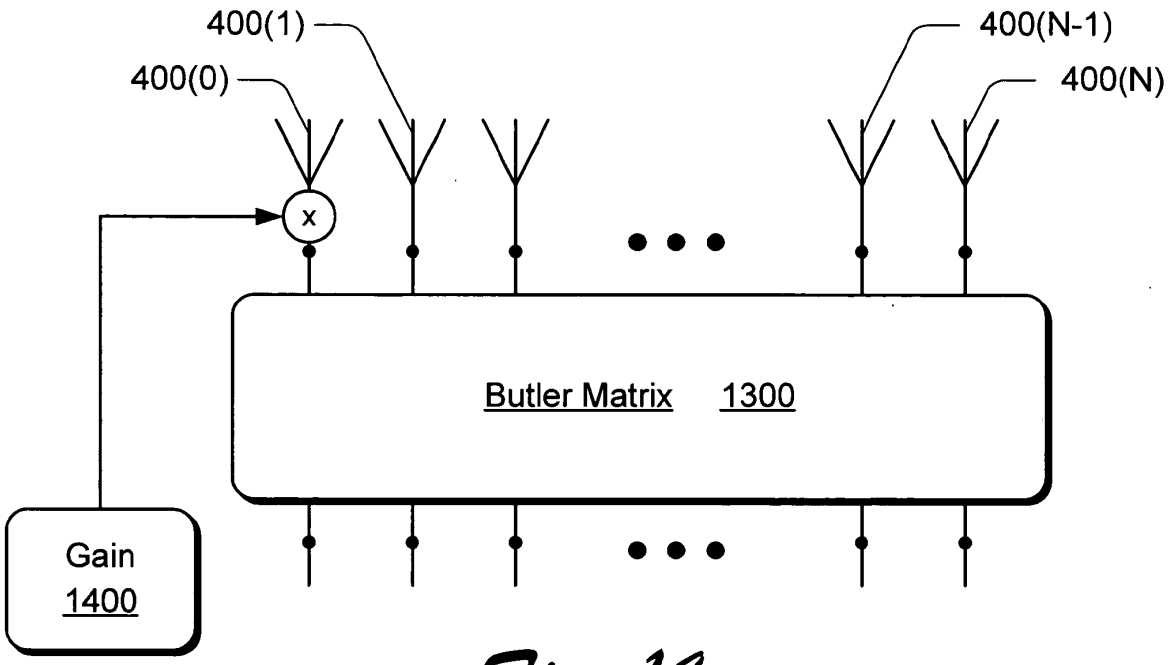

400(1)
400(0)
400(N-1)
400(N)
x
Butler Matrix 1300
Gain
1400

Fig. 14

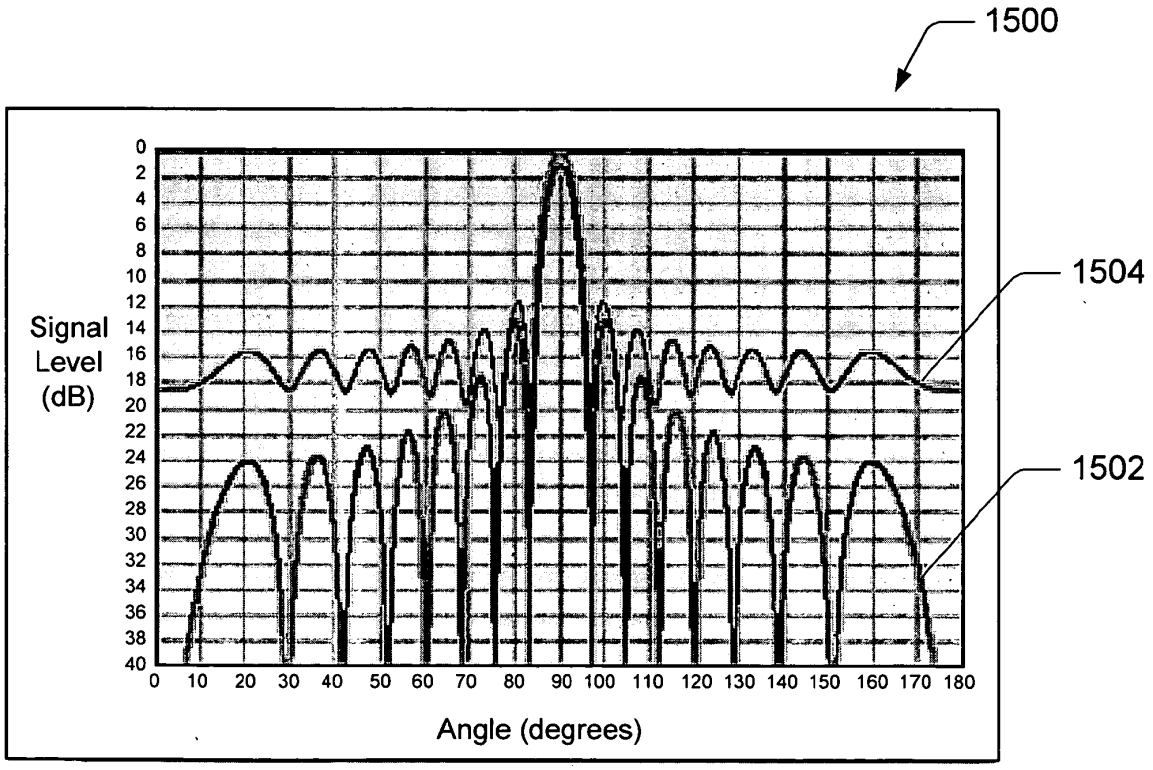

1500
1504
1502
Signal Level (dB)
0
2
4
6
8
10
12
14
16
18
20
22
24
26
28
30
32
34
36
38
40
0 10 20 30 40 50 60 70 80 90 100 110 120 130 140 150 160 170 180
Angle (degrees)

Fig. 15

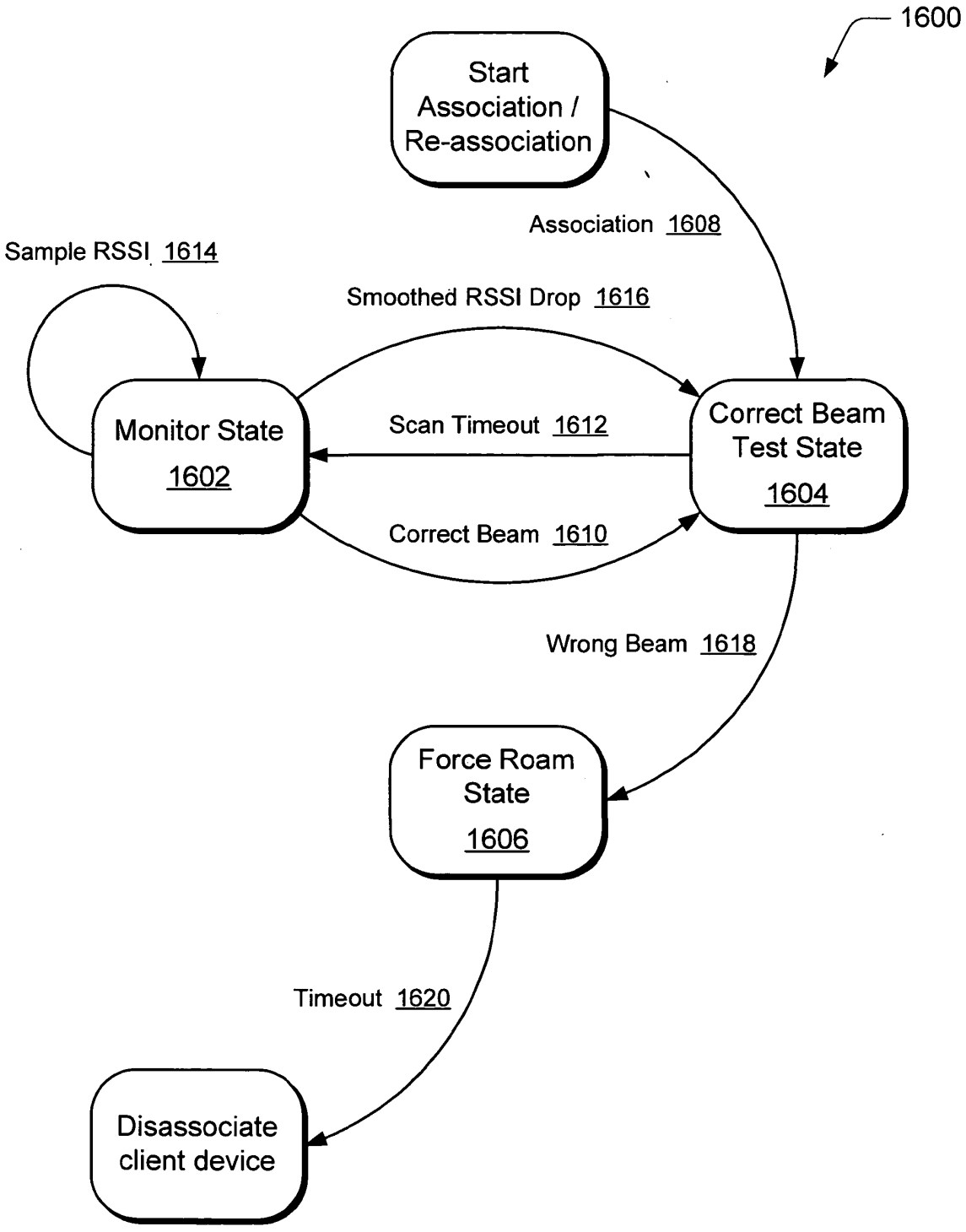

1600
Start Association / Re-association
Association 1608
Sample RSSI 1614
Smoothed RSSI Drop 1616
Monitor State 1602
Scan Timeout 1612
Correct Beam Test State 1604
Correct Beam 1610
Wrong Beam 1618
Force Roam State 1606
Timeout 1620
Disassociate client device

Fig. 16

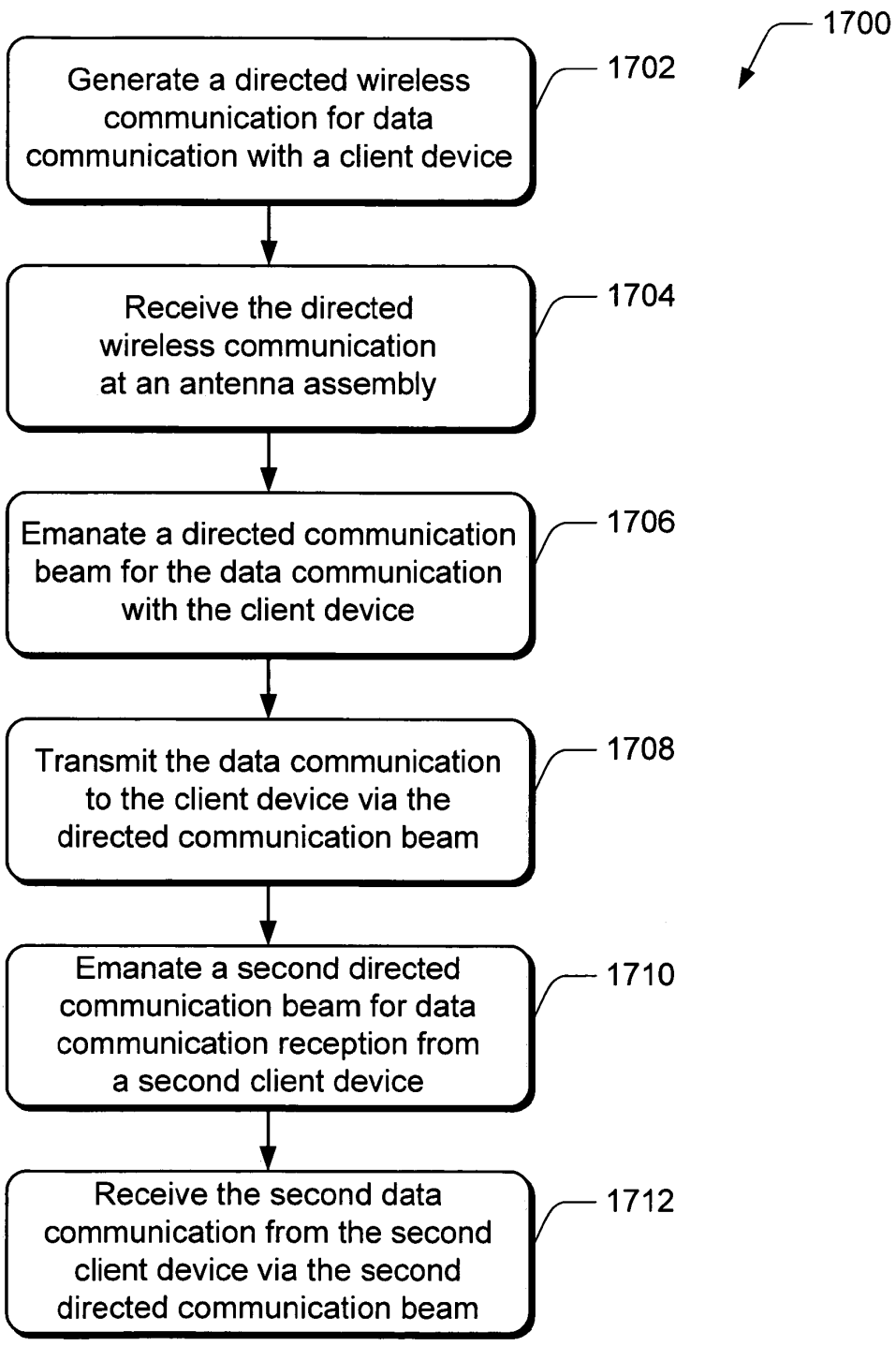

1700
Generate a directed wireless communication for data communication with a client device
1702
Receive the directed wireless communication at an antenna assembly
1704
Emanate a directed communication beam for the data communication with the client device
1706
Transmit the data communication to the client device via the directed communication beam
1708
Emanate a second directed communication beam for data communication reception from a second client device
1710
Receive the second data communication from the second client device via the second directed communication beam
1712

Fig. 17

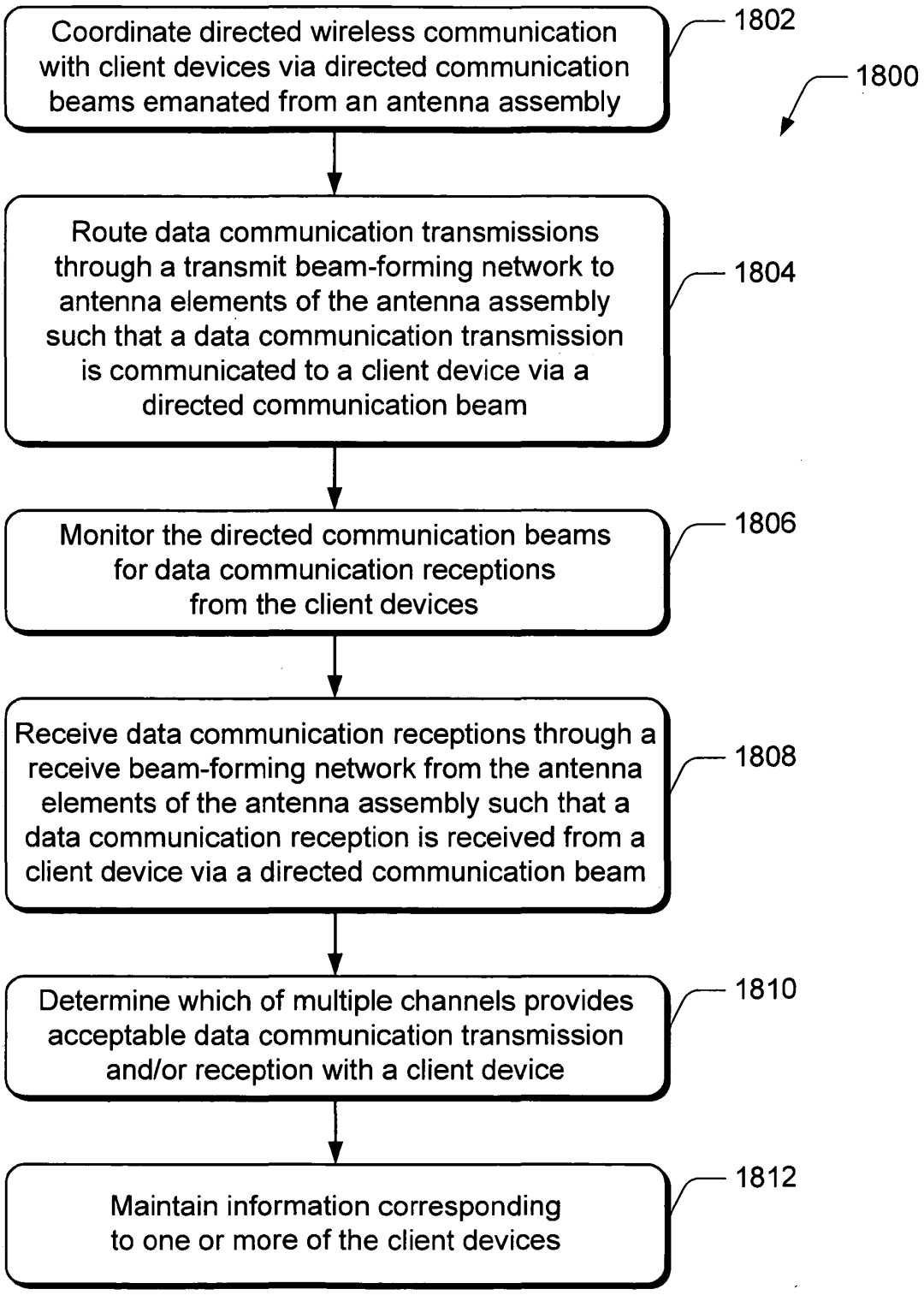

Coordinate directed wireless communication with client devices via directed communication beams emanated from an antenna assembly
1802
1800
Route data communication transmissions through a transmit beam-forming network to antenna elements of the antenna assembly such that a data communication transmission is communicated to a client device via a directed communication beam
1804
Monitor the directed communication beams for data communication receptions from the client devices
1806
Receive data communication receptions through a receive beam-forming network from the antenna elements of the antenna assembly such that a data communication reception is received from a client device via a directed communication beam
1808
Determine which of multiple channels provides acceptable data communication transmission and/or reception with a client device
1810
Maintain information corresponding to one or more of the client devices
1812

Fig. 18

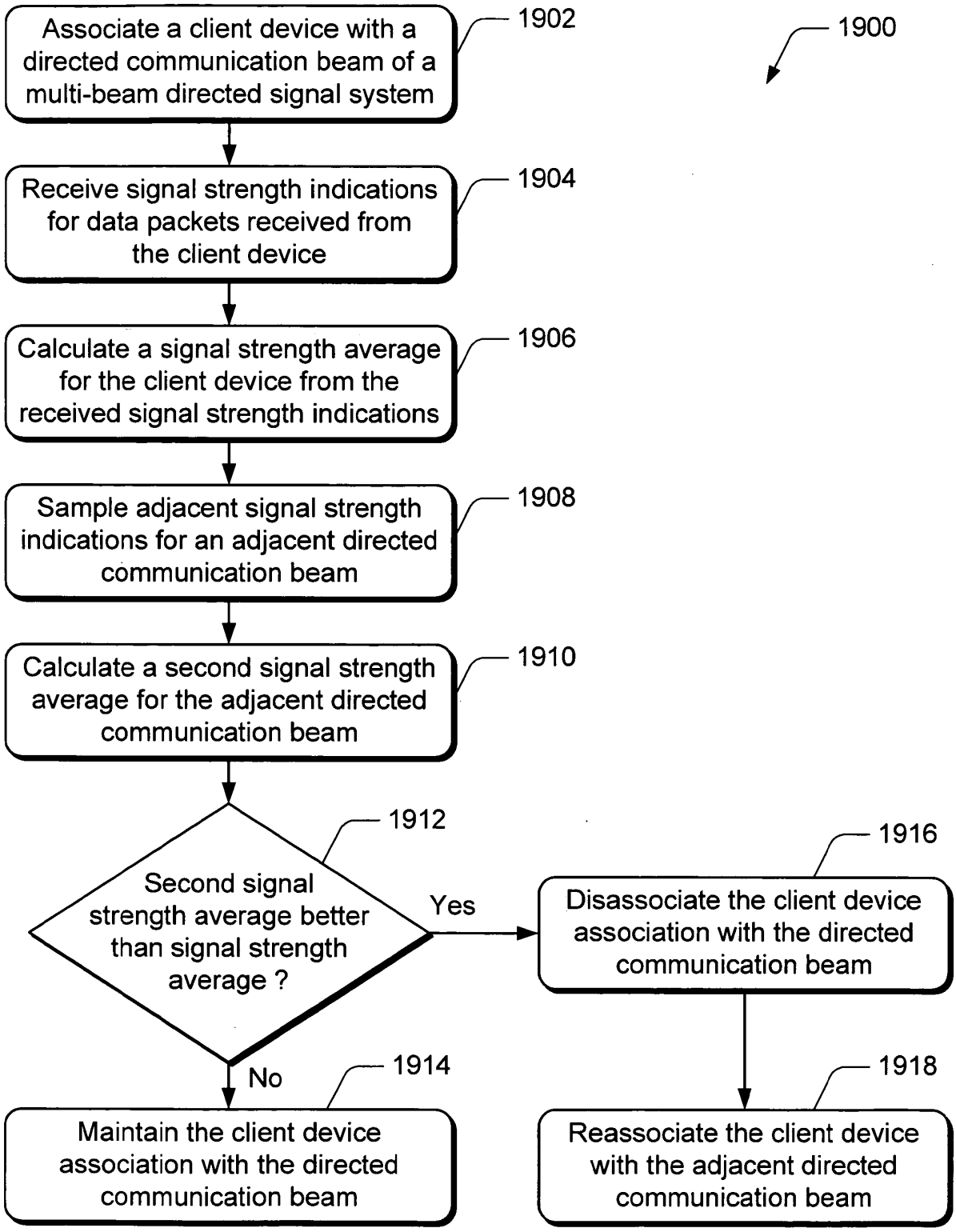

Associate a client device with a directed communication beam of a multi-beam directed signal system
1902
1900
Receive signal strength indications for data packets received from the client device
1904
Calculate a signal strength average for the client device from the received signal strength indications
1906
Sample adjacent signal strength indications for an adjacent directed communication beam
1908
Calculate a second signal strength average for the adjacent directed communication beam
1910
Second signal strength average better than signal strength average ?
1912
Yes
No
Disassociate the client device association with the directed communication beam
1916
Maintain the client device association with the directed communication beam
1914
Reassociate the client device with the adjacent directed communication beam
1918

Fig. 19

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Applicant:	XR Communications, LLC D/B/A Vivato Technologies
Application No.:	To be assigned
Filing Date:	Herewith
Title:	DIRECTED WIRELESS COMMUNICATION
Examiner:	To be assigned
Art Unit:	To be assigned
Confirmation No.:	To be assigned

INFORMATION DISCLOSURE STATEMENT TRANSMITTAL

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

Dear Sir:

Pursuant to 37 C.F.R. § 1.56, 1.97 and 1.98, the attention of the United States Patent and Trademark Office is hereby directed to the references listed on the attached PTO/SB/08. It is respectfully requested that the information be expressly considered during the prosecution of the above-identified application, and that the references be made of record therein and appear among the "References Cited" on any patent to issue therefrom.

In accordance with 37 C.F.R. § 1.98(d)(1), certain foreign patent references and non-patent literature references listed on the attached PTO/SB/08, are not supplied here because they have become unavailable and because they were previously cited by or submitted to the Office in prior U.S. Application Number 15,260,147, filed September 8, 2016, in U.S. Application Number 13/855,410, filed April 2, 2013, and in U.S. Application Number 10/700,329, filed November 3, 2003, which are relied on for an earlier effective filing date under 35 U.S.C. 120 in the present application.

Please charge any additional fees, including any fees for additional extension of time, or credit overpayment to Deposit Account No. 506237.

Respectfully submitted,

EIP US LLP

Dated: April 24, 2017

By: / Nicholas R. Transier /

Nicholas R. TRANSIER
Registration No. 68,743
Attorney of Record
Customer No. 114581
(619) 795-1300

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	Marcus DA SILVA
	Art Unit	TBD
	Examiner Name	TBD
	Attorney Docket Number	E1027.800(T).US1D1C1C3

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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	4231040		1980-10-28	Walker	
	2	5327143		1994-07-05	Goetz et al.	
	3	5771017		1998-06-23	Dean et al.	
	4	5809141		1998-09-15	Dent et al.	
	5	5987037		1999-11-16	Gans	
	6	6049307		2000-04-11	Lim	
	7	6091788		2000-07-18	Keskitalo et al.	
	8	6104935		2000-08-15	Smith et al.	

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	Application Number	
	Filing Date	
	First Named Inventor	Marcus DA SILVA
	Art Unit	TBD
	Examiner Name	TBD
	Attorney Docket Number	E1027.800(T).US1D1C1C3

	9	6108323		2000-08-22	Gray	
	10	6141335		2000-10-31	Kuwahara et al.	
	11	6169910		2001-01-02	Tamil et al.	
	12	6311075		2001-10-30	Bevan et al.	
	13	6337659		2002-01-08	Kim	
	14	6438376		2002-08-20	Elliott et al.	
	15	6470195		2002-10-22	Meyer	
	16	6611695		2003-08-26	Periyalwar	
	17	6628235		2003-09-30	Wight	
	18	6631277		2003-10-07	Berg et al.	
	19	6850741		2005-02-01	Lei et al.	

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	Application Number	
	Filing Date	
	First Named Inventor	Marcus DA SILVA
	Art Unit	TBD
	Examiner Name	TBD
	Attorney Docket Number	E1027.800(T).US1D1C1C3

	20	6907269		2005-06-14	Yamaguchi et al.	
	21	7346365		2008-03-18	Hovers et al.	
	22	9462589	B2	2016-10-04	DA SILVA	

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	1	20010033600	A1	2001-10-25	Yang et al.	
	2	20020103013	A1	2002-08-01	Watson et al.	
	3	20020158801	A1	2002-10-31	Crilly et al.	
	4	20030064752	A1	2003-04-03	Adachi et al.	
	5	20030073465	A1	2003-04-17	Li	
	6	20030114196	A1	2003-06-19	Chitrapu	

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	Application Number	
	Filing Date	
	First Named Inventor	Marcus DA SILVA
	Art Unit	TBD
	Examiner Name	TBD
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	7	20040063468	A1	2004-04-01	Frank			

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	1	9921391	WO	A2	1999-04-29	Radio Design Innovation Tj Ab		

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	1	Anastasi, et. al., "MAC Protocols for Widcband Wireless Local Access: Evolution Towards Wireless ATM", IEEE Personal Communications Magazine, pp. 53-64, Oct. 1998.	
	2	Berg, J., "Building penetration loss along urban street microcells," in Proceedings of PIMRC '96--7th International Symposium on Personal, Indoor, and Mobile Communications, 3:795-797 (1996).	
	3	Damoss, E. and L. Correia, eds., COST 231 Final Report--Digital Mobile Radio--Towards Future Generation Systems. European Commission, Directorate General XIII, Report No. RJR 18957 (ISBN 92-828-54167), 516 pages (1999).	
	4	Deng, S., "Empirical Model of WWW Document Arrivals at Access Link," Communications, 1996. ICC '96, Conference Record, Converging Technologies for Tomorrow's Applications. 1996 IEEE International Conference, 197-202 (1996).	
	5	Gans et al., "High data rate indoor wireless communications using antenna arrays," in Proceedings of 6th International Symposium on Personal, Indoor and Mobile Radio Communications, 3:1040-1046 (1995).	

INFORMATION DISCLOSURE STATEMENT BY APPLICANT (Not for submission under 37 CFR 1.99)		
	Application Number	
	Filing Date	
	First Named Inventor	Marcus DA SILVA
	Art Unit	TBD
	Examiner Name	TBD
	Attorney Docket Number	E1027.800(T).US1D1C1C3

	6	German et al., "Wireless Indoor Channel Modeling: Statistical Agreement of Ray Tracing Simulations and Channel Sounding Measurements," in Proceeding of 2001 IEEE International Conference on Acoustics, Speech, and Signal Processing, 4:2501-2504 (2001).	
	7	Gucsalla, R., "Characterizing the Variability of Arrival Processes with Indexes of Dispersion", IEEE JSAC, 9(2):203-211 (1990).	
	8	Hashemi, H., "The Indoor Propagation Channel," Proceedings of the IEEE, 81 (7): 943-968 (1993).	
	9	Jakes, W.C., ed., Microwave Mobile Communications. Wiley, 1974. 645 pages.	
	10	Kivinen et al., "Empirical Characterization of Wide hand Indoor radio Channel at 5.3 GHz," IEEE Transactions on Antennas and ProtJagation, 49(8): 1192-1203 (2001).	
	11	Leland et. Al., "On the Self-Similar Nature of Ethernet Traffic," IEEE/ACM Transactions on Networking, 2(1):1-15 (1994).	
	12	Medbo, J. and J. Berg, "Simple and accurate path loss modeling at 5 GHz in indoor environments with corridors," in Vehicular Technology Conference Fall 2000. IEEE VTS Fall VTC2000. 52nd Vehicular Technology Conference, 1:30-36 (2000).	

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Examiner Signature		Date Considered	

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INFORMATION DISCLOSURE STATEMENT BY APPLICANT (**Not for submission under 37 CFR 1.99)**		
	Application Number	
	Filing Date	
	First Named Inventor	Marcus DA SILVA
	Art Unit	TBD
	Examiner Name	TBD
	Attorney Docket Number	E1027.800(T).US1D1C1C3

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	/Nicholas R. Transier/	Date (YYYY-MM-DD)	2017-04-24
Name/Print	Nicholas R. TRANSIER	Registration Number	68743

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

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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.

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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.

IPR2024-00613
Petitioner's Exhibit 1002
Page 000381

Electronic Patent Application Fee Transmittal	
Application Number:	
Filing Date:	
Title of Invention:	DIRECTED WIRELESS COMMUNICATION
First Named Inventor/Applicant Name:	Marcus Da Silva
Filer:	Nicholas R. Transier/Jenny Stedman
Attorney Docket Number:	E1027.800(T).US1D1C1C3
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	70	70
UTILITY SEARCH FEE	2111	1	300	300
UTILITY EXAMINATION FEE	2311	1	360	360
REQUEST FOR PRIORITIZED EXAMINATION	2817	1	2000	2000
Pages:				
Claims:				
Miscellaneous-Filing:				

Description	Fee Code	Quantity	Amount	Sub-Total in USD($)
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:				
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Electronic Acknowledgement Receipt	
EFS ID:	29011435
Application Number:	15495539
International Application Number:	
Confirmation Number:	1050
Title of Invention:	DIRECTED WIRELESS COMMUNICATION
First Named Inventor/Applicant Name:	Marcus Da Silva
Customer Number:	114581
Filer:	Nicholas R. Transier/Jenny Stedman
Filer Authorized By:	Nicholas R. Transier
Attorney Docket Number:	E1027.800(T).US1D1C1C3
Receipt Date:	24-APR-2017
Filing Date:	
Time Stamp:	17:34:34
Application Type:	Utility under 35 USC 111(a)

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1	Application Data Sheet	WebADS.pdf	233723 1bf03203367fbc63a5c51d179deab14a7679bf7a	no	11
Warnings:					
Information:					
2	TrackOne Request	2017-04-24_Track_One_Request-C3.pdf	114188 a1d31a65ec4906f6f215f60d99758b57af037d4e	no	2
Warnings:					
Information:					
3	Oath or Declaration filed	Declarations.pdf	1030157 d4d2e2e410ee65ab5d46d28cc71da1e06b4984ff	no	17
Warnings:					
Information:					
4	Power of Attorney	2017-04-24_POA-C3.pdf	761429 bad3b04f3ce2e378d8cd8503b3a12de1f461038b	no	2
Warnings:					
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5		2017-04-24_Specification-C3.pdf	386110 95253e46bdf4d6b8e6ae3caa5ae561fa210db59c	yes	50

Multipart Description/PDF files in .zip description

Document Description	Start	End
Specification	1	44
Claims	45	49
Abstract	50	50

Warnings:					
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6	Drawings-only black and white line drawings	2017-04-24_Figures-C3.pdf	2451085 863be9d3035aa188765ed573bc128d87d8b3a299	no	18
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7	Transmittal Letter	2017-04-24_IDS_Transmittal-C3.pdf	16865 30247b20e7a3d082f680a3769e5776a57a1824b5	no	2
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9	Non Patent Literature	Anastasi.pdf	2727329 74ec4368eb7923f56b5b1382e3cf6ea0096992ba	no	12
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16	Non Patent Literature	leland.pdf	3243962 79a47a567e0957f9189dc1552f7389a00c46ae52	no	15
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17	Non Patent Literature	medbo_pathloss.pdf	491294 4f0a9fca125ef0111f9de799075782b4217d6943	no	7
Warnings:					
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18	Foreign Reference	WO1999021391A2.pdf	358774 ee34181f8fcb75b59ae9e43dc8e6d85a29d0b4e6	no	15
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19	Fee Worksheet (SB06)	fee-info.pdf	40284 e9ad93446f7c551d0b56f7a45f6cb58a571ca3d0	no	2
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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.

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Application Data Sheet 37 CFR 1.76	Attorney Docket Number	E1027.800(T).US1D1C1C3
	Application Number	
Title of Invention	DIRECTED WIRELESS COMMUNICATION	

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

Legal Name

Prefix	Given Name	Middle Name	Family Name	Suffix
	Marcus		Da Silva	

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

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Postal Code	99223	Country [i]	US

Inventor 2

Legal Name

Prefix	Given Name	Middle Name	Family Name	Suffix
	William	J.	Crilly	

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

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City	Liberty Lake	State/Province	WA
Postal Code	99019	Country [i]	US

Inventor 3

Legal Name

Prefix	Given Name	Middle Name	Family Name	Suffix
	James		Brennan	

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Petitioner's Exhibit 1002
Page 000389

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Application Data Sheet 37 CFR 1.76	Attorney Docket Number	E1027.800(T).US1D1C1C3
	Application Number	
Title of Invention	DIRECTED WIRELESS COMMUNICATION	

Residence Information (Select One)	◉ US Residency	○ Non US Residency	○ Active US Military Service		
City	Sammamish	**State/Province**	WA	**Country of Residence** [i]	US

Mailing Address of Inventor:

Address 1	414 213th PL SE		
Address 2			
City	Sammamish	**State/Province**	WA
Postal Code	98074	**Country** [i]	US

Inventor 4

Legal Name

Prefix	**Given Name**	**Middle Name**	**Family Name**	**Suffix**
	Robert	J.	Conley	

Residence Information (Select One)	◉ US Residency	○ Non US Residency	○ Active US Military Service		
City	Liberty Lake	**State/Province**	WA	**Country of Residence** [i]	US

Mailing Address of Inventor:

Address 1	23326 E. 2nd Avenue		
Address 2			
City	Liberty Lake	**State/Province**	WA
Postal Code	99019	**Country** [i]	US

Inventor 5

Legal Name

Prefix	**Given Name**	**Middle Name**	**Family Name**	**Suffix**
	Siavash		Alamouti	

Residence Information (Select One)	◉ US Residency	○ Non US Residency	○ Active US Military Service		
City	Spokane	**State/Province**	WA	**Country of Residence** [i]	US

Mailing Address of Inventor:

Address 1	2123 West 1st Ave., Apt 3		
Address 2			
City	Spokane	**State/Province**	WA
Postal Code	99204	**Country** [i]	US

Inventor 6

Legal Name

Prefix	**Given Name**	**Middle Name**	**Family Name**	**Suffix**
	Eduardo		Casas	

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Application Data Sheet 37 CFR 1.76	Attorney Docket Number	E1027.800(T).US1D1C1C3
	Application Number	
Title of Invention	DIRECTED WIRELESS COMMUNICATION	

Residence Information (Select One)	○ US Residency	◉ Non US Residency	○ Active US Military Service
City Vancouver	Country of Residence [i]	CA	

Mailing Address of Inventor:

Address 1	7542 Ontario Street		
Address 2			
City	Vancouver	**State/Province**	
Postal Code	V5X3C2	**Country** [i]	CA

Inventor 7

Legal Name

Prefix	**Given Name**	**Middle Name**	**Family Name**	**Suffix**
	Hujun		Yin	

Residence Information (Select One)	◉ US Residency	○ Non US Residency	○ Active US Military Service	
City Spokane	**State/Province**	WA	**Country of Residence** [i]	US

Mailing Address of Inventor:

Address 1	2415 N. Cherry Street, Apt. 23		
Address 2			
City	Spokane	**State/Province**	WA
Postal Code	99216	**Country** [i]	US

Inventor 8

Legal Name

Prefix	**Given Name**	**Middle Name**	**Family Name**	**Suffix**
	Bobby		Jose	

Residence Information (Select One)	◉ US Residency	○ Non US Residency	○ Active US Military Service	
City Veradale	**State/Province**	WA	**Country of Residence** [i]	US

Mailing Address of Inventor:

Address 1	15821 East 4th Ave., Apt F 125		
Address 2			
City	Veradale	**State/Province**	WA
Postal Code	99037	**Country** [i]	US

Inventor 9

Legal Name

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	Application Number	
Title of Invention	DIRECTED WIRELESS COMMUNICATION	

Prefix	**Given Name**	**Middle Name**	**Family Name**	**Suffix**
	Yang-Seok		Choi	

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

City	Liberty Lake	**State/Province**	WA	**Country of Residence** [i]	US

Mailing Address of Inventor:

Address 1	22809 East Country Vista Drive, Apt 438		
Address 2			
City	Liberty Lake	**State/Province**	WA
Postal Code	99019	**Country** [i]	US

Inventor 10

Legal Name

Prefix	**Given Name**	**Middle Name**	**Family Name**	**Suffix**
	Vahid		Tarokh	

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

City	Cambridge	**State/Province**	MA	**Country of Residence** [i]	US

Mailing Address of Inventor:

Address 1	157 Pleasant Street, Apt 305		
Address 2			
City	Cambridge	**State/Province**	MA
Postal Code	02139	**Country** [i]	US

Inventor 11

Legal Name

Prefix	**Given Name**	**Middle Name**	**Family Name**	**Suffix**
	Praveen		Mehrotra	

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

City	Spokane	**State/Province**	WA	**Country of Residence** [i]	US

Mailing Address of Inventor:

Address 1	13303 East Mission Ave., Apt 75		
Address 2			
City	Spokane	**State/Province**	WA
Postal Code	99216	**Country** [i]	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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Application Data Sheet 37 CFR 1.76	Attorney Docket Number	E1027.800(T).US1D1C1C3
	Application Number	
Title of Invention	DIRECTED WIRELESS COMMUNICATION	

Correspondence Information:

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

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

Customer Number	114581		
Email Address	sandiego@eip.com	Add Email	Remove Email

Application Information:

Title of the Invention	DIRECTED WIRELESS COMMUNICATION		
Attorney Docket Number	E1027.800(T).US1D1C1C3	**Small Entity Status Claimed**	☒
Application Type	Nonprovisional		
Subject Matter	Utility		
Total Number of Drawing Sheets (if any)	18	**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

Publication Information:

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

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

Representative Information:

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

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Application Data Sheet 37 CFR 1.76	Attorney Docket Number	E1027.800(T).US1D1C1C3
	Application Number	
Title of Invention	DIRECTED WIRELESS COMMUNICATION	

Please Select One:	◉ Customer Number	○ US Patent Practitioner	○ Limited Recognition (37 CFR 11.9)
Customer Number	114581		

Prefix	**Given Name**	Middle Name	**Family Name**	Suffix	Remove
Registration Number					
Prefix	**Given Name**	Middle Name	**Family Name**	Suffix	Remove
Registration Number					

Additional Representative Information blocks may be generated within this form by selecting the **Add** button.

Domestic Benefit/National Stage Information:

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

Prior Application Status	Pending		Remove
Application Number	Continuity Type	Prior Application Number	Filing or 371(c) Date (YYYY-MM-DD)
	Continuation of	15260147	2016-09-08

Prior Application Status	Patented				Remove
Application Number	Continuity Type	Prior Application Number	Filing Date (YYYY-MM-DD)	Patent Number	Issue Date (YYYY-MM-DD)
15260147	Continuation of	13855410	2013-04-02	9462589	2016-10-04

Prior Application Status	Patented				Remove
Application Number	Continuity Type	Prior Application Number	Filing Date (YYYY-MM-DD)	Patent Number	Issue Date (YYYY-MM-DD)
13855410	Division of	10700329	2003-11-03	8412106	2013-04-02

Prior Application Status	Expired		Remove
Application Number	Continuity Type	Prior Application Number	Filing or 371(c) Date (YYYY-MM-DD)
10700329	Claims benefit of provisional	60423660	2002-11-04

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

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Application Data Sheet 37 CFR 1.76	Attorney Docket Number	E1027.800(T).US1D1C1C3
	Application Number	
Title of Invention	DIRECTED WIRELESS COMMUNICATION	

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) 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).

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.

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.

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Application Data Sheet 37 CFR 1.76	Attorney Docket Number	E1027.800(T).US1D1C1C3
	Application Number	
Title of Invention	DIRECTED WIRELESS COMMUNICATION	

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	E1027.800(T).US1D1C1C3
	Application Number	
Title of Invention	DIRECTED WIRELESS COMMUNICATION	

Applicant Information:

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

Applicant 1

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

Clear

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

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

Name of the Deceased or Legally Incapacitated Inventor:	

If the Applicant is an Organization check here. ☒

Organization Name	XR Communications, LLC D/B/A Vivato Technologies

Mailing Address Information For Applicant:

Address 1	444 South Cedros Avenue		
Address 2			
City	Solana Beach	**State/Province**	CA
Country[i]	US	Postal Code	92075
Phone Number		Fax Number	
Email Address			

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

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Application Data Sheet 37 CFR 1.76	Attorney Docket Number	E1027.800(T).US1D1C1C3
	Application Number	
Title of Invention	DIRECTED WIRELESS COMMUNICATION	

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.

Assignee 1

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

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

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.

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Application Data Sheet 37 CFR 1.76	Attorney Docket Number	E1027.800(T).US1D1C1C3
	Application Number	
Title of Invention	DIRECTED WIRELESS COMMUNICATION	

Signature:

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

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

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

Signature	/Nicholas R. Transier/			Date (YYYY-MM-DD)	
First Name	Nicholas	Last Name	TRANSIER	Registration Number	68743

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