AO 120 (Rev. 08/10)

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

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

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

DOCKET NO.	DATE FILED	U.S. DISTRICT COURT
19-952 (MN)	5/22/2019	for the District of Delaware

PLAINTIFF	DEFENDANT
Dali Wireless, Inc.	CommScope Technologies LLC and CommScope Holding Company, Inc.

	PATENT OR TRADEMARK NO.	DATE OF PATENT OR TRADEMARK	HOLDER OF PATENT OR TRADEMARK
1	~~10,045,314 B2~~	~~8/7/2018~~	~~Dali Wireless, Inc.~~ The '314 and '178 patents were dropped from the suit by Stipulation and Order (*See* D.I. 176)
2	~~10,080,178 B2~~	~~9/18/2018~~	~~Dali Wireless, Inc.~~
3	8,682,338 B2	3/25/2014	Dali Systems Co., Ltd.
4	~~9,847,816 B2~~	~~12/19/2017~~	~~Dali Systems Co., Ltd.~~ The '816 Patent was dropped from the suit with the filing of the First Amended Complaint.
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		
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In the above—entitled case, the following decision has been rendered or judgement issued:

DECISION/JUDGEMENT
Judgment entered - see attached

CLERK	(BY) DEPUTY CLERK	DATE
John A. Cerino	/s/ Mark D. Buckson, Jr.	3/24/2022

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

AO 120 (Rev. 08/10)

TO:	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 for the 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
6:22-cv-104	1/27/2022	for the Western District of Texas

PLAINTIFF	DEFENDANT
Dali Wireless, Inc.	Cellco Partnership d/b/a Verizon Wireless, et al.

	PATENT OR TRADEMARK NO.	DATE OF PATENT OR TRADEMARK	HOLDER OF PATENT OR TRADEMARK
1	11,026,232	6/1/2021	Dali Wireless, Inc.
2	10,334,499	6/25/2019	Dali Wireless, Inc.
3	11,006,343	5/11/2021	Dali Wireless, Inc.
4	8,682,338	3/25/2014	Dali Wireless, Inc.
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
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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

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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 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
2:22-cv-12	1/7/2022	Eastern District of Texas

PLAINTIFF	DEFENDANT
DALI WIRELESS, INC.	AT&T CORP., et al

	PATENT OR TRADEMARK NO.	DATE OF PATENT OR TRADEMARK	HOLDER OF PATENT OR TRADEMARK
1	8,682,338	3/25/2014	Dali Wireless, Inc.
2	9,197,358	11/24/2015	Dali Wireless, Inc.
3	11,026,232	6/1/2021	Dali Wireless, Inc.
4	10,334,499	6/25/2019	Dali Wireless, Inc.
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
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In the above---entitled case, the following decision has been rendered or judgement issued:

DECISION/JUDGEMENT

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APPLICATION NUMBER	FILING OR 371(C) DATE	FIRST NAMED APPLICANT	ATTY.DOCKET NO./TITLE	REQUEST ID
13/211,243	08/16/2011	Paul Lemson	DALI0003US1	155216

Acknowledgement of Loss of Entitlement to Entity Status Discount

The entity status change request below filed through Private PAIR on 12/29/2021 has been accepted.

CERTIFICATIONS:

Change of Entity Status:

X Applicant changing to regular undiscounted fee status.

NOTE: Checking this box will be taken to be notification of loss of entitlement to small or micro entity status, as applicable.

This portion must be completed by the signatory or signatories making the entity status change in accordance with 37 CFR 1.4(d)(4).

Signature:	/Sarah Mirza/
Name:	Sarah Mirza
Registration Number:	74866

Trials@uspto.gov
571-272-7822

Paper 16
Entered: February 9, 2021

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

COMMSCOPE TECHNOLOGIES LLC,
Petitioner,

v.

DALI WIRELESS INC.,
Patent Owner.

IPR2020-01466
Patent 8,682,338 B2

Before KARL D. EASTHOM, MELISSA A. HAAPALA, and SHARON FENICK, *Administrative Patent Judges.*

HAAPALA, *Administrative Patent Judge.*

DECISION
Denying Institution of *Inter Partes* Review
35 U.S.C. § 314, 37 C.F.R. § 42.4

CommScope Technologies LLC ("Petitioner") filed a Petition pursuant to 35 U.S.C. §§ 311–319 to institute an *inter partes* review of claims 1–12 of U.S. Patent No. 8,682,338 B2 ("the '338 patent"). Paper 1 ("Pet."). Dali Wireless, Inc. ("Patent Owner") filed a Preliminary Response. Paper 9 ("Prelim. Resp."). Applying the standard set forth in 35 U.S.C. § 314(a), which requires demonstration of a reasonable likelihood that Petitioner would prevail with respect to at least one challenged claim, we deny Petitioner's request and do not institute an *inter partes* review of the '338 patent.

I. BACKGROUND

A. The '338 Patent (Ex. 1001)

The '338 patent describes a Reconfigurable Distributed Antenna System that provides flexibility to manage, control, re-configure, enhance and facilitate the radio resource efficiency, usage and performance of the distributed wireless network. Ex. 1001, 5:52–56. Figure 1, reproduced below, shows an embodiment of the Reconfigurable Distributed Antenna System.

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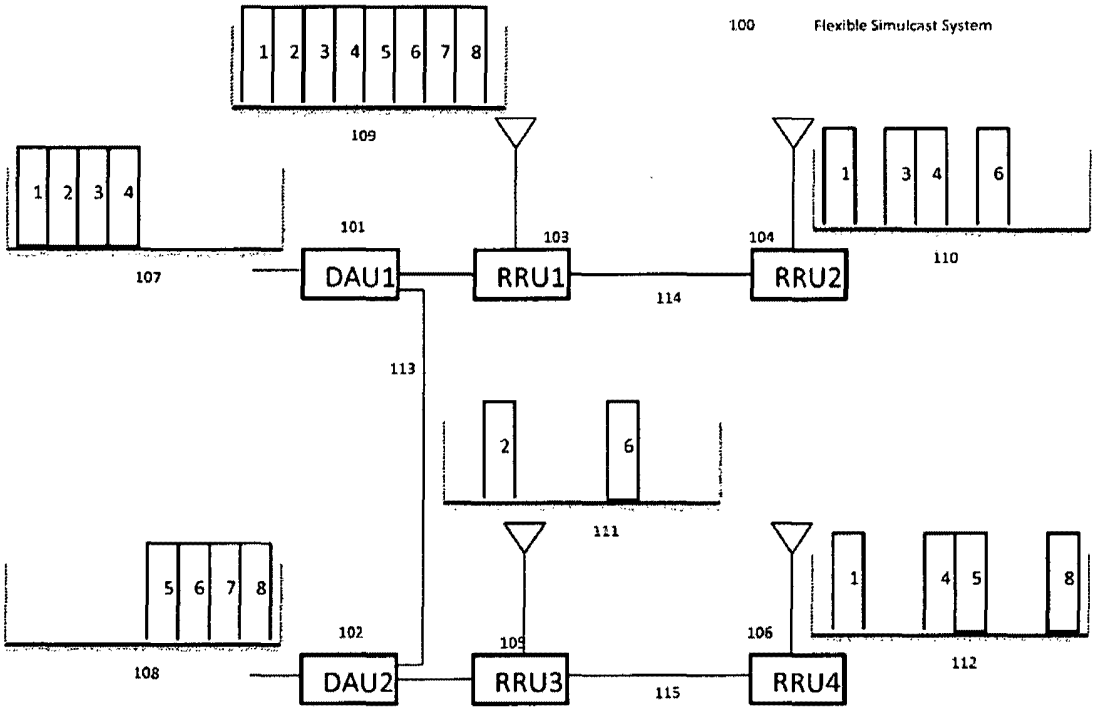


Figure 1: Flexible Simulcast Downlink Example

Figure 1 is a block diagram showing the basic structure and an example of a Flexible Simulcast downlink transport scenario. *Id.* at 5:25–28, 5:59–60. Flexible Simulcast System 100 system employs a Digital Access Unit ("DAU") that serves as an interface to a base station ("BTS"). *Id.* at 5:60–63. The DAU is, at one end, connected to the BTS, and, on the other end, is connected to multiple radio head units ("RRUs"). *Id.* at 5:63–64. Software settings within each RRU1, RRU2, RRU3, and RRU4 are configured to enable particular carriers to be present in each respective downlink output signal 109, 110, 111, 112 (e.g., Carriers 1-8 in RRU1, Carriers 2 and 6 in RRU3). *See id.* at 6:31–65.

An embodiment of the basic structure of embedded software control modules that manage key functions of the DAU and RRU is depicted in Figure 7, reproduced below.

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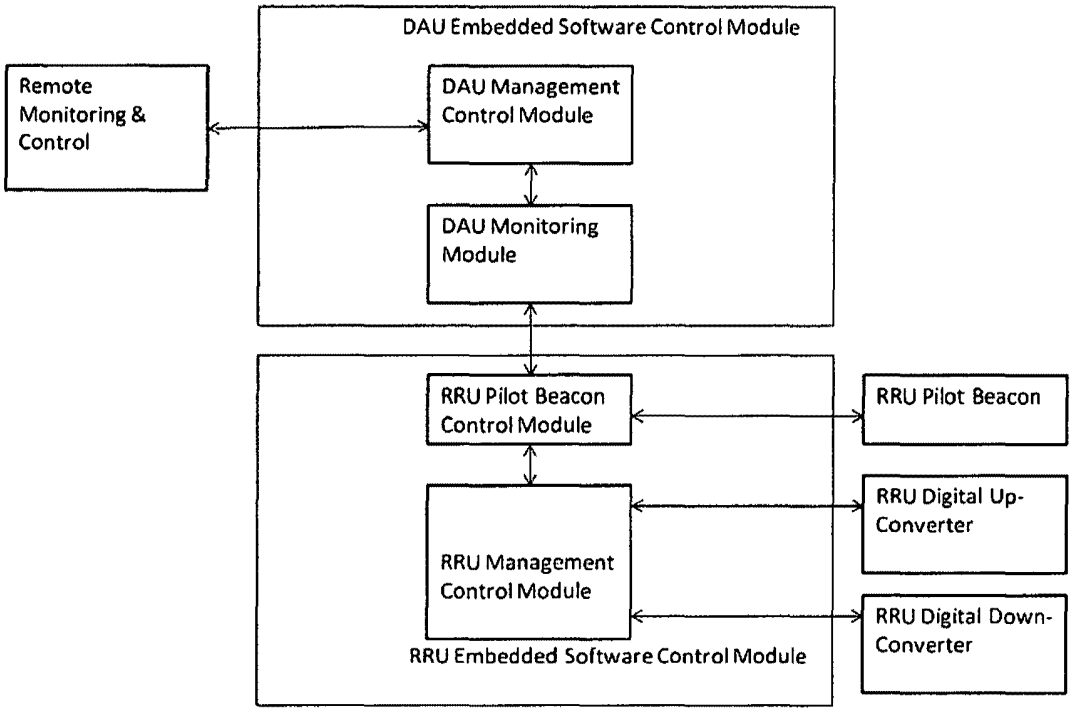


Figure 7: Embedded Software Control Modules

Id. at 5:45–47. Figure 7 illustrates DAU Embedded Software Control Module and RRU Embedded Software Control Module. *Id.* at 11:18–21. One key function of the modules is to determine and/or set the appropriate number of radio resources (such as RF carriers, CDMA codes or TDMA time slots) assigned to a particular RRU or group of RRUs to meet desired capacity and throughput objectives. *Id.* at 11:21–25. The DAU embedded software control module comprises a DAU Monitoring module that detects which carriers and corresponding time slots are active for each RRU. *Id.* at 11:25–28. The DAU embedded software control module also comprises a DAU Management Control module which communicates with the RRU over a fiber optic link control channel via a control protocol with the RRU Management Control module. *Id.* at 11:28–32. In turn, the RRU Management Control module sets the individual parameters of all the RRU

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Digital Up-Converters to enable or disable specific radio resources from being transmitted by a particular RRU or group of RRUs, and also sets the individual parameters of all the RRU Digital Down-Converters to enable or disable specific uplink radio resources from being processed by a particular RRU or group of RRUs. *Id.* at 11:32–39.

An algorithm operating within the DAU Monitoring module detects which carriers and corresponding time slots for each carrier are active for each RRU and provides information to the DAU Management Control module to help identify when a particular downlink carrier is loaded by a percentage greater than a predetermined threshold. *Id.* at 11:40–46. If that occurs, the DAU Management Control Module adaptively modifies the system configuration to deploy additional radio resources for use by a particular RRU that needs those radio resources within its coverage area. *Id.* at 11:48–53. At the same time, the DAU Management Control module adaptively modifies the system configuration to remove certain radio resources for use by a particular RRU that no longer needs those radio resources within its coverage area. *Id.* at 11:53–58.

B. Illustrative Claim

Claim 1 is the sole independent claim and is illustrative of the subject matter at issue:

> 1. A method for routing and switching RF signals comprising:
>
> providing one or more remote radio units, each remote radio unit configured to transmit one or more downlink RF signals and to receive one or more uplink RF signals;
>
> providing at least one digital access unit configured to communicate with the one or more remote radio units;
>
> translating the uplink and downlink signals between RF and base band as appropriate;

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packetizing the uplink and downlink base band signals, wherein the packetized signals correspond to a plurality of carriers;

configuring each remote radio unit to receive or transmit a respective subset of the plurality of carriers, each respective subset of the plurality of carriers including a number of carriers;

reconfiguring each remote radio unit by:

determining a load percentage for each remote radio unit; and

increasing or decreasing the number of carriers in the respective subset of the plurality of carriers based on the load percentage; and

routing and switching the packetized signals among the one or more remote radio units via the at least one digital access unit according to a result of the reconfiguring.

C. References

Petitioner relies on the following references:

1. U.S. Patent No. 8,032,148, issued October 4, 2001 ("Hettstedt") (Ex. 1005).
2. U.S. Patent No. 7,286,507, issued October 23, 2007 ("Oh") (Ex. 1010).
3. U.S. Patent Application Pub. No. 2010/0128676, published May 27, 2010 ("Wu") (Ex. 1022).
4. U.S. Patent No. 6,963,552, issued November 8, 2005 ("Sabat '552") (Ex. 1008).
5. U.S. Patent Application Pub. No. 2009/0180426, published July 16, 2009 ("Sabat '426") (Ex. 1021).
6. ETSI Technical Specification TS 125 423 V5.6.0 (2003-06) ("UMTS Standard") (Ex. 1006).
7. U.S. Patent No. 7,848,770, issued December 7, 2010 ("Scheinert") (Ex. 1013).

Petitioner further relies on testimony of its declarant, Dr. Anthony Acampora. (Ex. 1003).

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D. Grounds Asserted

Petitioner challenges the patentability of claims 1–12 on the following grounds:

Claim(s) Challenged	35 U.S.C. §	Reference(s)/Basis
1–3	102(e)	Hettstedt
1–3	103(a)	Hettstedt
1–12	103(a)	Hettstedt, Sabat '552
1–12	103(a)	Hettstedt, Sabat '552, UMTS Standard
1, 2	103(a)	Oh, Scheinert
3	103(a)	Oh, Scheinert, Hettstedt
1, 2, 4–12	103(a)	Oh, Scheinert, Sabat '552
1–12	103(a)	Oh, Scheinert, Hettstedt, Sabat '552, UMTS Standard
1–3	102(e)	Wu
1–3	103(a)	Wu, UMTS Standard
1–12	103(a)	Wu, UMTS Standard, Sabat '552
1–12	103(a)	Wu, Sabat '552, UMTS Standard, Sabat '426

E. Related Proceedings

Petitioner and Patent Owner identify the following district court litigation involving the '338 patent: *Dali Wireless Inc. v. CommScope Technologies LLC*, No. 1:19-cv-00952 (D. Del.). Pet. iii; Paper 4, 1.

F. Real Parties in Interest

Petitioner identifies the following additional real parties in interest: CommScope, Inc. of North Carolina; CommScope, Inc.; and CommScope Holding Company, Inc. Pet. iii. Patent Owner identifies no additional real parties in interest. Paper 4, 1.

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II. ANALYSIS

A. Claim Construction

In an *inter partes* review, claims of a patent shall be construed using the same claim construction standard that would be used to construe the claims in a civil action under 35 U.S.C. § 282(b), including construing the claims in accordance with the ordinary and customary meaning of such claims as understood by one of ordinary skill in the art and the prosecution history pertaining to the patent. 37 C.F.R. § 42.100(b); *see also Phillips v. AWH Corp.*, 415 F.3d 1303, 1312–14 (Fed. Cir. 2005). Any prior claim construction determination concerning a term of the claim in a civil action, or a proceeding before the International Trade Commission, that is timely made of record in the *inter partes* review proceeding will be considered. 37 C.F.R. § 42.100(b). In determining the meaning of the disputed claim limitation, we look principally to the intrinsic evidence of record, examining the claim language itself, the written description, and the prosecution history, if in evidence. *DePuy Spine, Inc. v. Medtronic Sofamor Danek, Inc.*, 469 F.3d 1005, 1014 (Fed. Cir. 2006) (citing *Phillips*, 415 F.3d at 1312–17).

1. reconfiguring each remote unit

This term appears in claim 1. Petitioner does not offer a construction for this term in this proceeding. *See generally* Pet. Patent Owner contends that the proper construction of this term is "readjusting the radio capacity of each remote radio unit by changing the configuration parameters of the remote radio units." Prelim. Resp. 23–24. In support of its construction, Patent Owner asserts that its construction "captures a novel feature of the invention by clarifying that reconfiguration is achieved by readjusting the radio capacity of one or more remote radio units by changing configuration

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parameters." *Id.* at 23 (citing Ex. 1001 4:2–19, 7:16–37, 8:8–32, 11:40–12:10).

In the related district court proceeding, the court issued a claim construction order in which it determined "'reconfiguring each remote radio unit' shall be given its plain and ordinary meaning, which is 'changing the configuration of each remote unit.'" Ex. 1047, 1. In that proceeding, Patent Owner proposed an identical construction as in this proceeding. *See id.* at 7–8. The district court declined to read in Patent Owner's proposed limitation that the reconfiguration must include adjustment of "the radio capacity of each remote unit by changing the configuration parameter of the remote radio units" because "the claim does not specify what change must be made to the configuration." *Id.* at 8.

We agree with the district court that the term "reconfiguring each remote radio unit" does not require readjusting the radio capacity by changing configuration parameters. Patent Owner's argument that its construction captures novel features of the invention (e.g., adaptive changes to radio capacity) reads in elements into this claim term that are not present. Although claim 1 requires the reconfiguring be done by "determining a load percentage" and "increasing or decreasing the number of carriers," our claim construction here focuses solely on the term "reconfiguring each remote radio unit." We agree with the district court that the plain meaning of "reconfiguring" is "changing the configuration." *See* Ex. 1047 1, 8.

Accordingly, we adopt the district court's construction and construe "reconfiguring each remote radio unit" to be "changing the configuration of each remote unit." We additionally note that the claim term requires that it is the remote radio unit itself that is changed because the "remote radio unit" is the direct object of the verb "reconfiguring." This is consistent with the

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specification of the '338 patent, which describes reconfiguring the RRUs themselves. *See e.g.*, Ex. 1001 7:16–31 (describing that Digital Up-Converters located within the RRU are dynamically software-programmable and can be re-configured to transport any specific frequency band, RF carriers, or RF channels which are available), 8:8–21 (describing that the Digital Up Converters present in the RRU can be dynamically software-reconfigured), 8:48–55 (describing that Digital Down-Converters present in each RRU are dynamically software-configured), 11:28–39 (describing setting individual parameters of the RRU Digital Up-Converters and Digital-Down Converters to enable or disable specific radio resources), 4:1–13 (describing that the present invention employs software-programmable Digital Up-Converters and Digital Down-Converters).

2. Other terms

Petitioner and Patent Owner both propose constructions for a number of other terms that appear in the '338 patent. *See* Pet. 6–8; PO Resp. 20–21, 25–28. For purposes of this Decision, we do not find it necessary to construe these terms, and accord them their ordinary and customary meaning. *See Nidec Motor Corp. v. Zhongshan Broad Ocean Motor Co.*, 868 F.3d 1013, 1017 (Fed. Cir. 2017) (holding that "we need only construe terms 'that are in controversy, and only to the extent necessary to resolve the controversy,'" (citation omitted)).

B. Discretionary Denial

Petitioner asserts that the Board should not issue a discretionary denial based on Patent Owner's related district court action. Pet. 87–88. Patent Owner does not address these arguments. *See generally* Prelim. Resp. But Patent Owner contends that the Board should exercise its discretion to deny the present petition under 35 U.S.C. § 312(a)(3) because Petitioner does not

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meet its burden to identify, with particularity, the grounds on which each claim is based. *See* Prelim. Resp. 66–67.

For the reasons discussed below, we determine Petitioner does not establish a reasonable likelihood of prevailing in its challenges to claims 1–12 of the '338 patent. Accordingly, we need not address whether we should exercise our discretion, under § 314(a) or § 312(a)(3), to deny institution.

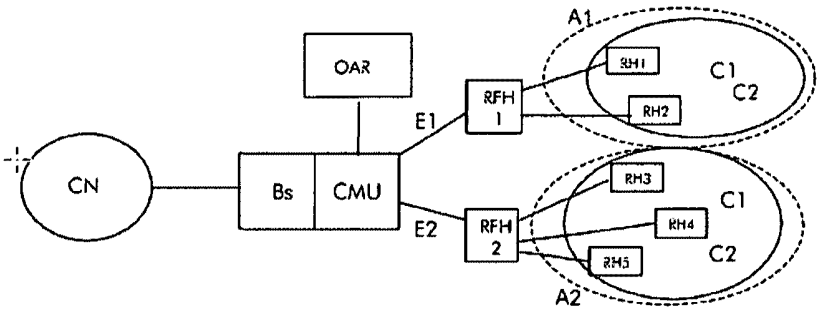
C. Challenges Based on Hettstedt

Petitioner contends that claims 1–3 are unpatentable under 35 U.S.C. § 102(e) as anticipated by Hettstedt. Pet. 18–26. Petitioner further contends that claims 1–3 are unpatentable under 35 U.S.C. § 103(a) as obvious over Hettstedt. *Id.* at 26–27. Petitioner additionally contends that claims 1–12 are unpatentable under 35 U.S.C. § 103(a) as obvious over Hettstedt and Sabat '552 and that claims 1–12 are also obvious over Hettstedt, Sabat '552 and UMTS Standard. *Id.* at 27–40.

1. Overview of Hettstedt

Hettstedt describes a method and system for wireless cellular indoor communications with cell and load balancing management. Ex. 1005, 2:6–8. Figure 4 is depicted below.

Figure 4



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Figure 4 illustrates a wireless cellular indoor communications system. *Id.* at 3:51–53. The wireless system comprises a core network CN, a base station Bs, a cell management unit CMU, an off-air repeater ("OAR"), RF hubs RFH1 and RFH2, and remote radio heads RH1 to RH5. *Id.* at 3:62–65. The first RF Hub RFH1 is connected to two remote radio heads RH1 and RH2, RH1 providing service in cell C2, and RH2 providing service in cell C2, where cells C1 and C2 are overlapping in the same indoor location area A1. *Id.* at 5:30–34. The second RF Hub RFH2 is connected to three remote radio heads RH3, RH4 and RH5 which also provide service in different overlapping cells C1, C2 at the same indoor location A2. *Id.* at 5:34–37.

Figure 5 is depicted below.

Figure 5

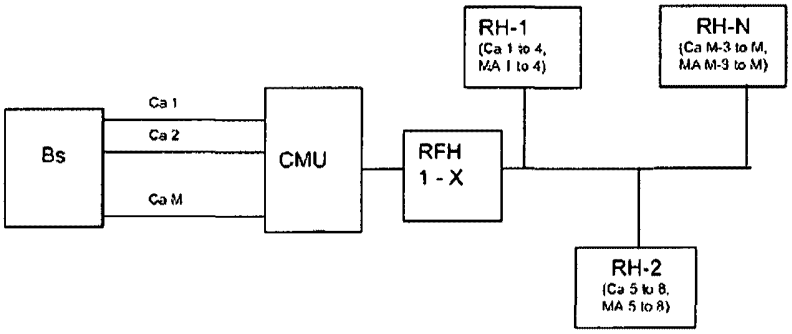


Figure 5 illustrates an example carrier distribution according to a wireless cellular indoor communications method. *Id.* at 5:46–47. There are four carriers per remote head RH-1 to RH-N. *Id.* at 5:48–49. The base station Bs provides the M carriers Ca1 to CaM to the cell management unit CMU which in turn distributes it between the at least one RF Hub RFH1 to RFHX of the next stage. *Id.* at 5:49–52. The one or more RF Hubs distribute carriers 1 to 4 to a first remote radio head RH-1 according to medium access control ("MAC") addresses MA1 to MA4 in the Ethernet packets, carriers 5 to 8 to a second remote radio head RH-2 according to MAC addresses 5 to 8,

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and carriers M-3 to M to an N remote radio head RH-N according to MAC addresses M-3 to M, where M=Nx4. *Id.* at 5:52–58.

2. Overview of Sabat '552

Sabat '552 describes a system in which a base station interface located at a central hub location converts radio frequency signals associated with multiple base stations, to and from a transport signaling format. Ex. 1008, 2:59–64. A shared transport medium, such as a fiber optic data network, is then used for transporting the converted signals from the hub location to a number of remote access node locations. *Id.* at 2:64–67.

3. Overview of UMTS Standard

UMTS Standard is an ETSI Technical Specification that describes the radio network layer signaling procedures between radio network controllers and base station subsystems.[1] Ex. 1006, 1, 17. One of the parameters of a signaling message is a "Load Value" parameter that contains a total load on a measured object relative to a maximum planned load for both uplink and downlink messages and is defined as a load percentage of a cell capacity class. *Id.* at 209.

4. Claim 1

Claim 1 recites "reconfiguring each remote radio unit by: determining a load percentage for each remote radio unit; and increasing or decreasing the number of carriers in the respective subset of the plurality of carriers based on the load percentage." Petitioner asserts this limitation is disclosed

[1] Patent Owner argues that Petitioner has not carried its burden to prove the public availability of UMTS Standard. *See* PO. Resp. 15–18. We decline to address these arguments because we determine that for other reasons, discussed below, Petitioner does not establish a reasonable likelihood of prevailing on its challenges.

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by Hettstedt.[2] Pet. 22–24. Specifically, Petitioner asserts Hettstedt discloses "adaptive cell reconfiguration" in which the CMU monitors the individual load for each carrier at each remote radio head so that the CMU can shift unused carriers from radio heads in low traffic areas to radio heads in high traffic areas. *Id.* at 22 (citing Ex. 1003 ¶ 53; Ex. 1005, 4:35–39. Petitioner asserts the CMU controls the frequency allocation of each carrier to the remote heads by changing the MAC address of a specific carrier packet to correspond no longer to a first remote radio head, but instead to be addressed to a different radio head in a high traffic area, which decreases the number of carriers assigned to the first remote radio head and increases the number of carriers assigned to the radio head in the high traffic area. *See id.* (citing Ex. 1005, 5:10–11, 3:8–16, 4:35–39, claim 4; Ex. 1003 ¶ 54). Petitioner further asserts Hettstedt discloses using a load threshold for triggering when to shift additional carriers to a radio head, which necessarily generates a value that represents current load conditions. *Id.* at 23 (citing Ex. 1005, 6:41–43, claim 2; Ex. 1003 ¶ 55).

Patent Owner argues Hettstedt fails to disclose "reconfiguring each remote radio unit." Prelim. Resp. 33–35. In particular, Patent Owner argues that Petitioner fails to specify where in Hettstedt a remote radio head is reconfigured by changing parameters of the radio head; rather, Hettstedt specifically teaches that the CMU provides transparent operation of the radio heads without reconfiguration of any type to a remote radio head. *Id.* at 34 (citing Ex. 1005, 4:21–23).

[2] Petitioner refers to the "reconfiguring each remote radio unit" limitation as element G. *See* Pet. 89

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After reviewing Petitioner's analysis and supporting evidence, and Patent Owner's response, we determine Petitioner fails to establish Hettstedt discloses "reconfiguring each remote radio unit" as we construe the claim (changing the configuration of each remote radio unit). Petitioner relies on Hettstedt's disclosure that the CMU controls allocation of each carrier by changing the MAC addresses of carrier packets to disclose the recited "reconfiguring." *See* Pet. 22. However, while changing the MAC addresses of carrier packets may result in an increase or decrease of the number of carriers assigned to a radio head by the CMU when routing traffic, it does not reconfigure (change) the configuration of the remote radio head itself. As we noted in our analysis of the claim construction of this term, the plain language of the claim requires that the remote radio head itself be reconfigured. Petitioner's analysis does not address how Hettstedt discloses reconfiguring the remote radio unit itself. Indeed, we agree with Patent Owner that Hettstedt specifically discloses that the CMU provides transparent operation of the radio heads and does not disclose making any changes to the radio heads. *See* Ex. 1005, 4:21–22. Therefore, we conclude Petitioner does not demonstrate a reasonable likelihood of prevailing in establishing claim 1 is anticipated by Hettstedt.

In its obviousness challenges over Hettstedt, the Hettstedt-Sabat '552 combination, and the Hettstedt-Sabat '552-UMTS Standard combination, Petitioner relies on the same disclosure of Hettstedt to teach "reconfiguring each remote radio unit." *See* Pet. 26–27, 38–40. Accordingly, for the same reasons discussed above, Petitioner does not demonstrate a reasonable likelihood of prevailing in establishing claim 1 would have been obvious over Hettstedt, the Hettstedt-Sabat '552 combination, or the Hettstedt-Sabat '552-UMTS Standard combination.

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5. Claims 2–12

Claims 2–12 depend from claim 1. In its challenges of these claims, Petitioner relies on the analysis of claim 1 to meet the "reconfiguring each remote radio head" limitation and does not set forth any additional analysis or argument regarding this limitation. *See* Pet. 25–38. Accordingly, Petitioner fails to cure the deficiency discussed above and has not demonstrated a reasonable likelihood of prevailing in these challenges.

D. Challenges Based on Oh

Petitioner contends that claims 1 and 2 are unpatentable under 35 U.S.C. § 103(a) as obvious over Oh and Scheinert. Pet. 40–48. Petitioner contends that claim 3 is unpatentable under 35 U.S.C. § 103(a) as obvious over Oh, Scheinert, and Hettstedt. *Id.* at 48–50. Petitioner further contends claims 1, 2, and 4–12 are unpatentable under 35 U.S.C. § 103(a) as obvious over Oh, Scheinert, and Sabat '552. *Id.* at 50–59. Petitioner also contends that claims 1–12 are unpatentable under 35 U.S.C. § 103(a) as obvious over Oh, Scheinert, Hettstedt, and Sabat '552. *Id.* at 59–60.

1. Overview of Oh

Oh describes a mechanism for routing communication traffic between a radio access network and distributed antenna system ("DAS") remote antenna units. Ex. 1010, 2:34–36. A distribution hub unit ("DHU") and each DAS remote antenna unit served by the DHU sits as a respective node on at least one packet-switched network. *Id.* at 2:36–40. The DHU maintains a set of mapping data that correlates one or more coverage segments of a cellular radio access network with one or more DAS antenna unit addresses on the packet-switched network. *Id.* at 2:40–44. An administrator of the DAS then alters the mapping data whenever desired, to

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change the RAN-DAS correlations, so as to distribute RAN coverage in a desired manner among the DAS antenna units. *Id.* at 2:45–48.

Figure 1 is reproduced below.

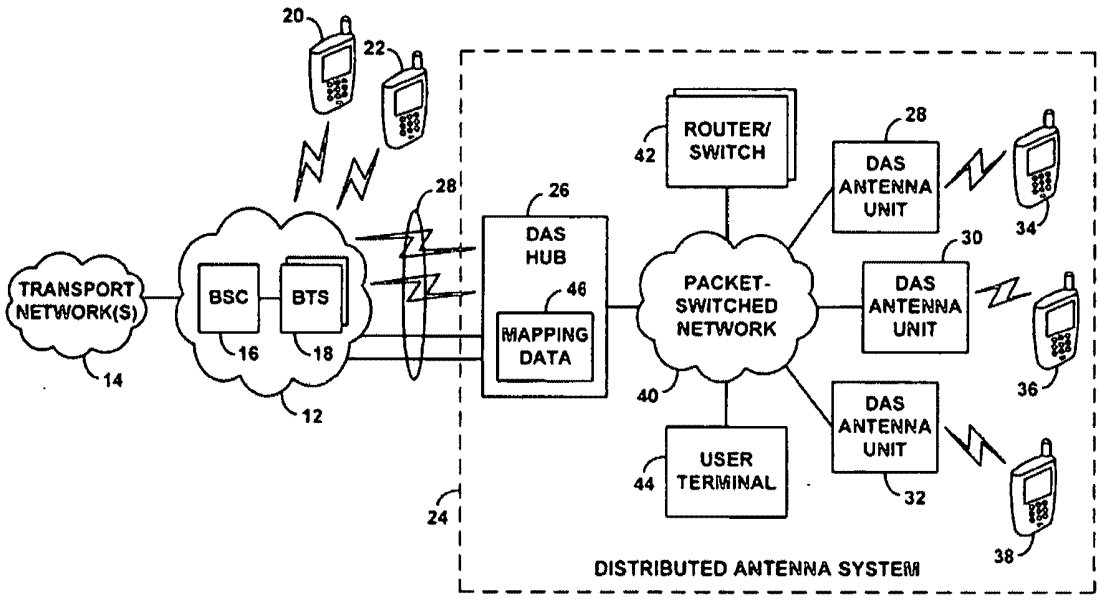


FIG. 1

Figure 1 illustrates a communication system that uses a distributed antenna system ("DAS") 24 to extend coverage of a radio access network ("RAN") 12 into a building, campus, or other designated area. *Id.* at 4:65–5:1. RAN 12 engages in radio frequency ("RF") communications with one or more client devices and provides the client devices with connectivity to one or more transport networks 14. *Id.* at 4:33–38. DAS 24 includes a DAS hub 26, which communicates with RAN 12 and maintains in data storage a set of mapping data 46. *Id.* at 5:1–2, 7:35–37.

Mapping data 46 serves to correlate one or more RAN coverage sections of RAN 12 with one or more IP addresses of the various DAS antenna units in DAS 24, to thereby indicate how DAS hub 26 should

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distribute capacity of RAN 12 among the various zones of the DAS 24. *Id.* at 7:37–42. Using the mapping data in its data storage, DAS hub 26 accordingly routes incoming and outgoing traffic via packet-switched network 40 between RAN 12 and the various DAS antenna units. *Id.* at 9:17–20.

2. Overview of Scheinert

Scheinert describes a distributed antenna communications system and methods of implementing a distributed antenna communications system. Ex. 1013, 1:55–57.

3. Claims 1–12

In its obviousness challenge of claim 1 based on the Oh-Scheinert combination, Petitioner relies on Oh to disclose the "reconfiguring" limitation recited in claim 1. *See* Pet. 46; *see also id.* at 45–46 (discussing Petitioner's assertions regarding the "configuring" limitation recited in claim 1). Petitioner asserts that Oh discloses using a mapping table to add or remove carriers received and transmitted by a remote unit. *Id.* at 44. Petitioner asserts the mapping data can be modified by a system administrator or automatically based on load measurements to change the distribution of capacity by altering the correlations between RAN coverage segment (RF carriers) and remote unit IP addresses. *Id.* at 46 (citing Ex. 1003 ¶¶ 130–131; Ex. 1010, 9:44–10:9, 4:46–60, Fig. 5). Petitioner asserts that when the mapping table is changed to add (or remove) a correlation that did not previously exist, the number of carriers allocated to a remote is increased (or decreased). *Id.*

Patent Owner argues that Oh only provides a DAS hub that routes signals according to stored mapping data and does not discuss configuring or setting any operational aspect of the remote radio unit itself. Prelim. Resp.

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48. Patent Owner argues that the DAS antenna units (which Petitioner asserts discloses the remote radio unit heads) are pass-through devices with static configurations and Oh does not disclose changing or altering any aspect of the DAS antenna units themselves. *Id.* at 49.

We agree with Patent Owner that Petitioner does not establish Oh discloses the "reconfiguring each remote radio unit" limitation. While Oh discloses that configuring and modifying the mapping data alters distribution of RAN coverage among the various DAS antenna units (*see e.g.,* Ex. 1010, 9:44–53), this modification of mapping data used to route traffic does not meet the claim limitation because it does not reconfigure (change) the DAS antenna units themselves. Therefore, we conclude Petitioner does not demonstrate a reasonable likelihood of prevailing in establishing that claim 1 is obvious over Oh and Scheinert.

Petitioner relies on the same disclosure of Oh to teach "reconfiguring each remote radio unit" in its remaining obviousness challenges of claim 1 based on Oh. *See* Pet. 50, 59–60. Accordingly, Petitioner fails to demonstrate a reasonable likelihood of prevailing in establishing claim 1 would have been obvious over the Oh-Scheinert-Sabat '552 combination, or the Oh-Scheinert-Hettstedt-Sabat '552-UMTS Standard combination.

In its obviousness challenges of dependent claims 2–12 based on Oh, Petitioner relies on its analysis of claim 1 to meet the "reconfiguring each remote radio head" limitation and does not set forth any additional analysis or argument regarding this limitation. *See* Pet. 48–60. Accordingly, Petitioner does not demonstrate a reasonable likelihood of prevailing in these challenges.

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E. Challenges Based on Wu

Petitioner contends that claims 1–3 are unpatentable under 35 U.S.C. § 102(e) as anticipated by Wu. Pet. 61–73. Petitioner further contends that claims 1–3 are unpatentable under 35 U.S.C. § 103(a) as obvious over Wu alone or in combination with UMTS Standard. *Id.* at 74–75. Petitioner contends that claims 1–12 are unpatentable under 35 U.S.C. § 103(a) as obvious over Wu, UMTS Standard and Sabat '552, and additionally contends that claims 1–12 are also obvious over Wu, Sabat '552, UMTS, and Sabat '426. *Id.* at 76–87.

1. Overview of Wu

Wu describes an apparatus, system, and method in which a carrier channel distribution system routes individual carrier channels to Remote Transceiver Units ("RTUs"). Ex. 1022, ¶ 11. The carrier channels are routed according to a routing policy that can be reconfigured as desired. *Id.*

Figure 2 of Wu is illustrated below.

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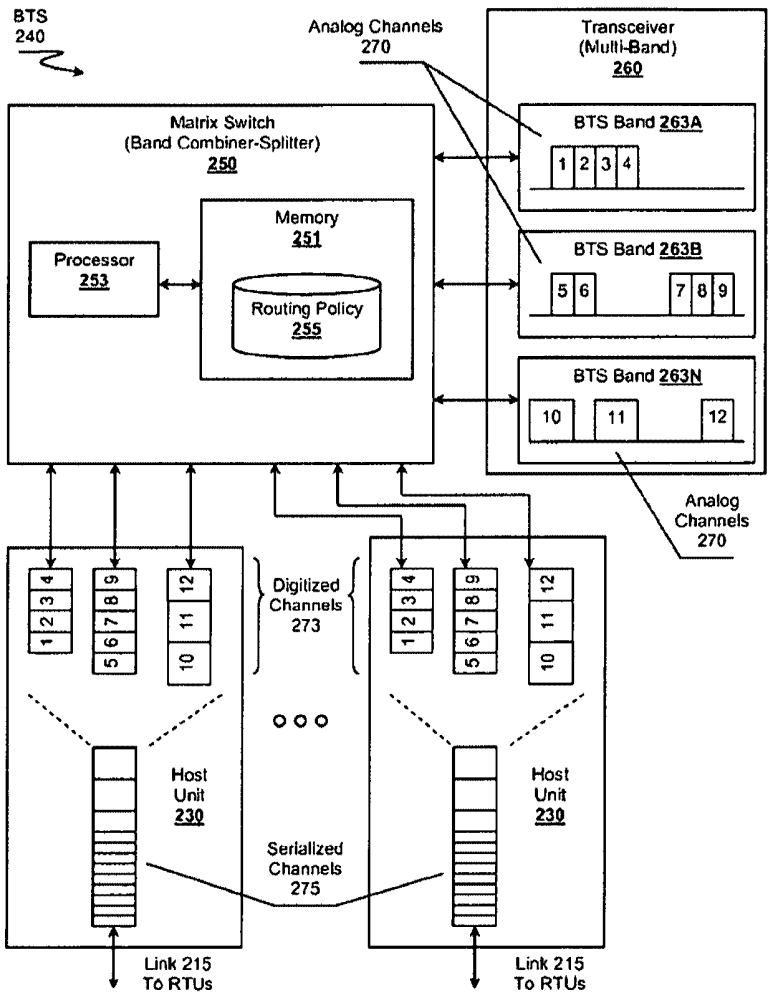


Figure 2

Figure 2 depicts a schematic of a base transceiver station (BTS) 240 having a matrix switch and host units. *Id.* at ¶ 15. BTS 240 includes multi-band transceiver 260, which is configured to receive or to transmit wireless signals within a plurality of bands as represented by bands 263A, 263B, through 263N. *Id.* at ¶¶ 34–35. Each of bands 263 comprises multiple analog channels 270 (band 263A contains channels 1, 2, 3, and 4, band 263B contains channels 5, 6, 7, 8, and 9, and band 263N contains channels 10, 11, and 12). *Id.* at 35. Received channels 1–12 from bands 263 are forwarded

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to matrix switch 250. *Id.* at ¶ 38. Matrix switch 250 routes analog channels 270 to an appropriate host unit 230 according to a policy 255 for distribution to remote regions or RTUs. *Id.* Host units 230 further distribute the channels to RTUs over links 215. *Id.*

2. Overview of Sabat '426

Sabat '426 describes a base station system and method of simulcasting a digital multiplexed signal to and from multiple digital radio heads. Ex. 1021, ¶ 29.

3. Claims 1–12

Petitioner asserts Wu discloses the "reconfiguring each remote radio unit" limitation recited in claim 1. Pet. 71–73. Specifically, Petitioner relies on Wu's description of routing channels to RTUs, using a switch, according to a routing policy, where the routing policy can be updated or reconfigured as desired and the routing policy can redistribute carriers based on metrics that include current traffic load. *Id.* at 71–72 (citing Ex. 1022 ¶¶ 9, 11, 38–47, 49).

Patent Owner argues Wu does not disclose reconfiguring the remote radio units themselves. Prelim. Resp. 62. We agree. In particular, Wu discloses that its switch can route, allocate, or distribute channels based on a routing policy, but does not disclose reconfiguring (changing the configuration of) the RTUs themselves. *See* Ex. 1022 ¶¶ 11, 40, 43–44. Although making changes to a routing policy may increase or decrease the channels available to a RTU, the change in capacity is not done by reconfiguring the RTU. Thus, Wu suffers from the same deficiency as Hettstedt and Oh. Accordingly, we conclude Petitioner does not demonstrate a reasonable likelihood of prevailing in establishing that claim 1 is anticipated by Wu.

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In its remaining obviousness challenges of claim 1 based on Wu, Petitioner relies on the same disclosure of Wu to meet the "reconfiguring each remote radio unit" limitation. *See* Pet. 74–76, 84–87. Petitioner also relies on this analysis in its challenges of dependent claims 2–12. *See id.* at 76–83. Accordingly, Petitioner does not demonstrate a reasonable likelihood of prevailing in establishing that claims 2 and 3 are anticipated by Wu, claims 1–3 would have been obvious over Wu alone or in combination with UMTS Standard, claims 1–12 would have been obvious over the Wu-UMTS Standard-Sabat '552 combination, or that claims 1–12 would have been obvious over the Wu-Sabat '552-UMTS Standard-Sabat '426 combination.

III. CONCLUSION

Petitioner has not demonstrated a reasonable likelihood of prevailing on its challenges to at least one of claims 1–12 of the '338 patent.

IV. ORDER

In view of the foregoing, it is

ORDERED that Petitioner's request for *inter partes* review of claims 1–12 of U.S. Patent 8,682,338 B2 is denied.

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For PETITIONER:

Philip Caspers
Samuel Hamer
CARLSON CASPERS VANDENBURGH & LINDQUIST
pcaspers@ccvl.com
shamer@carlsoncaspers.com

For PATENT OWNER:

David Schumann
Michael Kim
Michael Saunders
FOLIO LAW GROUP PLLC
David.schumann@foliolaw.com
Michael.kim@foliolaw.com
Mike.saunders@foliolaw.com

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PATENT ASSIGNMENT COVER SHEET

Electronic Version v1.1
Stylesheet Version v1.2

EPAS ID: PAT5633990

SUBMISSION TYPE:	NEW ASSIGNMENT
NATURE OF CONVEYANCE:	SECURITY INTEREST

CONVEYING PARTY DATA

Name	Execution Date
DALI WIRELESS, INC.	06/18/2019

RECEIVING PARTY DATA

Name:	DALI RESEARCH (NORTHWIND) LLC
Street Address:	156 WEST 56TH STREET
Internal Address:	9TH FLOOR
City:	NEW YORK
State/Country:	NEW YORK
Postal Code:	10019

PROPERTY NUMBERS Total: 143

Property Type	Number
Application Number:	15251293
Application Number:	13960346
Application Number:	15682431
Application Number:	16059434
Application Number:	10137556
Application Number:	11262079
Application Number:	11799239
Application Number:	11961969
Application Number:	12021241
Application Number:	13211243
Application Number:	13211247
Application Number:	13301224
Application Number:	13404679
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Application Number:	13887133
Application Number:	13913207
Application Number:	14095891
Application Number:	14169719

Property Type	Number
Application Number:	14245190
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Application Number:	13481389
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Application Number:	12603419
Application Number:	13553967
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Property Type	Number
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Application Number:	14553828
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Application Number:	12928933
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Application Number:	16213103
Application Number:	12928931
Application Number:	14337004
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Application Number:	12928943
Application Number:	14020425
Application Number:	14335647
Application Number:	14703579
Application Number:	13211236
Application Number:	14479875
Application Number:	15786396
Application Number:	16406252
Application Number:	16175520
Application Number:	16410860
Application Number:	13602818
Application Number:	14333277
Application Number:	14831626
Application Number:	13625760
Application Number:	14480267
Application Number:	14918371
Application Number:	16279535
Application Number:	13686036
Application Number:	14225673
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Application Number:	13671203
Application Number:	13754702

Property Type	Number
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Application Number:	15445467
Application Number:	16039182
Application Number:	13753288
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Application Number:	15383121
Application Number:	16054678
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Application Number:	14095706
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Application Number:	14257209
Application Number:	15819279

Property Type	Number
Application Number:	14590447
Application Number:	14580585
Application Number:	14621192
Application Number:	16360980
Application Number:	14639418
Application Number:	15090402
Application Number:	15820299
Application Number:	15203015
Application Number:	15358060
Application Number:	15594323

CORRESPONDENCE DATA

Fax Number: (212)586-5095

Correspondence will be sent to the e-mail address first; if that is unsuccessful, it will be sent using a fax number, if provided; if that is unsuccessful, it will be sent via US Mail.

Phone: 2125865800
Email: DFRIEDMAN@CTSWLAW.COM
Correspondent Name: DANIEL J. FRIEDMAN
Address Line 1: 420 LEXINGTON AVENUE
Address Line 2: SUITE 2400
Address Line 4: NEW YORK, NEW YORK 10170

NAME OF SUBMITTER:	DANIEL J. FRIEDMAN
SIGNATURE:	/Daniel J. Friedman/
DATE SIGNED:	07/24/2019
	This document serves as an Oath/Declaration (37 CFR 1.63).

Total Attachments: 42
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PATENT SECURITY AGREEMENT

This Patent Security Agreement, dated as of June 18, 2019 (this "Agreement"), made by Dali Wireless, Inc., a Delaware corporation ("Grantor"), in favor of Dali Research (Northwind) LLC, a Delaware limited liability company (together with its successors and assigns, "Grantee"). Reference is made to that certain Prepaid Forward Purchase Agreement between Buyer and Seller, dated as of the date hereof (as it may be amended from time to time, the "Purchase Agreement").

RECITALS

WHEREAS, the Grantor has an ownership interest in certain Patents set forth on Exhibit A hereto (the "Patents"); and

WHEREAS, the Grantor and Grantee are parties to that certain Security Agreement, of even date herewith (as from time to time amended or supplemented, the "Security Document"); and

WHEREAS, pursuant to the Security Document, Grantor has granted to Grantee a security interest in certain of its assets, including, without limitation, the Patents, to secure the performance of Grantor's obligations under the Security Document and related agreements; and

WHEREAS, it is a condition precedent to Grantee's entry into the Security Document and related agreements that the Grantor execute and deliver this Agreement to Grantee; and

WHEREAS, the Grantor and Grantee by this instrument seek to confirm and make a record of the grant of the security interest in the Patents and the assignment of the Patents upon the occurrence of an Event of Default (as defined below) in accordance with the terms of this Agreement; and

WHEREAS, capitalized terms used and not defined herein have the meanings given to them in the Security Document.

NOW, THEREFORE, for good and valuable consideration, the receipt and adequacy of which are hereby acknowledged, the Grantor hereby agrees, confirms and acknowledges as follows:

1. As collateral security for the payment and performance of the Obligations, Grantor hereby grants and conveys to Grantee a first priority continuing security interest in and lien upon all Patents now owned and hereafter acquired by Grantor and the Proceeds and products thereof. The Grantor does hereby acknowledge and confirm that the Patents, the goodwill associated therewith, and the Proceeds and products thereof constitute Collateral pledged by Grantor to Grantee pursuant to the Security Document.

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2. The Grantor further acknowledges and confirms that the rights and remedies of Grantee with respect to the Patents are more fully set forth in the Security Document, the terms and provisions of which are incorporated herein by reference.

3. The Grantor hereby irrevocably constitutes and appoints Grantee, with full power of substitution, as its true and lawful attorney-in-fact, with full irrevocable power and authority in its place and stead and in its name or otherwise, from time to time in Grantee's sole discretion, at Grantee's sole cost and expense, to take any and all action and to execute and deliver any and all documents and instruments which Grantee may deem reasonably necessary or advisable to (a) accomplish the purposes of perfecting, continuing and preserving, a continuing first priority security interest in the Patents and the goodwill associated therewith in favor of Grantee, and (b) effect a transfer of the Patents and the goodwill associated therewith to Grantee or to Grantee's designees without further consent or authorization of the Grantor upon the occurrence of an Event of Default (as defined in the Security Document) (an "Event of Default"). In furtherance and not in limitation of the foregoing, if an Event of Default has occurred and is continuing, the Grantee is hereby authorized file with the United States Patent and Trademark Office or with such other governmental authorities, the assignment in the form substantially similar to that of Exhibit 1 attached to this Agreement, together with such other instruments and documents as Grantee may deem necessary or appropriate to effectuate the foregoing.

4. Grantee is hereby authorized to file or record this Agreement or any other instrument or documents in such public offices and with such governmental authorities, including the United States Patent and Trademark Office, as Grantee may determine from time to time for the purpose of evidencing the foregoing grant of security.

[REMAINDER OF PAGE INTENTIONALLY LEFT BLANK AND SIGNATURES ON NEXT PAGE]

IN WITNESS WHEREOF, this Patent Security Agreement has been executed and delivered as of the day and year first above written.

GRANTOR

DALI WIRELESS, INC.

By:_____

Name:Albert Lee_____

Title:CEO_____

ACCEPTED AND AGREED:

GRANTEE:

DALI RESEARCH (NORTHWIND) LLC

By_____

Title: Authorized Person

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EX-1013 0037

EXHIBIT 1

ASSIGNMENT OF PATENTS

This **ASSIGNMENT OF PATENTS** (this "Assignment"), dated as of _____ __, 20__, made by **Dali Wireless, Inc.**, a Delaware corporation ("Assignor"), in favor of **Dali Research (Northwind) LLC**, a Delaware limited liability company (together with its successors and assigns, "Grantee" or "Assignee") and the Assignee as set forth below. For good and valuable consideration, the receipt and adequacy of are hereby acknowledged, Assignor hereby assigns to Grantee the Patents set forth on Exhibit A hereto (the "Patents") as follows:

1. Assignment of Patents. Assignor hereby assigns, transfers, and conveys to _____, a _____ with offices at _____ (the "Assignee") all of Assignor's right, title and interest in and to the Patents together with the goodwill associated therewith and the right to sue for past infringement of the Patents.

3. Filing and Recordation. Assignee is hereby authorized to file or record this Assignment or any other instrument in such public offices and with such governmental authorities, including the United States Patent and Trademark Office, as Assignee may determine from time to time for the purpose of evidencing the foregoing assignment.

IN WITNESS WHEREOF, Assignor has executed this Assignment of Patents as of the date first above written.

ASSIGNOR:

DALI WIRELESS, INC.

By:_____

Name:_____

Title:_____

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EX-1013 0038

TITLE	COUNTRY	APPLN. NO.	FILING DATE	PUB NO.	PUB DATE	PATENT NO.	ISSUE DATE	STATUS
SYSTEM AND METHOD FOR DIGITAL MEMORIZED PREDISTORTION FOR WIRELESS COMMUNICATION	United States of America	10/137,556	5/1/02	US 2003-0207680 A1	11/6/03	6,985,704	1/10/06	Issued
SYSTEM AND METHOD FOR DIGITAL MEMORIZED PREDISTORTION FOR WIRELESS COMMUNICATION	United States of America	11/262,079	10/27/05	US 2006-0046665 A1	3/2/06	8,326,238	12/4/12	Issued
SYSTEM AND METHOD FOR DIGITAL MEMORIZED PREDISTORTION FOR WIRELESS COMMUNICATION	United States of America	13/619,538	9/14/12	US-2013-0243124-A1		8,731,495	5/20/14	Issued
SYSTEM AND METHOD FOR DIGITAL MEMORIZED PREDISTORTION FOR WIRELESS COMMUNICATION	United States of America	14/245,190	4/4/14	US-2014-0306762-A1		9,031,521	5/12/15	Issued
SYSTEM AND METHOD FOR DIGITAL MEMORIZED PREDISTORTION FOR WIRELESS COMMUNICATION	United States of America	14/684,678	4/13/15	US-2015-0326349-A1		9,374,196	6/21/16	Issued
SYSTEM AND METHOD FOR DIGITAL MEMORIZED PREDISTORTION FOR WIRELESS COMMUNICATION	United States of America	16/230,750	12/21/18					Pending
HIGH EFFICIENCY LINEARIZATION POWER AMPLIFIER FOR WIRELESS COMMUNICATION	China	200780023875.1	4/30/07	101479956	7/31/13	ZL200780023875.1	7/31/13	Issued
HIGH EFFICIENCY LINEARIZATION POWER AMPLIFIER FOR WIRELESS COMMUNICATION	United States of America	11/799,239	4/30/07	US 2007/0241812 A1		8,064,850	11/22/11	Issued
HIGH EFFICIENCY LINEARIZATION POWER AMPLIFIER FOR WIRELESS COMMUNICATION	United States of America	13/301,224	11/21/11	US-2012-0135695-A1	5/31/12	8,620,234	12/31/13	Issued
HIGH EFFICIENCY LINEARIZATION POWER AMPLIFIER FOR WIRELESS COMMUNICATION	United States of America	14/095,891	12/3/13	US-2014-0179248-A1		9,054,758	6/9/15	Issued
HIGH EFFICIENCY LINEARIZATION POWER AMPLIFIER FOR WIRELESS COMMUNICATION	United States of America	14/691,152	4/20/15	US-2015-0333710-A1		9,742,446	8/22/17	Issued

HIGH EFFICIENCY LINEARIZATION POWER AMPLIFIER FOR WIRELESS COMMUNICATION	United States of America	15/682,431	8/21/17	US-2018-0097530-A1		10,305,521	5/28/19	Issued
HIGH EFFICIENCY LINEARIZATION POWER AMPLIFIER FOR WIRELESS COMMUNICATION	United States of America	16/388,680	4/18/19					Pending
POWER AMPLIFIER PREDISTORTION METHODS AND APPARATUS	United States of America	11/962,025	12/20/07			8,472,897	6/25/13	Issued
POWER AMPLIFIER TIME-DELAY INVARIANT PREDISTORTION METHODS AND APPARATUS	China	200880003130.3	1/28/08	101606315	12/16/09	ZL200880003130.3	7/2/14	Issued
POWER AMPLIFIER TIME-DELAY INVARIANT PREDISTORTION METHODS AND APPARATUS	Macao	J/001490	1/28/08		1/2/15	J/001490	11/13/14	Issued
POWER AMPLIFIER TIME-DELAY INVARIANT PREDISTORTION METHODS AND APPARATUS	United States of America	12/021,241	1/28/08	US 2008-0174365 A1	7/24/08	8,380,143	2/19/13	Issued
POWER AMPLIFIER TIME-DELAY INVARIANT PREDISTORTION METHODS AND APPARATUS	China	201410199319.1	1/28/08	CN 103997301 A	9/28/18	ZL 201410199319.1	9/28/18	Issued
POWER AMPLIFIER TIME-DELAY INVARIANT PREDISTORTION METHODS AND APPARATUS	Hong Kong	14109438.5	9/18/14	1196186A	12/5/14			Published
POWER AMPLIFIER TIME-DELAY INVARIANT PREDISTORTION METHODS AND APPARATUS	Macao	J/001456	7/2/14					Pending
POWER AMPLIFIER TIME-DELAY INVARIANT PREDISTORTION METHODS AND APPARATUS	United States of America	13/724,157	12/21/12	US-2013-0147550-A1		9,077,297	7/7/15	Issued
POWER AMPLIFIER TIME-DELAY INVARIANT PREDISTORTION METHODS AND APPARATUS	United States of America	14/788,567	6/30/15	US-2016-0036394-A1		10,097,142	10/9/18	Issued
POWER AMPLIFIER TIME-DELAY INVARIANT PREDISTORTION METHODS AND APPARATUS	United States of America	16/118,329	8/30/18					Pending
ANALOG POWER AMPLIFIER PREDISTORTION METHODS AND APPARATUS	United States of America	12/203,064	9/2/08	US-2009-0085658-A1		8,693,962	4/8/14	Issued

POWER AMPLIFIER PREDISTORTION METHODS AND APPARATUS USING ENVELOPE AND PHASE DETECTOR	United States of America	12/203,076	9/2/08	US-2009-0096521-A1	4/16/09	8,224,266	7/17/12	Issued
METHOD AND SYSTEM FOR BASEBAND PREDISTORTION LINEARIZATION IN MULTI-CHANNEL WIDEBAND COMMUNICATION SYSTEMS	China	200780051434.2	12/20/07	102017553	10/15/14	ZL200780051434.2	10/15/14	Issued
METHOD AND SYSTEM FOR BASEBAND PREDISTORTION LINEARIZATION IN MULTI-CHANNEL WIDE-BAND COMMUNICATION SYSTEMS	India	4344/CHENP/2009	12/20/07			283900	6/5/17	Issued
METHOD AND SYSTEM FOR BASEBAND PREDISTORTION LINEARIZATION IN MULTI-CHANNEL WIDEBAND COMMUNICATION SYSTEMS	Japan	2009-543544	12/20/07	2010-518660	7/17/13	5236661	4/5/13	Issued
METHOD AND SYSTEM FOR BASED AND PREDISTORITION LEANARIZATION IN MULTI-CHANNEL WIDE-BAND COMMUNICATION SYSTEMS	Macao	J/001620	12/20/07			J/001620	3/10/15	Issued
METHOD AND SYSTEM FOR BASEBAND PREDISTORTION LINEARIZATION IN MULTI-CHANNEL WIDEBAND COMMUNICATION SYSTEMS	United States of America	11/961,969	12/20/07	US 2008/0152037 A1		8,149,950	4/3/12	Issued
METHOD AND SYSTEM FOR BASEBAND PREDISTORTION LINEARIZATION IN MULTI-CHANNEL WIDEBAND COMMUNICATION SYSTEMS	China	201410462933.2	12/20/07	CN 104202279 A				Published
METHOD AND SYSTEM FOR BASEBAND PREDISTORTION LINEARIZATION IN MULTI-CHANNEL WIDEBAND COMMUNICATION SYSTEMS	European Patent Office	18187871.1	12/20/07	3416340				Published

METHOD AND SYSTEM FOR BASEBAND PREDISTORTION LINEARIZATION IN MULTI-CHANNEL WIDEBAND COMMUNICATION SYSTEMS	Hong Kong	15105454.1	12/20/07	1205382A	12/11/15			Published
METHOD AND SYSTEM FOR BASEBAND PREDISTORTION LINEARIZATION IN MULTI-CHANNEL WIDEBAND COMMUNICATION SYSTEMS	United States of America	13/404,679	2/24/12	US-2012-0147993-A1	6/14/12	8,509,347	8/13/13	Issued
METHOD AND SYSTEM FOR BASEBAND PREDISTORTION LINEARIZATION IN MULTI-CHANNEL WIDEBAND COMMUNICATION SYSTEMS	United States of America	13/887,133	5/3/13	US-2013-0315291-A1		8,855,234	10/7/14	Issued
METHOD AND SYSTEM FOR BASEBAND PREDISTORTION LINEARIZATION IN MULTI-CHANNEL WIDEBAND COMMUNICATION SYSTEMS	United States of America	14/480,285	9/8/14	US-2015-0092830-A1		9,246,731	1/26/16	Issued
METHOD AND SYSTEM FOR BASEBAND PREDISTORTION LINEARIZATION IN MULTI-CHANNEL WIDEBAND COMMUNICATION SYSTEMS	United States of America	14/991,264	1/8/16	US-2016-0269210-A1		9,913,194	3/6/18	Issued
METHOD AND SYSTEM FOR BASEBAND PREDISTORTION LINEARIZATION IN MULTI-CHANNEL WIDEBAND COMMUNICATION SYSTEMS	United States of America	15/875,936	1/19/18	US-2018-0279197-A1				Published
DIGITAL HYBRID MODE POWER AMPLIFIER SYSTEM	China	200880021049.8	4/23/08	101720528	6/2/10	ZL200880021049.8	3/19/14	Issued
DIGITAL HYBRID MODE POWER AMPLIFIER SYSTEM	Germany	08746721.3	4/23/08	2143209		60 2008 056 496.7	8/15/18	Issued
DIGITAL HYBRID MODE POWER AMPLIFIER SYSTEM	European Patent Office	08746721.3	4/23/08	2143209	8/15/18	2143209	8/15/18	Issued
DIGITAL HYBRID MODE POWER AMPLIFIER SYSTEM	France	08746721.3	4/23/08	2143209		2143209	8/15/18	Issued
DIGITAL HYBRID MODE POWER AMPLIFIER SYSTEM	United Kingdom	08746721.3	4/23/08	2143209		2143209	8/15/18	Issued
DIGITAL HYBRID MODE POWER AMPLIFIER SYSTEM	India	7544/DELNP/2009	4/23/08	28/2010				Published

DIGITAL HYBRID MODE POWER AMPLIFIER SYSTEM	Japan	2010-506483	4/23/08	2010-525758	7/22/10	5591106	8/8/14	Issued
DIGITAL HYBRID MODE POWER AMPLIFIER SYSTEM	Republic of Korea	10-2009-7024361	4/23/08	10-2010-0017270	3/24/15	10-1503548	3/11/15	Issued
DIGITAL HYBRID MODE POWER AMPLIFIER SYSTEM	Macao	J/001446	4/23/08		9/29/14	J/001446	8/25/14	Issued
DIGITAL HYBRID MODE POWER AMPLIFIER SYSTEM	Netherlands	08746721.3	4/23/08	2143209		2143209	8/15/18	Issued
DIGITAL HYBRID MODE POWER AMPLIFIER SYSTEM	United States of America	12/108,502	4/23/08	US-2008-0265996-A1		8,811,917	8/19/14	Issued
METHOD FOR UPDATING COEFFICENTS OF A PREDISTORTION CIRCUIT AND ADAPTATION CIRCUIT	Republic of Korea	10-2014-7021366	4/23/08		12/22/16	10-1688710	12/15/16	Issued
DIGITAL HYBRID MODE POWER AMPLIFIER SYSTEM	United States of America	14/271,881	5/7/14	US-2014-0327481-A1		9,768,739	9/19/17	Issued
DIGITAL HYBRID MODE POWER AMPLIFIER SYSTEM	United States of America	15/684,580	8/23/17	US-2018-0102747-A1				Published
N-WAY DOHERTY DISTRIBUTED POWER AMPLIFIER	China	200880021149.0	4/23/08	102089966	2/3/16	ZL 2008800211490	2/3/16	Issued
N-WAY DOHERTY DISTRIBUTED POWER AMPLIFIER	Germany	08829011.9	4/23/08	2145385		60 2008 057 483.0	10/17/18	Issued
N-WAY DOHERTY DISTRIBUTED POWER AMPLIFIER	European Patent Office	08829011.9	4/23/08	2145385	10/17/18	2145385	10/17/18	Issued
N-WAY DOHERTY DISTRIBUTED POWER AMPLIFIER	France	08829011.9	4/23/08	2145385		2145385	10/17/18	Issued
N-WAY DOHERTY DISTRIBUTED POWER AMPLIFIER	United Kingdom	08829011.9	4/23/08	2145385		2145385	10/17/18	Issued
N-WAY DOHERTY DISTRIBUTED POWER AMPLIFIER	India	7514/DELNP/2009	4/23/08	27/2010	9/10/18	300878	9/10/18	Issued
N-WAY DOHERTY DISTRIBUTED POWER AMPLIFIER	Japan	2010-504909	4/23/08	2010-530148	4/16/14	5474764	2/14/14	Issued
N-WAY DOHERTY DISTRIBUTED POWER AMPLIFIER	Republic of Korea	10-2009-7024268	4/23/08	10-2010-0017214	1/20/15	10-1484796	1/14/15	Issued
N-WAY DOHERTY DISTRIBUTED POWER AMPLIFIER	Macao	J/002140	4/23/08		9/13/16	J/002140	8/9/16	Issued
N-WAY DOHERTY DISTRIBUTED POWER AMPLIFIER	Netherlands	08829011.9	4/23/08	2145385		2145385	10/17/18	Issued
N-WAY DOHERTY DISTRIBUTED POWER AMPLIFIER	United States of America	12/108,507	4/23/08	US 2008-0284509 A1	11/20/08	7,688,135	3/30/10	Issued
BASEBAND-DERIVED RF DIGITAL PREDISTORTION	China	200880126324.2	12/8/08	102150361	11/9/16	ZL 2008801263242	11/9/16	Issued

BASEBAND-DERIVED RF DIGITAL PREDISTORTION	European Patent Office	08873193.0	12/8/08	2248255				Published
BASEBAND-DERIVED RF DIGITAL PREDISTORTION	India	4196/CHENP/2010	12/8/08	01/2011				Published
BASEBAND-DERIVED RF DIGITAL PREDISTORTION	Japan	2010-536550	12/8/08	2011-511493	7/31/13	5250636	4/19/13	Issued
BASEBAND-DERIVED WIDEBAND RF DIGITAL PREDISTORTION SYSTEM	Republic of Korea	10-2010-7015019	12/8/08	10-2010-0108546	10/25/16	10-1669173	10/19/16	Issued
BASEBAND-DERIVED RF DIGITAL PREDISTORTION	Macao	J/002468	12/8/08		5/4/17	J/002468	4/11/17	Issued
BASEBAND-DERIVED RF DIGITAL PREDISTORTION	United States of America	12/330,451	12/8/08	US 2009-0146736 A1		8,213,884	7/3/12	Issued
BASEBAND-DERIVED RF DIGITAL PREDISTORTION	United States of America	13/481,389	5/25/12	US-2012-0230382-A1	9/13/12	8,401,499	3/19/13	Issued
BASEBAND-DERIVED RF DIGITAL PREDISTORTION	United States of America	13/776,163	2/25/13	US-2013-0214861-A1		8,548,403	10/1/13	Issued
REMOTELY RECONFIGURABLE POWER AMPLIFIER SYSTEM AND METHOD	China	201080025887.X	4/26/10	CN 102460385 A	5/16/12	ZL201080025887X	3/2/16	Issued
REMOTELY RECONFIGURABLE POWER AMPLIFIER SYSTEM AND METHOD	European Patent Office	10767899.7	4/26/10	2 430 531	3/21/12			Allowed
REMOTELY RECONFIGURABLE POWER AMPLIFIER SYSTEM AND METHOD	Indonesia	W-00 2012 01448	4/26/10		12/19/17	ID P 000 048 875	12/19/17	Issued
REMOTELY RECONFIGURABLE POWER AMPLIFIER SYSTEM AND METHOD	India	8527/CHENP/2011	4/26/10	8527/CHENP/2011				Published
REMOTELY RECONFIGURABLE POWER AMPLIFIER SYSTEM AND METHOD	Republic of Korea	10-2011-7027891	4/26/10			10-1967471	4/3/19	Issued
REMOTELY RECONFIGURABLE POWER AMPLIFIER SYSTEM AND METHOD	Macao	J/002198	4/26/10		10/17/16	J/002198	9/12/16	Issued
REMOTELY RECONFIGURABLE POWER AMPLIFIER SYSTEM AND METHOD	United States of America	12/767,669	4/26/10	US 2010-0271957 A1	10/28/10	9,026,067	5/5/15	Issued
REMOTELY RECONFIGURABLE POWER AMPLIFIER SYSTEM AND METHOD	Japan	2015-178686	4/26/10					Pending

REMOTELY RECONFIGURABLE POWER AMPLIFIER SYSTEM AND METHOD	Japan	2017-253609	4/26/10					Pending
N-WAY DOHERTY DISTRIBUTED POWER AMPLIFIER WITH POWER TRACKING	United States of America	12/603,419	10/21/09	US-2010-0176885-A1	7/15/10	8,274,332	9/25/12	Issued
N-WAY DOHERTY DISTRIBUTED POWER AMPLIFIER WITH POWER TRACKING	United States of America	13/553,967	7/20/12	US-2013-0009707-A1	1/10/13	8,618,883	12/31/13	Issued
N-WAY DOHERTY DISTRIBUTED POWER AMPLIFIER WITH POWER TRACKING	United States of America	14/087,682	11/22/13	US-2014-0191805-A1		9,184,703	11/10/15	Issued
N-WAY DOHERTY DISTRIBUTED POWER AMPLIFIER WITH POWER TRACKING	United States of America	14/885,890	10/16/15	US-2016-0173040-A1		10,298,177	5/21/19	Issued
MULTI-BAND WIDEBAND POWER AMPLIFIER DIGITAL PREDISTORTION SYSTEM AND METHOD	China	201080064338.3	12/21/10	CN 102939716A		ZL 201080064338.3	2/3/16	Issued
MULTI-BAND WIDEBAND POWER AMPLIFIER DIGITAL PREDISTORTION SYSTEM AND METHOD	Macao	J/2106	12/21/10			J/002106	7/29/16	Issued
MULTI-BAND WIDEBAND POWER AMPLIFIER DIGITAL PREDISTORITION SYSTEM AND METHOD	United States of America	12/928,934	12/21/10	US-2012-0154038-A1	6/21/12	8,351,877	1/8/13	Issued
DIGITAL PREDISTORTION SYSTEM AND METHOD FOR AMPLIFYING SIGNALS	China	201610003690.5	12/21/10	CN 105634415A	3/8/19	ZL 201610003690.5	3/8/19	Issued
A MULTI-BAND DIGITAL PREDISTORTION SYSTEM AND A METHOD FOR AMPLIFYING SIGNALS	Hong Kong	16112532.2	12/21/10	1224439A	8/18/17			Published
DIGITAL PREDISTORTION SYSTEM AND METHOD FOR AMPLIFYING SIGNALS	Macao	J/3685	12/21/10					Pending
MULTI-BAND WIDE BAND POWER AMPLIFIER DIGITAL PREDISTORTION SYSTEM	United States of America	13/705,022	12/4/12	US-2013-0094612-A1		8,467,747	6/18/13	Issued

MULTI-BAND WIDE BAND POWER AMPLIFIER DIGITAL PREDISTORTION SYSTEM	United States of America	13/894,987	5/15/13	US-2013-0251066-A1		8,903,337	12/2/14	Issued
MULTI-BAND WIDE BAND POWER AMPLIFIER DIGITAL PREDISTORTION SYSTEM	United States of America	14/553,828	11/25/14	US-2015-0171899-A1		9,379,745	6/28/16	Issued
MULTI-BAND WIDE BAND POWER AMPLIFIER DIGITAL PREDISTORTION SYSTEM	United States of America	15/181,033	6/13/16	US-2017-0047952-A1				Published
REMOTE RADIO HEAD UNIT WITH WIDEBAND POWER AMPLIFIER AND METHOD	China	201080064329.4	12/21/10	CN 102948081A	6/1/16	ZL 201080064329.4	6/1/16	Issued
REMOTE RADIO HEAD UNIT WITH WIDEBAND POWER AMPLIFIER AND METHOD	Macao	J/2296	12/21/10			J/002296	12/14/16	Issued
REMOTE RADIO HEAD UNIT SYSTEM WITH WIDEBAND POWER AMPLIFIER AND METHOD	United States of America	12/928,933	12/21/10	US 2011-0158081 A1		8,730,786	5/20/14	Issued
SYSTEM FOR IMPROVING ISOLATION BETWEEN TRANSMITTERS AND RECEIVERS	Hong Kong	17103802.3	12/21/10	1230352A	12/1/17			Published
REMOTE RADIO HEAD UNIT SYSTEM WITH WIDEBAND POWER AMPLIFIER AND METHOD	United States of America	14/248,597	4/9/14	US-2014-0219174-A1		9,106,453	8/11/15	Issued
REMOTE RADIO HEAD UNIT SYSTEM WITH WIDEBAND POWER AMPLIFIER	United States of America	14/754,908	6/30/15	US-2015-0382363-A1		9,814,053	11/7/17	Issued
REMOTE RADIO HEAD UNIT SYSTEM WITH WIDEBAND POWER AMPLIFIER	United States of America	15/718,469	9/28/17	US-2018-0152947-A1		10,153,789	12/11/18	Issued
REMOTE RADIO HEAD UNIT SYSTEM WITH WIDEBAND POWER AMPLIFIER	United States of America	16/213,103	12/7/18					Pending
MODULATION AGNOSTIC DIGITAL HYBRID MODE POWER AMPLIFIER SYSTEM AND METHOD	China	201080064414.0	12/21/10	CN 102948071A		ZL 201080064414.0	6/22/16	Issued
MODULATION AGNOSTIC DIGITAL HYBRID MODE POWER AMPLIFIER SYSTEM AND METHOD	Germany	10838778.8	12/21/10	2517353	10/31/12	60 2010 032 691.8	4/20/16	Issued
MODULATION AGNOSTIC DIGITAL HYBRID MODE POWER AMPLIFIER SYSTEM AND METHOD	European Patent Office	10838778.8	12/21/10	2517353	10/31/12	2517353	4/20/16	Issued

MODULATION AGNOSTIC DIGITAL HYBRID MODE POWER AMPLIFIER SYSTEM AND METHOD	United Kingdom	10838778.8	12/21/10	2517353	10/31/12	2517353	4/20/16	Issued
MODULATION AGNOSTIC DIGITAL HYBRID MODE POWER AMPLIFIER SYSTEM AND METHOD	Indonesia	W00201202630	12/21/10	2014/04399	5/17/18	IDP000051138	5/17/18	Issued
MODULATION AGNOSTIC DIGITAL HYBRID MODE POWER AMPLIFIER SYSTEM AND METHOD	India	6164/CHENP/2012	12/21/10	2012CN06164				Published
MODULATION AGNOSTIC DIGITAL HYBRID MODE POWER AMPLIFIER SYSTEM AND METHOD	Japan	2012-545469	12/21/10	2013-515423		5761646	6/19/15	Issued
MODULATION AGNOSTIC DIGITAL HYBRID MODE POWER AMPLIFIER SYSTEM AND METHOD	Republic of Korea	10-2012-7019385	12/21/10			10-1815329	12/28/17	Issued
MODULATION AGNOSTIC DIGITAL HYBRID MODE POWER AMPLIFIER SYSTEM AND METHOD	Macao	J/2312	12/21/10			J/002312	1/4/17	Issued
MODULATION AGNOSTIC DIGITAL HYBRID MODE POWER AMPLIFIER SYSTEM AND METHOD	United States of America	12/928,931	12/21/10	US-2011-0156815-A1		8,804,870	8/12/14	Issued
MODULATION AGNOSTIC DIGITAL HYBRID MODE POWER AMPLIFIER SYSTEM AND METHOD	European Patent Office	16166094.9	12/21/10	3068047				Published
MODULATION AGNOSTIC DIGITAL HYBRID MODE POWER AMPLIFIER SYSTEM AND METHOD	Hong Kong	17101974.9	12/21/10	1228604A	11/3/17			Published
MODULATION AGNOSTIC DIGITAL HYBRID MODE POWER AMPLIFIER SYSTEM AND METHOD	Indonesia	P00201803072	12/21/10					Pending
MODULATION AGNOSTIC DIGITAL HYBRID MODE POWER AMPLIFIER SYSTEM AND METHOD	United States of America	14/337,004	7/21/14	US-2015-0010110-A1		9,866,414	1/9/18	Issued
MODULATION AGNOSTIC DIGITAL HYBRID MODE POWER AMPLIFIER SYSTEM AND METHOD	United States of America	15/827,794	11/30/17	US-2018-0227152-A1				Published
HIGH EFFICIENCY, REMOTELY RECONFIGURABLE REMOTE RADIO HEAD UNIT SYSTEM AND METHOD FOR WIRELESS COMMUNICATIONS	China	201080064443.7	12/21/10	CN 102870494A	4/20/16	ZL 201080064443.7	4/20/16	Issued

HIGH EFFICIENCY, REMOTELY RECONFIGURABLE REMOTE RADIO HEAD UNIT SYSTEM AND METHOD FOR WIRELESS COMMUNICATIONS	Germany	10848623.4	12/21/10	2524568	11/21/12	60 2010 036 118.7	8/31/16	Issued
HIGH EFFICIENCY, REMOTELY RECONFIGURABLE REMOTE RADIO HEAD UNIT SYSTEM AND METHOD FOR WIRELESS COMMUNICATIONS	European Patent Office	10848623.4	12/21/10	2524568	8/31/16	2524568	8/31/16	Issued
HIGH EFFICIENCY, REMOTELY RECONFIGURABLE REMOTE RADIO HEAD UNIT SYSTEM AND METHOD FOR WIRELESS COMMUNICATIONS	France	10848623.4	12/21/10	2524568	11/21/12	2524568	8/31/16	Issued
HIGH EFFICIENCY, REMOTELY RECONFIGURABLE REMOTE RADIO HEAD UNIT SYSTEM AND METHOD FOR WIRELESS COMMUNICATIONS	United Kingdom	10848623.4	12/21/10	2524568	11/21/12	2524568	8/31/16	Issued
HIGH EFFICIENCY, REMOTELY RECONFIGURABLE REMOTE RADIO HEAD UNIT SYSTEM AND METHOD FOR WIRELESS COMMUNICATIONS	Indonesia	W00201202631	12/21/10	2013/00167 A	3/21/16	IDP000040 655	3/21/16	Issued
HIGH EFFICIENCY REMOTELY RECONFIGURABLE REMOTE RADIO HEAD UNIT SYSTEM AND METHOD FOR WIRELESS COMMUNICATIONS	India	6163/CHENP/2012	12/21/10	2012CN06163				Published
HIGH EFFICIENCY, REMOTELY RECONFIGURABLE REMOTE RADIO HEAD UNIT SYSTEM AND METHOD FOR WIRELESS COMMUNICATIONS	Japan	2012-545471	12/21/10	2013-515424		5744910	5/15/15	Issued
HIGH EFFICIENCY, REMOTELY RECONFIGURABLE REMOTE RADIO HEAD UNIT SYSTEM FOR WIRELESS COMMUNICATIONS	Republic of Korea	10-2012-7019387	12/21/10			10-1763970	7/26/17	Issued

HIGH EFFICIENCY, REMOTELY RECONFIGURABLE REMOTE RADIO HEAD UNIT SYSTEM AND METHOD FOR WIRELESS COMMUNICATIONS	Macao	J/2206	12/21/10			J/002206	10/18/16	Issued
HIGH EFFICIENCY, REMOTELY RECONFIGURABLE REMOTE RADIO HEAD UNIT SYSTEM AND METHOD FOR WIRELESS COMMUNICATIONS	United States of America	12/928,943	12/21/10	US-2012-0155572-A1	6/21/12	8,542,768	9/24/13	Issued
HIGH EFFICIENCY, REMOTELY RECONFIGURABLE REMOTE RADIO HEAD UNIT SYSTEM AND METHOD FOR WIRELESS COMMUNICATIONS	Germany	16181745.7	12/21/10	3110231		60 2010 050 454.9	5/2/18	Issued
HIGH EFFICIENCY, REMOTELY RECONFIGURABLE REMOTE RADIO HEAD UNIT SYSTEM AND METHOD FOR WIRELESS COMMUNICATIONS	European Patent Office	16181745.7	12/21/10	3110231	5/2/18	3110231	5/2/18	Issued
HIGH EFFICIENCY, REMOTELY RECONFIGURABLE REMOTE RADIO HEAD UNIT SYSTEM AND METHOD FOR WIRELESS COMMUNICATIONS	France	16181745.7	12/21/10	3110231		3110231	5/2/18	Issued
HIGH EFFICIENCY, REMOTELY RECONFIGURABLE REMOTE RADIO HEAD UNIT SYSTEM AND METHOD FOR WIRELESS COMMUNICATIONS	United Kingdom	16181745.7	12/21/10	3110231		3110231	5/2/18	Issued
HIGH EFFICIENCY, REMOTELY RECONFIGURABLE REMOTE RADIO HEAD UNIT SYSTEM AND METHOD FOR WIRELESS COMMUNICATIONS	Hong Kong	17105876.9	12/21/10	1232372A	1/18/19	1232372B	1/18/19	Issued
HIGH EFFICIENCY, REMOTELY RECONFIGURABLE REMOTE RADIO HEAD UNIT SYSTEM AND METHOD FOR WIRELESS COMMUNICATIONS	Netherlands	16181745.7	12/21/10	3110231		3110231	5/2/18	Issued

HIGH EFFICIENCY, REMOTELY RECONFIGURABLE REMOTE RADIO HEAD UNIT SYSTEM AND METHOD FOR WIRELESS COMMUNICATIONS	United States of America	14/020,425	9/6/13	US-2014-0079153-A1		8,824,595	9/2/14	Issued
HIGH EFFICIENCY, REMOTELY RECONFIGURABLE REMOTE RADIO HEAD UNIT SYSTEM AND METHOD FOR WIRELESS COMMUNICATIONS	United States of America	14/335,647	7/18/14	US-2015-0080054-A1		9,048,797	6/2/15	Issued
HIGH EFFICIENCY, REMOTELY RECONFIGURABLE REMOTE RADIO HEAD UNIT SYSTEM AND METHOD FOR WIRELESS COMMUNICATIONS	United States of America	14/703,579	5/4/15	US-2015-0381217-A1		9,948,332	4/17/18	Issued
NEUTRAL HOST ARCHITECTURE FOR A DISTRIBUTED ANTENNA SYSTEM	China	201180050053.9	8/16/11	CN 103180844 A	10/3/17	ZL 201180050053.9	10/3/17	Issued
NEUTRAL HOST ARCHITECTURE FOR A DISTRIBUTED ANTENNA SYSTEM	European Patent Office	11818694.9	8/16/11	2606435				Published
NEUTRAL HOST ARCHITECTURE FOR A DISTRIBUTED ANTENNA SYSTEM	Indonesia	W00 201300982	8/16/11	2014/01150		IDP000048511	11/9/17	Issued
NEUTRAL HOST ARCHITECTURE FOR A DISTRIBUTED ANTENNA SYSTEM	India	1764/CHENP/2013	8/16/11					Published
NEUTRAL HOST ARCHITECTURE FOR A DISTRIBUTED ANTENNA SYSTEM	Japan	2013-524941	8/16/11	2013-541255		5911149	4/8/16	Issued
NEUTRAL HOST ARCHITECTURE FOR A DISTRIBUTED ANTENNA SYSTEM	Republic of Korea	10-2013-7006774	8/16/11			10-1662879	9/28/16	Issued
NEUTRAL HOST ARCHITECTURE FOR A DISTRIBUTED ANTENNA SYSTEM	Macao	J/2833	8/16/11			J/002833	2/15/18	Issued
NEUTRAL HOST ARCHITECTURE FOR A DISTRIBUTED ANTENNA SYSTEM	United States of America	13/211,236	8/16/11	US-2012-0069880-A1		8,848,766	9/30/14	Issued
NEUTRAL HOST ARCHITECTURE FOR A DISTRIBUTED ANTENNA SYSTEM	China	201710791641.7	8/16/11	CN 107682021A				Published

REMOTELY RECONFIGURABLE REMOTE RADIO HEAD UNIT	Hong Kong	18109794.9	8/16/11	1250427A	12/14/18			Published
NEUTRAL HOST ARCHITECTURE FOR A DISTRIBUTED ANTENNA SYSTEM	Republic of Korea	10-2016-7026899	8/16/11			10-1835254	2/27/18	Issued
NEUTRAL HOST ARCHITECTURE FOR A DISTRIBUTED ANTENNA SYSTEM	United States of America	14/479,875	9/8/14	US-2015-0055593-A1		9,826,508	11/21/17	Issued
NEUTRAL HOST ARCHITECTURE FOR A DISTRIBUTED ANTENNA SYSTEM	United States of America	15/786,396	10/17/17	US-2018-0184404-A1				Allowed
NEUTRAL HOST ARCHITECTURE FOR A DISTRIBUTED ANTENNA SYSTEM	United States of America	16/406,252	5/8/19					Pending
REMOTELY RECONFIGURABLE DISTRIBUTED ANTENNA SYSTEM AND METHODS	China	201180050052.4	8/16/11	CN 103597807A		ZL 201180050052.4	9/30/15	Issued
REMOTELY CONFIGURABLE DISTRIBUTED ANTENNA SYSTEM AND METHODS	European Patent Office	11818695.6	8/16/11	2606571				Published
REMOTELY RECONFIGURABLE DISTRIBUTED ANTENNA SYSTEM AND METHODS	Hong Kong	14106888.6	8/16/11	1193522A	8/12/16	HK1193522	8/12/16	Issued
REMOTELY RECONFIGURABLE DISTRIBUTED ANTENNA SYSTEM AND METHODS	Indonesia	W00 201300983	8/16/11	2015/05508				Published
REMOTELY RECONFIGURABLE DISTRIBUTED ANTENNA SYSTEM AND METHODS	India	1763/CHENP/2013	8/16/11					Published
REMOTELY RECONFIGURABLE DISTRIBUTED ANTENNA SYSTEM AND METHODS	Japan	2013-524942	8/16/11	2014-500635		5859538	12/25/15	Issued
REMOTELY RECONFIGURABLE DISTRIBUTED ANTENNA SYSTEM AND METHODS	Republic of Korea	10-2013-7006776	8/16/11			10-1610447	4/1/16	Issued
REMOTELY RECONFIGURABLE DISTRIBUTED ANTENNA SYSTEM AND METHODS	Macao	J/1934	8/16/11			J/001934	3/23/16	Issued
REMOTELY RECONFIGURABLE DISTRIBUTED ANTENNA SYSTEM AND METHODS	United States of America	13/211,243	8/16/11	US-2012-0039320-A1		8,682,338	3/25/14	Issued

SYSTEM FOR TRANSMITTING SIGNALS AND DISTRIBUTED ANTENNA SYSTEM	China	201510502030.7	8/16/11	CN 105208083A	9/21/18	ZL 201510502030.7	9/21/18	Issued
SYSTEM FOR TRANSMITTING SIGNALS AND DISTRIBUTED ANTENNA SYSTEM	Hong Kong	16105628.1	8/16/11	1217583A	1/13/17			Published
REMOTELY RECONFIGURABLE DISTRIBUTED ANTENNA SYSTEM AND METHODS	Japan	2018-124665	8/16/11					Pending
REMOTELY RECONFIGURABLE DISTRIBUTED ANTENNA SYSTEM AND METHODS	Macao	J/3488	8/16/11					Pending
REMOTELY RECONFIGUREABLE DISTRIBUTED ANTENNA SYSTEM AND METHODS	United States of America	14/169,719	1/31/14	US-2014-0286247-A1		9,419,714	8/16/16	Issued
A METHOD OF OPERATING A DISTRIBUTED ANTENNA SYSTEM AND A METHOD OF COMMUNICATING IN THE SYSTEM	China	201510531485.1	8/16/11	CN 105141513A	12/14/18	ZL 201510531485.1	12/14/18	Issued
METHOD FOR OPERATING A DISTRIBUTED ANTENNA SYSTEM AND METHOD OF COMMUNICATING IN THE SYSTEM	Hong Kong	16105230.1	8/16/11	1217385A	1/6/17			Published
REMOTELY RECONFIGURABLE DISTRIBUTED ANTENNA SYSTEM AND METHODS	Japan	2015-245373	8/16/11			6144327	5/19/17	Issued
REMOTELY RECONFIGURABLE DISTRIBUTED ANTENNA SYSTEM AND METHODS	Republic of Korea	10-2015-7024302	8/16/11			10-1829517	2/8/18	Issued
A METHOD OF OPERATING A DISTRIBUTED ANTENNA SYSTEM AND A METHOD OF COMMUNICATING IN THE SYSTEM	Macao	J/3540	8/16/11					Pending
REMOTELY RECONFIGURABLE DISTRIBUTED ANTENNA SYSTEM AND METHODS	United States of America	14/949,405	11/23/15	US-2016-0080082-A1		9,531,473	12/27/16	Issued
REMOTELY RECONFIGURABLE DISTRIBUTED ANTENNA SYSTEM AND METHODS	Japan	2017-094314	8/16/11		7/25/18	6364109	7/6/18	Issued

REMOTELY RECONFIGURABLE DISTRIBUTED ANTENNA SYSTEM AND METHODS	Republic of Korea	10-2018-7003797	8/16/11	20180017234				Published
REMOTELY RECONFIGURABLE DISTRIBUTED ANTENNA SYSTEM AND METHODS	United States of America	15/205,820	7/8/16	US-2017-0070897-A1		9,820,171	11/14/17	Issued
REMOTELY RECONFIGURABLE DISTRIBUTED ANTENNA SYSTEM AND METHODS	United States of America	15/391,408	12/27/16	US-2017-0238318-A1		10,159,074	12/18/18	Issued
REMOTELY RECONFIGURABLE DISTRIBUTED ANTENNA SYSTEM AND METHODS	United States of America	16/175,520	10/30/18					Pending
DAISY-CHAINED RING OF REMOTE UNITS FOR A DISTRIBUTED ANTENNA SYSTEM	China	201180050066.6	8/16/11	CN 103201958A	1/18/17	ZL 201180050066.6	1/18/17	Issued
DAISY-CHAINED RING OF REMOTE UNITS FOR A DISTRIBUTED ANTENNA SYSTEM	European Patent Office	11818697.2	8/16/11	2606576				Published
DAISY-CHAINED RING OF REMOTE UNITS FOR A DISTRIBUTED ANTENNA SYSTEM	Indonesia	W00 201300670	8/16/11					Pending
DAISY CHAINED RING OF REMOTE UNITS FOR A DISTRIBUTED ANTENNA SYSTEM	India	1856/CHENP/2013	8/16/11					Published
DAISY CHAINED RING OF REMOTE UNITS FOR A DISTRIBUTED ANTENNA SYSTEM	Japan	2013-525983	8/16/11	2013-541875		6005646	9/16/16	Issued
DAISY-CHAINED RING OF REMOTE UNITS FOR A DISTRIDUTED ANTENNA SYSTEM	Republic of Korea	10-2013-7006775	8/16/11			10-1874655	6/28/18	Issued
DAISY-CHAINED RING OF REMOTE UNITS FOR A DISTRIBUTED ANTENNA SYSTEM	Macao	J/2551	8/16/11			J/002551	6/9/17	Issued
DAISY-CHAINED RING OF REMOTE UNITS FOR A DISTRIBUTED ANTENNA SYSTEM	United States of America	13/211,247	8/16/11	US-2012-0039254-A1		8,737,300	5/27/14	Issued
DAISY-CHAINED RING OF REMOTE UNITS FOR A DISTRIBUTED ANTENNA SYSTEM	United States of America	13/913,207	6/7/13	US-2013-0272202-A1		9,148,324	9/29/15	Issued
DAISY-CHAINED RING OF REMOTE UNITS	China	201611139142.1	8/16/11	CN 106921549A				Published

DAISY-CHAINED RING OF REMOTE UNITS	Hong Kong	17112719.6	8/16/11	1238815A	5/4/18			Published
DAISY-CHAINED RING OF REMOTE UNITS	Macao							Unfiled
DAISY-CHAINED RING OF REMOTE UNITS FOR A DISTRIBUTED ANTENNA SYSTEM	United States of America	14/260,145	4/23/14	US-2014-0313884-A1		9,137,078	9/15/15	Issued
A METHOD OF COMMUNICATING IN A DISTRIBUTED ANTENNA SYSTEM	China	201610011597.9	8/16/11	CN105634585A				Allowed
A METHOD OF COMMUNICATING IN A DISTRIBUTED ANTENNA SYSTEM	Hong Kong	16112531.3	8/16/11	1224444A	8/18/17			Published
A METHOD AND SYSTEM FOR ROUTING AND SWITCHING SIGNALS	Indonesia	P00201801237	8/16/11					Pending
DAISY-CHAINED RING OF REMOTE UNITS FOR A DISTRIBUTED ANTENNA SYSTEM	Japan	2016-139702	8/16/11			6405342	9/21/18	Issued
A METHOD OF COMMUNICATING IN A DISTRIBUTED ANTENNA SYSTEM	Macao							Unfiled
DISTRIBUTED ANTENNA SYSTEM	United States of America	14/800,515	7/15/15	US-2016-0014782-A1		9,419,837	8/16/16	Issued
TRANSPORT OF WIRELESS COMMUNICATIONS	China	201611138820.2	8/16/11	CN 106850735A				Published
WIRELESS COMMUNICATION TRANSMISSION	Hong Kong	17111546.7	8/16/11	1238016A	4/20/18			Published
DAISY-CHAINED RING OF REMOTE UNITS FOR A DISTRIBUTED ANTENNA SYSTEM	Indonesia	P00201703225	8/16/11	2018/00031				Published
DAISY-CHAINED RING OF REMOTE UNITS FOR A DISTRIBUTED ANTENNA SYSTEM	Japan	2016-174930	8/16/11			6463707	1/11/19	Issued
DAISY-CHAINED RING OF REMOTE UNITS FOR A DISTRIBUTED ANTENNA SYSTEM	Republic of Korea	10-2018-7018518	8/16/11	20180078335		10-1947975	2/7/19	Issued
TRANSPORT OF WIRELESS COMMUNICATIONS	Macao							Unfiled
DISTRIBUTED ANTENNA SYSTEM	United States of America	15/223,819	7/29/16	US-2017-0055198-A1		10,080,178	9/18/18	Issued

DIGITAL REMOTE UNITS IN A DISTRIBUTED ANTENNA SYSTEM	China	201611138760.4	8/16/11	CN 107018055A				Published
DIGITAL REMOTE UNIT IN DISTRIBUTED ANTENNA SYSTEM	Hong Kong	17113376.8	8/16/11	1239987A	5/11/18			Published
DAISY-CHAINED RING OF REMOTE UNITS FOR A DISTRIBUTED ANTENNA SYSTEM	Japan	2019-000096	8/16/11					Pending
DAISY-CHAINED RING OF REMOTE UNITS FOR A DISTRIBUTED ANTENNA SYSTEM	Republic of Korea	10-2019-7003593	8/16/11	20190015636				Published
DIGITAL REMOTE UNITS IN A DISTRIBUTED ANTENNA SYSTEM	Macao							Unfiled
DISTRIBUTED ANTENNA SYSTEM	United States of America	16/059,434	8/9/18	US-2019-0110239-A1				Allowed
TRANSPORT OF WIRELESS COMMUNICATIONS	China	201611139152.5	8/16/11	CN 107104869A				Published
WIRELESS COMMUNICATION TRANSMISSION	Hong Kong	18100385.3	8/16/11	1241165A	6/1/18			Published
TRANSPORT OF WIRELESS COMMUNICATIONS	Macao							Unfiled
DISTRIBUTED ANTENNA SYSTEM	United States of America	16/410,860	5/13/19					Pending
SOFTWARE CONFIGURABLE DISTRIBUTED ANTENNA SYSTEM AND METHOD FOR REDUCING UPLINK NOISE	China	201280042828.2	9/4/12	CN 103999436A	8/24/16	ZL 201280042828.2	8/24/16	Issued
SOFTWARE CONFIGURABLE DISTRIBUTED ANTENNA SYSTEM AND METHOD FOR REDUCING UPLINK NOISE	European Patent Office	12827424.8	9/4/12	2749123				Published
SOFTWARE CONFIGURABLE DISTRIBUTED ANTENNA SYSTEM AND METHOD FOR REDUCING UPLINK NOISE	Hong Kong	15101013.4	9/4/12	1200622A	10/20/17	HK1200622	10/20/17	Issued
SOFTWARE CONFIGURABLE DISTRIBUTED ANTENNA SYSTEM AND METHOD FOR REDUCING UPLINK NOISE	Macao	J/2359	9/4/12			J/002359	2/14/17	Issued
SOFTWARE CONFIGURABLE DISTRIBUTED ANTENNA SYSTEM AND METHOD FOR REDUCING UPLINK NOISE	United States of America	13/602,818	9/4/12	US-2014-0072064-A1		8,817,848	8/26/14	Issued

SOFTWARE CONFIGURABLE DISTRIBUTED ANTENNA SYSTEM AND METHOD FOR REDUCING UPLINK NOISE	United States of America	14/333,277	7/16/14	US-2015-0078471-A1		9,148,203	9/29/15	Issued
SOFTWARE CONFIGURABLE DISTRIBUTED ANTENNA SYSTEM AND METHOD FOR REDUCING UPLINK NOISE	United States of America	14/831,626	8/20/15	US-2015-0358054-A1		9,954,585	4/24/18	Issued
SYSTEM AND METHOD FOR INCREASING BANDWIDTH FOR DIGITAL PREDISTORTION IN MULTI-CHANNEL WIDEBAND COMMUNICATION SYSTEMS	China	201280045910.0	9/24/12	CN 103858337A	5/3/17	ZL 201280045910.0	5/3/17	Issued
SYSTEM AND METHOD FOR INCREASING BANDWIDTH FOR DIGITAL PREDISTORTION IN MULTI-CHANNEL WIDEBAND COMMUNICATION SYSTEMS	Hong Kong	14109157.4	9/24/12	1195829A	4/27/18	HK1195829	4/27/18	Issued
SYSTEM AND METHOD FOR INCREASING BANDWIDTH FOR DIGITAL PREDISTORTION IN MULTI-CHANNEL WIDEBAND COMMUNICATION SYSTEMS	Japan	2014-532074	9/24/12	2014-526863		6080854	1/27/17	Issued
SYSTEM AND METHOD FOR INCREASING BANDWIDTH FOR DIGITAL PREDISTORTION IN MULTI-CHANNEL WIDEBAND COMMUNICATION SYSTEMS	Republic of Korea	10-2014-7010583	9/24/12					Allowed
SYSTEM AND METHOD FOR INCREASING BANDWIDTH FOR DIGITAL PREDISTORTION IN MULTI-CHANNEL WIDEBAND COMMUNICATION SYSTEMS	Macao	J/1529	9/24/12			J/001529	6/23/17	Issued
SYSTEM AND METHOD FOR INCREASING BANDWIDTH FOR DIGITAL PREDISTORTION IN MULTI-CHANNEL WIDEBAND COMMUNICATION SYSTEMS	United States of America	13/625,760	9/24/12	US-2013-0077713-A1		8,873,674	10/28/14	Issued

SYSTEM AND METHOD FOR INCREASING BANDWIDTH FOR DIGITAL PREDISTORTION IN MULTI-CHANNEL WIDEBAND COMMUNICATION SYSTEMS	United States of America	14/480,267	9/8/14	US-2014-0376661-A1		9,197,259	11/24/15	Issued
SYSTEM AND METHOD FOR INCREASING BANDWIDTH FOR DIGITAL PREDISTORTION IN MULTI-CHANNEL WIDEBAND COMMUNICATION SYSTEMS	United States of America	14/918,371	10/20/15	US-2016-0191087-A1		10,256,853	4/9/19	Issued
SYSTEM AND METHOD FOR INCREASING BANDWIDTH FOR DIGITAL PREDISTORTION IN MULTI-CHANNEL WIDEBAND COMMUNICATION SYSTEMS	United States of America	16/279,535	2/19/19					Pending
SOFTWARE CONFIGURABLE DISTRIBUTED ANTENNA SYSTEM AND METHOD FOR BANDWIDTH COMPRESSION AND TRANSPORT OF SIGNALS IN NONCONTIGUOUS FREQUENCY BLOCKS	United States of America	13/686,036	11/27/12	US-2014-0010168-A1		8,724,664	5/13/14	Issued
SOFTWARE CONFIGURABLE DISTRIBUTED ANTENNA SYSTEM AND METHOD FOR BANDWIDTH COMPRESSION AND TRANSPORT OF SIGNALS IN NONCONTIGUOUS FREQUENCY BLOCKS	United States of America	14/225,673	3/26/14	US-2014-0206282-A1		9,236,897	1/12/16	Issued
SOFTWARE CONFIGURABLE DISTRIBUTED ANTENNA SYSTEM AND METHOD FOR BANDWIDTH COMPRESSION AND TRANSPORT OF SIGNALS IN NONCONTIGUOUS FREQUENCY BLOCKS	United States of America	14/960,177	12/4/15	US-2016-0226784-A1		9,722,939	8/1/17	Issued
SOFT HAND-OFF AND ROUTING DATA IN A VIRTUALIZED DISTRIBUTED ANTENNA SYSTEM	United Arab Emirates	471/2014	11/6/12					Pending
SOFT HAND-OFF AND ROUTING DATA IN A VIRTUALIZED DISTRIBUTED ANTENNA SYSTEM	Australia	2012336027	11/6/12		4/13/17	2012336027	7/28/17	Issued

SOFT HAND-OFF AND ROUTING DATA IN A VIRTUALIZED DISTRIBUTED ANTENNA SYSTEM	Brazil	BR 11 2014 010895 1	11/6/12					Pending
SOFT HAND-OFF AND ROUTING DATA IN A VIRTUALIZED DISTRIBUTED ANTENNA SYSTEM	China	201280066105.6	11/6/12	CN 104040368A	8/22/17	ZL 201280066105.6	8/22/17	Issued
RESOURCE ALLOCATION IN A DISTRIBUTED ANTENNA SYSTEM	Germany	12847270.1	11/6/12	EP 2776857 A1		60 2012 047 724.5	6/20/18	Issued
SOFT HAND-OFF AND ROUTING DATA IN A VIRTUALIZED DISTRIBUTED ANTENNA SYSTEM	Eurasian Patent Office	201400556	11/6/12					Pending
RESOURCE ALLOCATION IN A DISTRIBUTED ANTENNA SYSTEM	European Patent Office	12847270.1	11/6/12	EP 2776857 A1	6/20/18	2776857	6/20/18	Issued
RESOURCE ALLOCATION IN A DISTRIBUTED ANTENNA SYSTEM	France	12847270.1	11/6/12	EP 2776857 A1		2776857	6/20/18	Issued
RESOURCE ALLOCATION IN A DISTRIBUTED ANTENNA SYSTEM	United Kingdom	12847270.1	11/6/12	EP 2776857 A1		2776857	6/20/18	Issued
SOFT HAND-OFF AND ROUTING DATA IN A VIRTUALIZED DISTRIBUTED ANTENNA SYSTEM	Hong Kong	15101263.1	11/6/12	1200916A	7/13/18	HK1200916	7/13/18	Issued
SOFT HAND-OFF AND ROUTING DATA IN A VIRTUALIZED DISTRIBUTED ANTENNA SYSTEM	Indonesia	P00 2014 03239	11/6/12	2015/04205				Published
SOFT HAND-OFF AND ROUTING DATA IN A VIRTUALIZED DISTRIBUTED ANTENNA SYSTEM	Israel	232439	11/6/12		4/30/19			Pending
SOFT HAND-OFF AND ROUTING DATA IN A VIRTUALIZED DISTRIBUTED ANTENNA SYSTEM	India	4237/CHENP/2014	11/6/12					Published
SOFT HAND-OFF AND ROUTING DATA IN A VIRTUALIZED DISTRIBUTED ANTENNA SYSTEM	Japan	2014-540195	11/6/12	2014-534783		6101277	3/3/17	Issued
SOFT HAND-OFF AND ROUTING DATA IN A VIRTUALIZED DISTRIBUTED ANTENNA SYSTEM	Republic of Korea	10-2014-7015429	11/6/12					Pending
SOFT HAND-OFF AND ROUTING DATA IN A VIRTUALIZED DISTRIBUTED ANTENNA SYSTEM	Macao	J/2816	11/6/12			J/002816	2/12/18	Issued
RESOURCE ALLOCATION IN A DISTRIBUTED ANTENNA SYSTEM	Netherlands	12847270.1	11/6/12	EP 2776857 A1		2776857	6/20/18	Issued

SOFT HAND-OFF AND ROUTING DATA IN A VIRTUALIZED DISTRIBUTED ANTENNA SYSTEM	Singapore	11201402105S	11/6/12			11201402105S	7/26/16	Issued
SOFT HAND-OFF AND ROUTING DATA IN A VIRTUALIZED DISTRIBUTED ANTENNA SYSTEM	United States of America	13/670,162	11/6/12	US-2013-0114963-A1				Published
SOFT HAND-OFF AND ROUTING DATA IN A VIRTUALIZED DISTRIBUTED ANTENNA SYSTEM	Australia	2017204786	11/6/12					Pending
SOFT HAND-OFF AND ROUTING DATA IN A VIRTUALIZED DISTRIBUTED ANTENNA SYSTEM	China	201710619658.4	11/6/12	CN 107529172A				Published
SOFT HAND-OFF IN A VIRTUALIZED DISTRIBUTED ANTENNA SYSTEM	European Patent Office	18178591.6	11/6/12	3445078				Published
SOFT HAND-OFF AND ROUTING DATA IN VIRTUALIZED DISTRIBUTED ANTENNA SYSTEM	Hong Kong	18106058.6	11/6/12	1247019A	9/14/18			Published
VIRTUALIZED WIRELESS NETWORK	United Arab Emirates	472/2014	11/6/12					Pending
VIRTUALIZED WIRELESS NETWORK	Australia	2012336026	11/6/12		7/21/16	2012336026	11/3/16	Issued
VIRTUALIZED WIRELESS NETWORK	Brazil	11 2014 011034 4	11/6/12					Pending
VIRTUALIZED WIRELESS NETWORK	China	201280066289.6	11/6/12	CN 104081795B	12/21/18	ZL 201280066289.6	12/21/18	Issued
VIRTUALIZED WIRELESS NETWORK	Eurasian Patent Office	201400555	11/6/12	201400555				Published
VIRTUALIZED WIRELESS NETWORK	European Patent Office	12848304.7	11/6/12	EP 2777302				Published
VIRTUALIZED WIRELESS NETWORK	Hong Kong	15102186.3	11/6/12	1202012A	9/11/15			Published
VIRTUALIZED WIRELESS NETWORK	Indonesia	P00 2014 03237	11/6/12	2015/03305				Allowed
VIRTUALIZED WIRELESS NETWORK	Israel	232438	11/6/12			232438	7/31/18	Issued
VIRTUALIZED WIRELESS NETWORK	India	4232/CHENP/2014	11/6/12	2014CN04232				Published
VIRTUALIZED WIRELESS NETWORK	Japan	2014-540194	11/6/12	2015-505427		6158818	6/16/17	Issued
VIRTUALIZED WIRELESS NETWORK	Republic of Korea	10-2014-7015432	11/6/12					Pending

VIRTUALIZED WIRELESS NETWORK	Macao	J/1714	11/6/12					Pending
VIRTUALIZED WIRELESS NETWORK	Malaysia	PI 2014001321	11/6/12					Pending
VIRTUALIZED WIRELESS NETWORK	Singapore	11201402104T	11/6/12			11201402104T	2/2/18	Issued
VIRTUALIZED WIRELESS NETWORK	United States of America	13/670,290	11/6/12	US-2013-0128810-A1		10,264,626	4/16/19	Issued
VIRTUALIZED WIRELESS NETWORK	China	201811416669.3	11/6/12					Pending
VIRTUALIZED WIRELESS NETWORK	Japan	2017-113169	11/6/12					Pending
VIRTUALIZED WIRELESS NETWORK	Singapore	10201800761X	11/6/12	10201800761X				Published
VIRTUALIZED WIRELESS MESH NETWORK	United States of America	15/857,356	12/28/17	US-2018-0249532-A1				Published
VIRTUALIZED WIRELESS NETWORK	Australia	2018247240	11/6/12					Pending
VIRTUALIZED WIRELESS NETWORK WITH PILOT BEACONS	United States of America	13/671,203	11/7/12	US-2013-0114486-A1		9,420,628	8/16/16	Issued
DATA TRANSPORT IN A VIRTUALIZED DISTRIBUTED ANTENNA SYSTEM	Brazil	BR 11 2014 018841 6	1/31/13					Pending
A SYSTEM FOR ROUTING SIGNALS IN A DISTRIBUTED ANTENNA SYSTEM	China	201380007517.7	1/31/13	CN 104221293A	2/22/17	ZL 201380007517.7	2/22/17	Issued
DATA TRANSPORT IN A VIRTUALIZED DISTRIBUTED ANTENNA SYSTEM	European Patent Office	13744144.0	1/31/13	2 810 373				Published
SYSTEM FOR ROUTING SIGNALS IN A DISTRIBUTED ANTENNA SYSTEM	Hong Kong	15104338.6	1/31/13	1204164A	3/29/18	HK1204164	3/29/18	Issued
DATA TRANSPORT IN A VIRTUALIZED DISTRIBUTED ANTENNA SYSTEM	Israel	233785	1/31/13					Pending
DATA TRANSPORT IN A VIRTUALIZED DISTRIBUTED ANTENNA SYSTEM	India	5859/CHENP/2014	1/31/13	2014CN05859				Published
DATA TRANSPORT IN A VIRTUALIZED DISTRIBUTED ANTENNA SYSTEM	Japan	2014-554989	1/31/13			6193265	8/18/17	Issued

DATA TRANSPORT IN A VIRTUALIZED DISTRIBUTED ANTENNA SYSTEM	Republic of Korea	10-2014-7024349	1/31/13					Pending
A SYSTEM FOR ROUTING SIGNALS IN A DISTRIBUTED ANTENNA SYSTEM	Macao	J/2563	1/31/13			J/002563	6/23/17	Issued
DATA TRANSPORT IN A VIRTUALIZED DISTRIBUTED ANTENNA SYSTEM	United States of America	13/754,702	1/30/13	US-2014-0037292-A1		9,025,956	5/5/15	Issued
DATA TRANSMISSION IN VIRTUALIZED DISTRIBUTED ANTENNA SYSTEM	Hong Kong	17113429.5	1/31/13	1239969A	5/11/18			Published
DATA TRANSPORT IN A VIRTUALIZED DISTRIBUTED ANTENNA SYSTEM	Japan	2017-154789	1/31/13					Pending
DATA TRANSPORT IN A VIRTUALIZED DISTRIBUTED ANTENNA SYSTEM	United States of America	14/678,779	4/3/15	US-2015-0326957-A1		9,621,971	4/11/17	Issued
DATA TRANSPORT IN A VIRTUALIZED DISTRIBUTED ANTENNA SYSTEM	United States of America	15/445,467	2/28/17	US-2017-0303019-A1		10,051,350	8/14/18	Issued
DATA TRANSPORT IN A VIRTUALIZED DISTRIBUTED ANTENNA SYSTEM	United States of America	16/039,182	7/18/18	US-2019-0082243-A1				Published
FREQUENCY TRANSLATION IN A VIRTUALIZED DISTRIBUTED ANTENNA SYSTEM	United States of America	13/753,288	1/29/13	US-2014-0036770-A1		9,723,612	8/1/17	Issued
EVOLUTIONARY ALGORITHMS FOR GEOGRAPHIC LOAD BALANCING USING A DISTRIBUTED ANTENNA SYSTEM	Brazil	BR 11 2014 020305 9	2/19/13					Pending
METHODS FOR GEOGRAPHIC LOAD BALANCING USING A DISTRIBUTED ANTENNA SYSTEM	China	201380009723.1	2/19/13	CN104160725A	5/1/18	ZL 201380009723.1	5/1/18	Issued
EVOLUTIONARY ALOGORITHMS FOR GEOGRAPHIC LOAD BALANCING USING A DISTRIBUTED ANTENNA SYSTEM	Germany	13749837.4	2/19/13	2815591		60 2013 025 498.2	8/23/17	Issued
EVOLUTIONARY ALGORITHMS FOR GEOGRAPHIC LOAD BALANCING USING A DISTRIBUTED ANTENNA SYSTEM	European Patent Office	13749837.4	2/19/13	2815591	8/23/17	2815591	8/23/17	Issued

EVOLUTIONARY ALOGORITHMS FOR GEOGRAPHIC LOAD BALANCING USING A DISTRIBUTED ANTENNA SYSTEM	France	13749837.4	2/19/13	2815591		2815591	8/23/17	Issued
EVOLUTIONARY ALOGORITHMS FOR GEOGRAPHIC LOAD BALANCING USING A DISTRIBUTED ANTENNA SYSTEM	United Kingdom	13749837.4	2/19/13	2815591		2815591	8/23/17	Issued
EVOLUTIONARY ALGORITHMS FOR GEOGRAPHIC LOAD BALANCING USING A DISTRIBUTED ANTENNA SYSTEM	Hong Kong	15103517.1	2/19/13	1203022A	10/9/15			Published
EVOLUTIONARY ALGORITHMS FOR GEOGRAPHIC LOAD BALANCING USING A DISTRIBUTED ANTENNA SYSTEM	Israel	233975	2/19/13		4/30/18	233975	7/31/18	Issued
EVOLUTIONARY ALGORITHMS FOR GEOGRAPHIC LOAD BALANCING USING A DISTRIBUTED ANTENNA SYSTEM	India	6777/DELNP/2014	2/19/13	2014DN06777				Published
DATA TRANSPORT IN A VIRTUALIZED DISTRIBUTED ANTENNA SYSTEM	Japan	2014-557866	2/19/13			6320939	4/13/18	Issued
EVOLUTIONARY ALGORITHMS FOR GEOGRAPHIC LOAD BALANCING USING A DISTRIBUTED ANTENNA SYSTEM	Republic of Korea	10-2014-7025637	2/19/13					Pending
EVOLUTIONARY ALGORITHMS FOR GEOGRAPHIC LOAD BALANCING USING A DISTRIBUTED ANTENNA SYSTEM	Macao	J/3166	2/19/13			J/003166	10/9/18	Issued
EVOLUTIONARY ALGORITHMS FOR GEOGRAPHIC LOAD BALANCING USING A DISTRIBUTED ANTENNA SYSTEM	United States of America	13/770,113	2/19/13	US-2014-0057627-A1		9,148,839	9/29/15	Issued
EVOLUTIONARY ALGORITHMS FOR GEOGRAPHIC LOAD BALANCING USING A DISTRIBUTED ANTENNA	European Patent Office	17185342.7	2/19/13	3258722				Published

EVOLUTIONARY ALGORITHMS FOR GEOGRAPHIC LOAD BALANCING USING A DISTRIBUTED ANTENNA SYSTEM	United States of America	14/837,850	8/27/15	US-2016-0073313-A1		9,854,494	12/26/17	Issued
EVOLUTIONARY ALGORITHMS FOR GEOGRAPHIC LOAD BALANCING USING A DISTRIBUTED ANTENNA SYSTEM	United States of America	15/782,309	10/12/17	US-2018-0160356-A1				Published
HYBRID DATA TRANSPORT FOR A VIRTUALIZED DISTRIBUTED ANTENNA SYSTEM	United States of America	13/777,185	2/26/13	US-2014-0072299-A1		9,537,572	1/3/17	Issued
HYBRID DATA TRANSPORT FOR A VIRTUALIZED DISTRIBUTED ANTENNA SYSTEM	United States of America	15/383,121	12/19/16	US-2017-0104538-A1		10,063,319	8/28/18	Issued
HYBRID DATA TRANSPORT FOR A VIRTUALIZED DISTRIBUTED ANTENNA SYSTEM	United States of America	16/054,678	8/3/18	US-2019-0036606-A1				Published
METHOD AND SYSTEM FOR SOFT FREQUENCY REUSE IN A DISTRIBUTED ANTENNA SYSTEM	United States of America	13/894,309	5/14/13	US-2014-0233468-A1		9,197,358	11/24/15	Issued
METHOD AND SYSTEM FOR SOFT FREQUENCY REUSE IN A DISTRIBUTED ANTENNA SYSTEM	United States of America	14/887,922	10/20/15	US-2016-0113014-A1		9,538,536	1/3/17	Issued
METHOD AND SYSTEM FOR SOFT FREQUENCY REUSE IN A DISTRIBUTED ANTENNA SYSTEM	United States of America	15/383,431	12/19/16	US-2017-0230836-A1		9,942,771	4/10/18	Issued
METHOD AND SYSTEM FOR SOFT FREQUENCY REUSE IN A DISTRIBUTED ANTENNA SYSTEM	United States of America	15/912,859	3/6/18	US-2018-0332477-A1				Allowed
METHOD AND SYSTEM FOR SOFT FREQUENCY REUSE IN A DISTRIBUTED ANTENNA SYSTEM	United States of America							Unfiled
SELF-OPTIMIZING DISTRIBUTED ANTENNA SYSTEM USING SOFT FREQUENCY REUSE	United States of America	13/935,157	7/3/13	US-2014-0161057-A1		9,363,768	6/7/16	Issued
SELF-OPTIMIZING DISTRIBUTED ANTENNA SYSTEM USING SOFT FREQUENCY REUSE	United States of America	15/154,073	5/13/16	US-2017-0013568-A1		9,769,766	9/19/17	Issued
SELF-OPTIMIZING DISTRIBUTED ANTENNA SYSTEM USING SOFT FREQUENCY REUSE	United States of America	15/676,631	8/14/17	US-2018-0092045-A1				Allowed

METHOD AND SYSTEM FOR ALIGNING SIGNALS WIDELY SPACED IN FREQUENCY FOR WIDEBAND DIGITAL PREDISTORTION IN WIRELESS COMMUNICATION SYSTEMS	Brazil	BR 11 2015 001348 1	7/18/13					Pending
METHOD AND SYSTEM FOR ALIGNING SIGNALS WIDELY SPACED IN FREQUENCY FOR WIDEBAND DIGITAL PREDISTORTION IN WIRELESS COMMUNICATION SYSTEMS	China	201380039353.6	7/18/13	CN 104584501A				Allowed
METHOD AND SYSTEM FOR ALIGNING SIGNALS WIDELY SPACED IN FREQUENCY FOR WIDEBAND DIGITAL PREDISTORTION IN WIRELESS COMMUNICATION SYSTEMS	European Patent Office	13823723.5	7/18/13	2875620				Published
METHOD AND SYSTEM FOR ALIGNING SIGNALS WIDELY SPACED IN FREQUENCY FOR WIDEBAND DIGITAL PREDISTORTION IN WIRELESS COMMUNICATION SYSTEMS	Hong Kong	15108803.3	7/18/13	1208291A	2/26/16			Published
METHOD AND SYSTEM FOR ALIGNING SIGNALS WIDELY SPACED IN FREQUENCY FOR WIDEBAND DIGITAL PREDISTORTION IN WIRELESS COMMUNICATION SYSTEMS	Israel	236619	7/18/13		8/30/18	236619	12/1/18	Issued
METHOD AND SYSTEM FOR ALIGNING SIGNALS WIDELY SPACED IN FREQUENCY FOR WIDEBAND DIGITAL PREDISTORTION IN WIRELESS COMMUNICATION SYSTEMS	India	211/CHENP/2015	7/18/13	2015CN00211				Published
METHOD AND SYSTEM FOR ALIGNING SIGNALS WIDELY SPACED IN FREQUENCY FOR WIDEBAND DIGITAL PREDISTORTION IN WIRELESS COMMUNICATION SYSTEMS	Japan	2015-524332	7/18/13	2015-525036				Allowed

METHOD AND SYSTEM FOR ALIGNING SIGNALS WIDELY SPACED IN FREQUENCY FOR WIDEBAND DIGITAL PREDISTORTION IN WIRELESS COMMUNICATION SYSTEMS	Republic of Korea	10-2015-7004064	7/18/13					Pending
METHOD AND SYSTEM FOR ALIGNING SIGNALS WIDELY SPACED IN FREQUENCY FOR WIDEBAND DIGITAL PREDISTORTION IN WIRELESS COMMUNICATION SYSTEMS	Macao							Unfiled
METHOD AND SYSTEM FOR ALIGNING SIGNALS WIDELY SPACED IN FREQUENCY FOR WIDEBAND DIGITAL PREDISTORTION IN WIRELESS COMMUNICATION SYSTEMS	United States of America	13/945,736	7/18/13	US-2014-0159810-A1		9,225,296	12/29/15	Issued
METHOD AND SYSTEM FOR ALIGNING SIGNALS WIDELY SPACED IN FREQUENCY FOR WIDEBAND DIGITAL PREDISTORTION IN WIRELESS COMMUNICATION SYSTEMS	Israel	259447	7/18/13					Pending
METHOD AND SYSTEM FOR ALIGNING SIGNALS WIDELY SPACED IN FREQUENCY FOR WIDEBAND DIGITAL PREDISTORTION IN WIRELESS COMMUNICATION SYSTEMS	United States of America	14/956,040	12/1/15	US-2016-0344351-A1		10,263,569	4/16/19	Issued
METHOD AND SYSTEM FOR ALIGNING SIGNALS WIDELY SPACED IN FREQUENCY FOR WIDEBAND DIGITAL PREDISTORTION IN WIRELESS COMMUNICATION SYSTEMS	United States of America	16/352,065	3/13/19					Pending
OPTIMIZATION OF TRAFFIC LOAD IN A DISTRIBUTED ANTENNA SYSTEM	United Arab Emirates	125/2015	7/26/13					Pending
OPTIMIZATION OF TRAFFIC LOAD IN A DISTRIBUTED ANTENNA SYSTEM	Australia	2013296819	7/26/13		8/31/17	2013296819	12/18/17	Issued

OPTIMIZATION OF TRAFFIC LOAD IN A DISTRIBUTED ANTENNA SYSTEM	Brazil	BR 11 2015 001916 1	7/26/13					Pending
OPTIMIZATION OF TRAFFIC LOAD IN A DISTRIBUTED ANTENNA SYSTEM	China	201380040757.7	7/26/13	CN 104956732B	4/30/19	ZL 201380040757.7	4/30/19	Issued
OPTIMIZATION OF TRAFFIC LOAD IN A DISTRIBUTED ANTENNA SYSTEM	Eurasian Patent Office	201500184	7/26/13					Pending
OPTIMIZATION OF TRAFFIC LOAD IN A DISTRIBUTED ANTENNA SYSTEM	European Patent Office	13825612.8	7/26/13	2880888				Published
OPTIMIZATION OF TRAFFIC LOAD IN A DISTRIBUTED ANTENNA SYSTEM	Hong Kong	16101919.8	7/26/13	1214067A	7/15/16			Published
OPTIMIZATION OF TRAFFIC LOAD IN A DISTRIBUTED ANTENNA SYSTEM	Indonesia	P00201500998	7/26/13					Pending
OPTIMIZATION OF TRAFFIC LOAD IN A DISTRIBUTED ANTENNA SYSTEM	Israel	236631	7/26/13			236631	12/1/18	Issued
OPTIMIZATION OF TRAFFIC LOAD IN A DISTRIBUTED ANTENNA SYSTEM	India	244/CHENP/2015	7/26/13					Published
OPTIMIZATION OF TRAFFIC LOAD IN A DISTRIBUTED ANTENNA SYSTEM	Japan	2015-525473	7/26/13		8/15/18	6373837	7/27/18	Issued
OPTIMIZATION OF TRAFFIC LOAD IN A DISTRIBUTED ANTENNA SYSTEM	Republic of Korea	10-2015-7004047	7/26/13					Pending
OPTIMIZATION OF TRAFFIC LOAD IN A DISTRIBUTED ANTENNA SYSTEM	Macao							Unfiled
OPTIMIZATION OF TRAFFIC LOAD IN A DISTRIBUTED ANTENNA SYSTEM	Malaysia	PI 2015000254	7/26/13					Pending
OPTIMIZATION OF TRAFFIC LOAD IN A DISTRIBUTED ANTENNA SYSTEM	Singapore	11201500770U	7/26/13			11201500770U	5/22/17	Issued
OPTIMIZATION OF TRAFFIC LOAD IN A DISTRIBUTED ANTENNA SYSTEM	United States of America	13/950,160	7/24/13	US-2014-0162664-A1				Published

OPTIMIZATION OF TRAFFIC LOAD IN A DISTRIBUTED ANTENNA SYSTEM	Australia	2017268613	7/26/13					Pending
A SYSTEM FOR DYNAMICALLY ROUTING SIGNALS	China	201910237775.3	7/26/13					Pending
TIME SYNCHRONIZED ROUTING IN A DISTRIBUTED ANTENNA SYSTEM	United States of America	13/960,346	8/6/13	US-2014-0162713-A1		9,439,242	9/6/16	Issued
TIME SYNCHRONIZED ROUTING IN A DISTRIBUTED ANTENNA SYSTEM	United States of America	15/251,293	8/30/16	US-2017-0118734-A1		10,045,314	8/7/18	Issued
TIME SYNCHRONIZED ROUTING IN A DISTRIBUTED ANTENNA SYSTEM	United States of America	16/038,613	7/18/18	US-2019-0082407-A1				Published
POWER AMPLIFIER PROTECTION USING A CYCLIC REDUNDANCY CHECK ON THE DIGITAL TRANSPORT OF DATA	United States of America	14/095,706	12/3/13	US-2014-0223266-A1		9,559,806	1/31/17	Issued
DAS INTEGRATED DIGITAL OFF-AIR REPEATER	United States of America	14/044,668	10/2/13	US-2014-0169263-A1		9,112,549	8/18/15	Issued
DAS INTEGRATED DIGITAL OFF-AIR REPEATER	United States of America	14/743,789	6/18/15	US-2016-0007264-A1		9,622,148	4/11/17	Issued
DAS INTEGRATED DIGITAL OFF-AIR REPEATER	United States of America	16/230,253	12/21/18					Pending
WIDE BANDWIDTH DIGITAL PREDISTORTION SYSTEM WITH REDUCED SAMPLING RATE	United States of America	13/777,194	2/26/13	US-2014-0241461-A1		8,913,689	12/16/14	Issued
WIDE BANDWIDTH DIGITAL PREDISTORTION SYSTEM WITH REDUCED SAMPLING RATE	United States of America	14/552,231	11/24/14	US-2015-0180519-A1		9,258,022	2/9/16	Issued
WIDE BANDWIDTH DIGITAL PREDISTORTION SYSTEM WITH REDUCED SAMPLING RATE	United States of America	14/987,093	1/4/16	US-2016-0261294-A1		9,673,848	6/6/17	Issued
WIDE BANDWIDTH DIGITAL PREDISTORTION SYSTEM WITH REDUCED SAMPLING RATE	United States of America	15/492,902	4/20/17	US-2017-0353199-A1		10,218,392	2/26/19	Issued
WIDE BANDWIDTH DIGITAL PREDISTORTION SYSTEM WITH REDUCED SAMPLING RATE	United States of America	16/240,433	1/4/19					Pending
INDOOR LOCALIZATION USING DIGITAL OFF-AIR ACCESS UNITS	United States of America	14/168,328	1/30/14	US-2014-0313075-A1		9,671,496	6/6/17	Issued

INDOOR LOCALIZATION USING DIGITAL OFF-AIR ACCESS UNITS	United States of America	15/582,776	5/1/17	US-2017-0363743-A1		10,180,497	1/15/19	Issued
INDOOR LOCALIZATION USING DIGITAL OFF-AIR ACCESS UNITS	United States of America	16/205,567	11/30/18					Pending
FEEDBACK BASED INDOOR LOCALIZATION USING DIGITAL OFF-AIR ACCESS UNITS	United States of America	14/171,600	2/3/14	US-2014-0306841-A1		9,476,984	10/25/16	Issued
FEEDBACK BASED INDOOR LOCALIZATION USING DIGITAL OFF-AIR ACCESS UNITS	United States of America	15/279,136	9/28/16	US-2017-0146662-A1				Allowed
INDOOR LOCALIZATION USING ANALOG OFF-AIR ACCESS UNITS	United States of America	14/183,297	2/18/14	US-2014-0320340-A1				Published
METHOD AND SYSTEM FOR WI-FI DATA TRANSMISSION	United States of America	14/189,044	2/25/14	US-2014-0314061-A1		9,955,361	4/24/18	Issued
METHOD AND SYSTEM FOR WI-FI DATA TRANSMISSION	United States of America	15/907,153	2/27/18	US-2018-0324599-A1				Published
INDOOR TRILATERALIZATION USING DIGITAL OFF-AIR ACCESS UNITS	United States of America	14/199,617	3/6/14	US-2014-0313076-A1		9,958,548	5/1/18	Issued
INDOOR TRILATERALIZATION USING DIGITAL OFF-AIR ACCESS UNITS	United States of America	15/917,342	3/9/18	US-2018-0329068-A1				Published
REAL-TIME LOCATING SYSTEM USING GPS TIME DIFFERENCE OF ARRIVAL WITH DIGITAL OFF-AIR ACCESS UNITS AND REMOTE UNITS	United States of America	14/257,209	4/21/14	US-2014-0340255-A1		9,851,445	12/26/17	Issued
REAL-TIME LOCATING SYSTEM USING GPS TIME DIFFERENCE OF ARRIVAL WITH DIGITAL OFF-AIR ACCESS UNITS AND REMOTE UNITS	United States of America	15/819,279	11/21/17	US-2018-0239025-A1				Published
DIGITAL TRANSPORT OF DATA OVER DISTRIBUTED ANTENNA NETWORK	Brazil	BR 11 2016 014197 0	12/18/14					Pending
DIGITAL TRANSPORT OF DATA OVER DISTRIBUTED ANTENNA NETWORK	China	201480069382.1	12/18/14	CN 105830373B	4/23/19	ZL 201480069382.1	4/23/19	Issued
DIGITAL TRANSPORT OF DATA OVER DISTRIBUTED ANTENNA NETWORK	European Patent Office	14872389.3	12/18/14	3084992				Published

DIGITAL TRANSPORT OF DATA OVER DISTRIBUTED ANTENNA NETWORK	Hong Kong	17100236.5	12/18/14	1226878A				Published
DIGITAL TRANSPORT OF DATA OVER DISTRIBUTED ANTENNA NETWORK	Indonesia	P00201604728	12/18/14	2017/10943				Published
DIGITAL TRANSPORT OF DATA OVER DISTRIBUTED ANTENNA NETWORK	Israel	246210	12/18/14					Pending
DIGITAL TRANSPORT OF DATA OVER DISTRIBUTED ANTENNA NETWORK	India	201617023992	12/18/14					Published
DIGITAL TRANSPORT OF DATA OVER DISTRIBUTED ANTENNA NETWORK	Japan	2016-541192	12/18/14					Pending
DIGITAL TRANSPORT OF DATA OVER DISTRIBUTED ANTENNA NETWORK	Republic of Korea	10-2016-7019353	12/18/14					Pending
DIGITAL TRANSPORT OF DATA OVER DISTRIBUTED ANTENNA NETWORK	Macao							Unfiled
DIGITAL TRANSPORT OF DATA OVER DISTRIBUTED ANTENNA NETWORK	Malaysia	PI 2016001132	12/18/14					Pending
DIGITAL TRANSPORT OF DATA OVER DISTRIBUTED ANTENNA NETWORK	Singapore	11201605002Q	12/18/14					Allowed
DIGITAL TRANSPORT OF DATA OVER DISTRIBUTED ANTENNA NETWORK	United States of America	14/574,071	12/17/14	US-2015-0207545-A1		9,847,816	12/19/17	Issued
DIGITAL TRANSPORT OF DATA OVER DISTRIBUTED ANTENNA NETWORK	Australia	2019202190	12/18/14					Pending
DIGITAL TRANSPORT OF DATA OVER DISTRIBUTED ANTENNA NETWORK	China	201910227542.5	12/18/14					Pending
DIGITAL TRANSPORT OF DATA OVER DISTRIBUTED ANTENNA NETWORK	Singapore	10201904722T	12/18/14					Pending
DIGITAL TRANSPORT OF DATA OVER DISTRIBUTED ANTENNA NETWORK	United States of America	15/812,018	11/14/17	US-2018-0212650-A1				Allowed

NETWORK SWITCH FOR A DISTRIBUTED ANTENNA NETWORK	Brazil	BR 11 2016 015642 0	1/6/15					Pending
NETWORK SWITCH FOR A DISTRIBUTED ANTENNA NETWORK	China	201580003669.9	1/6/15	CN 105874824A				Published
NETWORK SWITCH FOR A DISTRIBUTED ANTENNA NETWORK	European Patent Office	15733064.8	1/6/15	3092832				Published
NETWORK SWITCH FOR A DISTRIBUTED ANTENNA NETWORK	Hong Kong	17100234.7	1/6/15	1226892A				Published
NETWORK SWITCH FOR A DISTRIBUTED ANTENNA NETWORK	Indonesia	P00 2016 05228	1/6/15	2017/10346				Published
NETWORK SWITCH FOR A DISTRIBUTED ANTENNA NETWORK	Israel	246326	1/6/15					Pending
NETWORK SWITCH FOR A DISTRIBUTED ANTENNA NETWORK	India	201617024698	1/6/15					Published
NETWORK SWITCH FOR A DISTRIBUTED ANTENNA NETWORK	Japan	2016-562732	1/6/15					Pending
NETWORK SWITCH FOR A DISTRIBUTED ANTENNA NETWORK	Republic of Korea	10-2016-7020351	1/6/15					Pending
NETWORK SWITCH FOR A DISTRIBUTED ANTENNA NETWORK	Malaysia	PI 2016001173	1/6/15					Pending
NETWORK SWITCH FOR A DISTRIBUTED ANTENNA NETWORK	Singapore	11201605464T	1/6/15					Pending
NETWORK SWITCH FOR A DISTRIBUTED ANTENNA NETWORK	United States of America	14/590,447	1/6/15	US-2015-0303999-A1				Allowed
NETWORK SWITCH FOR A DISTRIBUTED ANTENNA NETWORK	Australia	2019202185	1/6/15					Pending
NETWORK SWITCH FOR A DISTRIBUTED ANTENNA NETWORK	Singapore	10201805615W	1/6/15	10201805615W				Published

DIGITAL MULTIPLEXER IN A DISTRIBUTED ANTENNA SYSTEM	United States of America	14/580,585	12/23/14	US-2015-0303998-A1				Published
DIGITAL MULTIPLEXER IN A DISTRIBUTED ANTENNA SYSTEM	Brazil	BR 11 2016 014663 8	12/23/14					Pending
DIGITAL MULTIPLEXER IN A DISTRIBUTED ANTENNA SYSTEM	China	201480070750.4	12/23/14	CN 105917675A				Published
DIGITAL MULTIPLEXER IN A DISTRIBUTED ANTENNA SYSTEM	European Patent Office	14874737.1	12/23/14	3087762				Published
DIGITAL MULTIPLEXER IN A DISTRIBUTED ANTENNA SYSTEM	Hong Kong	17100988.5	12/23/14	1227599A				Published
DIGITAL MULTIPLEXER IN A DISTRIBUTED ANTENNA SYSTEM	Indonesia	P00201604818	12/23/14	2017/09815				Published
DIGITAL MULTIPLEXER IN A DISTRIBUTED ANTENNA SYSTEM	Israel	246242	12/23/14					Pending
DIGITAL MULTIPLEXER IN A DISTRIBUTED ANTENNA SYSTEM	India	201617024316	12/23/14					Published
DIGITAL MULTIPLEXER IN A DISTRIBUTED ANTENNA SYSTEM	Japan	2016-560881	12/23/14					Pending
DIGITAL MULTIPLEXER IN A DISTRIBUTED ANTENNA SYSTEM	Republic of Korea	10-2016-7020070	12/23/14					Pending
DIGITAL MULTIPLEXER IN A DISTRIBUTED ANTENNA SYSTEM	Malaysia	PI 2016001159	12/23/14					Pending
DIGITAL MULTIPLEXER IN A DISTRIBUTED ANTENNA SYSTEM	Singapore	11201605115V	12/23/14					Pending
DIGITAL MULTIPLEXER IN A DISTRIBUTED ANTENNA SYSTEM	United States of America							Unfiled
DIGITAL MULTIPLEXER IN A DISTRIBUTED ANTENNA SYSTEM	Australia	2019202115	12/23/14					Pending
DIGITAL MULTIPLEXER IN A DISTRIBUTED ANTENNA SYSTEM	Singapore	10201805212Y	12/23/14	10201805212Y				Published
SYSTEM AND METHOD FOR PERFORMANCE OPTIMIZATION IN AND THROUGH A DISTRIBUTED ANTENNA SYSTEM	Australia	2015218375	2/13/15					Pending
SYSTEM AND METHOD FOR PERFORMANCE OPTIMIZATION IN AND THROUGH A DISTRIBUTED ANTENNA SYSTEM	Switzerland	15749690.2	2/13/15	3105968		3105968	12/5/18	Issued
SYSTEM AND METHOD FOR PERFORMANCE OPTIMIZATION IN AND THROUGH A DISTRIBUTED ANTENNA SYSTEM	China	201580008198.0	2/13/15	CN 105993139A				Published

SYSTEM AND METHOD FOR PERFORMANCE OPTIMIZATION IN AND THROUGH A DISTRIBUTED ANTENNA SYSTEM	Germany	15749690.2	2/13/15	3105968		602015020944.3	12/5/18	Issued
SYSTEM AND METHOD FOR PERFORMANCE OPTIMIZATION IN AND THROUGH A DISTRIBUTED ANTENNA SYSTEM	European Patent Office	15749690.2	2/13/15	3105968	12/5/18	3105968	12/5/18	Issued
SYSTEM AND METHOD FOR PERFORMANCE OPTIMIZATION IN AND THROUGH A DISTRIBUTED ANTENNA SYSTEM	Spain	15749690.2	2/13/15	3105968		3105968	12/5/18	Issued
SYSTEM AND METHOD FOR PERFORMANCE OPTIMIZATION IN AND THROUGH A DISTRIBUTED ANTENNA SYSTEM	France	15749690.2	2/13/15	3105968		3105968	12/5/18	Issued
SYSTEM AND METHOD FOR PERFORMANCE OPTIMIZATION IN AND THROUGH A DISTRIBUTED ANTENNA SYSTEM	United Kingdom	15749690.2	2/13/15	3105968		3105968	12/5/18	Issued
SYSTEM AND METHOD FOR PERFORMANCE OPTIMIZATION IN AND THROUGH A DISTRIBUTED ANTENNA SYSTEM	Hong Kong	17102313.7	2/13/15	1229081A	11/10/17			Published
SYSTEM AND METHOD FOR PERFORMANCE OPTIMIZATION IN AND THROUGH A DISTRIBUTED ANTENNA SYSTEM	Japan	2016-551758	2/13/15					Pending
SYSTEM AND METHOD FOR PERFORMANCE OPTIMIZATION IN AND THROUGH A DISTRIBUTED ANTENNA SYSTEM	Macao							Unfiled
SYSTEM AND METHOD FOR PERFORMANCE OPTIMIZATION IN AND THROUGH A DISTRIBUTED ANTENNA SYSTEM	Netherlands	15749690.2	2/13/15	3105968		3105968	12/5/18	Issued
SYSTEM AND METHOD FOR PERFORMANCE OPTIMIZATION IN AND THROUGH A DISTRIBUTED ANTENNA SYSTEM	United States of America	14/621,192	2/12/15	US-2015-0304044-A1		10,284,296	5/7/19	Issued

SYSTEM AND METHOD FOR PERFORMANCE OPTIMIZATION IN AND THROUGH A DISTRIBUTED ANTENNA SYSTEM	United States of America	16/360,980	3/21/19					Pending
DISTRIBUTED RADIO SYSTEM WITH REMOTE RADIO HEADS	Australia	2015227155	3/5/15					Pending
DISTRIBUTED RADIO SYSTEM WITH REMOTE RADIO HEADS	Brazil	BR 11 2016 020285 6	3/5/15					Pending
DISTRIBUTED ANTENNA SYSTEM WITH REMOTE RADIO HEADS	China	201580011639.2	3/5/15	CN 106170932A				Allowed
DISTRIBUTED RADIO SYSTEM WITH REMOTE RADIO HEADS	European Patent Office	15758873.2	3/5/15	3114780				Published
DISTRIBUTED RADIO SYSTEM WITH REMOTE RADIO HEADS	Hong Kong	17104046.7	3/5/15	1230802A	12/8/17			Published
DISTRIBUTED RADIO SYSTEM WITH REMOTE RADIO HEADS	Israel	247415	3/5/15					Pending
DISTRIBUTED RADIO SYSTEM WITH REMOTE RADIO HEADS	India	201617029173	3/5/15	201617029173				Published
DISTRIBUTED RADIO SYSTEM WITH REMOTE RADIO HEADS	Japan	2016-555465	3/5/15					Pending
DISTRIBUTED RADIO SYSTEM WITH REMOTE RADIO HEADS	Republic of Korea	10-2016-7027525	3/5/15					Pending
DISTRIBUTED RADIO SYSTEM WITH REMOTE RADIO HEADS	Macao							Unfiled
DISTRIBUTED RADIO SYSTEM WITH REMOTE RADIO HEADS	United States of America	14/639,418	3/5/15	US-2015-0256358-A1				Published
METHOD AND SYSTEM FOR LINK SYNCHRONIZATION IN AN LTE-TDD ARCHITECTURE	Australia	2016244115	4/4/16	2016244115				Published
METHOD AND SYSTEM FOR LINK SYNCHRONIZATION IN AN LTE-TDD ARCHITECTURE	Brazil	BR1120170211440	4/4/16					Pending
METHOD AND SYSTEM FOR LINK SYNCHRONIZATION IN AN LTE-TDD ARCHITECTURE	China	201680030803.9	4/4/16	CN 107850631 A				Published
METHOD AND SYSTEM FOR LINK SYNCHRONIZATION IN AN LTE-TDD ARCHITECTURE	European Patent Office	16774416.8	4/4/16	3278122				Published
METHOD AND SYSTEM FOR LINK SYNCHRONIZATION IN AN LTE-TDD ARCHITECTURE	Hong Kong	18106961.2	4/4/16					Pending

METHOD AND SYSTEM FOR LINK SYNCHRONIZATION IN AN LTE-TDD ARCHITECTURE	Indonesia	PID201707729	4/4/16	2018/05650				Published
METHOD AND SYSTEM FOR LINK SYNCHRONIZATION IN AN LTE-TDD ARCHITECTURE	India	201717038921	4/4/16	201717038921				Published
METHOD AND SYSTEM FOR LINK SYNCHRONIZATION IN AN LTE-TDD ARCHITECTURE	Japan	2017-551651	4/4/16					Pending
METHOD AND SYSTEM FOR LINK SYNCHRONIZATION IN AN LTE TDD ARCHITECTURE	Republic of Korea	10-2017-7032015	4/4/16					Pending
METHOD AND SYSTEM FOR LINK SYNCHRONIZATION IN AN LTE-TDD ARCHITECTURE	Macao							Unfiled
METHOD AND SYSTEM FOR LINK SYNCHRONIZATION IN AN LTE-TDD ARCHITECTURE	Singapore	11201708119W	4/4/16					Pending
METHOD AND SYSTEM FOR LINK SYNCHRONIZATION IN AN LTE-TDD ARCHITECTURE	United States of America	15/090,402	4/4/16	US-2016-0360500-A1		9,854,553	12/26/17	Issued
METHOD AND SYSTEM FOR LINK SYNCHRONIZATION IN AN LTE-TDD ARCHITECTURE	United States of America	15/820,299	11/21/17	US-2018-0227870-A1				Published
DISTRIBUTED ANTENNA SYSTEM NETWORK ANALYTICS	Australia	2016289947	7/6/16	2016289947				Published
DISTRIBUTED ANTENNA SYSTEM NETWORK ANALYTICS	Brazil	BR 11 2018 000161 9	7/6/16					Pending
DISTRIBUTED ANTENNA SYSTEM NETWORK ANALYTICS	China	201680051423.3	7/6/16	CN 108450059 A				Published
DISTRIBUTED ANTENNA SYSTEM NETWORK ANALYTICS	European Patent Office	16821901.2	7/6/16	3320369				Published
DISTRIBUTED ANTENNA SYSTEM NETWORK ANALYTICS	Hong Kong	18113025.2	7/6/16					Pending
DISTRIBUTED ANTENNA SYSTEM NETWORK ANALYTICS	Israel	256721	7/6/16					Pending
DISTRIBUTED ANTENNA SYSTEM NETWORK ANALYTICS	India	201817003865	7/6/16	201817003865				Published
DISTRIBUTED ANTENNA SYSTEM NETWORK ANALYTICS	Japan	2018-500520	7/6/16	2018524929				Published
DISTRIBUTED ANTENNA SYSTEM NETWORK ANALYTICS	Republic of Korea	10-2018-7003658	7/6/16					Pending

DISTRIBUTED ANTENNA SYSTEM NETWORK ANALYTICS	Macao							Unfiled
DISTRIBUTED ANTENNA SYSTEM NETWORK ANALYTICS	Singapore	11201800110P	7/6/16					Pending
DISTRIBUTED ANTENNA SYSTEM NETWORK ANALYTICS	United States of America	15/203,015	7/6/16	US-2017-0013585-A1				Published
VIRTUAL RADIO ACCESS NETWORK USING SOFTWARE-DEFINED NETWORK OF REMOTES AND DIGITAL MULTIPLEXING SWITCHES	Australia	2016357315	11/21/16	2016357315				Published
VIRTUAL RADIO ACCESS NETWORK USING SOFTWARE-DEFINED NETWORK OF REMOTES AND DIGITAL MULTIPLEXING SWITCHES	China	2016800795294	11/21/16	CN 108604912 A				Published
VIRTUAL RADIO ACCESS NETWORK USING SOFTWARE-DEFINED NETWORK OF REMOTES AND DIGITAL MULTIPLEXING SWITCHES	European Patent Office	16867324.2	11/21/16	3378167				Published
VIRTUAL RADIO ACCESS NETWORK USING SOFTWARE-DEFINED NETWORK OF REMOTES AND DIGITAL MULTIPLEXING SWITCHES	Hong Kong	18113803.0	11/21/16					Pending
VIRTUAL RADIO ACCESS NETWORK USING SOFTWARE-DEFINED NETWORK OF REMOTES AND DIGITAL MULTIPLEXING SWITCHES	Macao							Unfiled
VIRTUAL RADIO ACCESS NETWORK USING SOFTWARE-DEFINED NETWORK OF REMOTES AND DIGITAL MULTIPLEXING SWITCHES	Singapore	11201804193X	11/21/16					Pending
VIRTUAL RADIO ACCESS NETWORK USING SOFTWARE-DEFINED NETWORK OF REMOTES AND DIGITAL MULTIPLEXING SWITCHES	United States of America	15/358,060	11/21/16	US-2017-0250927-A1				Published

REDUNDANCY IN A PUBLIC SAFETY DISTRIBUTED ANTENNA SYSTEM	Australia	2017261802	5/12/17					Pending
REDUNDANCY IN A PUBLIC SAFETY DISTRIBUTED ANTENNA SYSTEM	China	2017800434163	5/12/17					Pending
REDUNDANCY IN A PUBLIC SAFETY DISTRIBUTED ANTENNA SYSTEM	European Patent Office	17796989.6	5/12/17	3456115				Published
REDUNDANCY IN A PUBLIC SAFETY DISTRIBUTED ANTENNA SYSTEM	Japan	2018-559301	5/12/17					Pending
REDUNDANCY IN A PUBLIC SAFETY DISTRIBUTED ANTENNA SYSTEM	Republic of Korea	10-2018-7035997	5/12/17					Pending
REDUNDANCY IN A PUBLIC SAFETY DISTRIBUTED ANTENNA SYSTEM	Singapore	11201809610Y	5/12/17					Pending
REDUNDANCY IN A PUBLIC SAFETY DISTRIBUTED ANTENNA SYSTEM	United States of America	15/594,323	5/12/17	US-2017-0366268-A1				Published

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APPLICATION NO.	ISSUE DATE	PATENT NO.	ATTORNEY DOCKET NO.	CONFIRMATION NO.
13/211,243	03/25/2014	8682338	91172-821473(102300US)	3787

20350 7590 03/05/2014

KILPATRICK TOWNSEND & STOCKTON LLP
TWO EMBARCADERO CENTER
EIGHTH FLOOR
SAN FRANCISCO, CA 94111-3834

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 184 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):

Paul Lemson, Woodinville, WA;
Shawn Patrick Stapleton, Burnaby, CANADA;
Sasa Trajkovic, Burnaby, CANADA;
Albert S. Lee, San Mateo, CA;

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Ericsson Inc. v. Dali Wireless Inc.
EX-1013 0077

PART B - FEE(S) TRANSMITTAL

Complete and send this form, together with applicable fee(s), to: Mail **Mail Stop ISSUE FEE**
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20350 7590 11/08/2013
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SAN FRANCISCO, CA 94111-3834

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

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

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
13/211,243	08/16/2011	Paul Lemson	91172-821473(102300US)	3787

TITLE OF INVENTION: REMOTELY RECONFIGURABLE DISTRIBUTED ANTENNA SYSTEM AND METHODS

APPLN. TYPE	ENTITY STATUS	ISSUE FEE DUE	PUBLICATION FEE DUE	PREV. PAID ISSUE FEE	TOTAL FEE(S) DUE	DATE DUE
nonprovisional	SMALL	~~$890~~ $480	~~$300~~	$0	$1190	02/10/2014

EXAMINER	ART UNIT	CLASS-SUBCLASS
REGO, DOMINIC E	2647	455-453000

1. Change of correspondence address or indication of "Fee Address" (37 CFR 1.363).

☐ Change of correspondence address (or Change of Correspondence Address form PTO/SB/122) attached.

☐ "Fee Address" indication (or "Fee Address" Indication form PTO/SB/47; Rev 03-02 or more recent) attached. **Use of a Customer Number is required.**

2. For printing on the patent front page, list

(1) the names of up to 3 registered patent attorneys or agents OR, alternatively,

(2) the name of a single firm (having as a member a registered attorney or agent) and the names of up to 2 registered patent attorneys or agents. If no name is listed, no name will be printed.

Kilpatrick Townsend & Stockton LLP
1 _____
2 _____
3 _____

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

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

(A) NAME OF ASSIGNEE: Dali Systems Co. Ltd.

(B) RESIDENCE: (CITY and STATE OR COUNTRY): George Town Grand Cayman, Cayman Islands

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

4a. The following fee(s) are submitted:

☒ Issue Fee

☐ Publication Fee (No small entity discount permitted)

☐ Advance Order - # of Copies _____

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

☐ A check is enclosed.

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

☒ The Director is hereby authorized to charge the required fee(s), any deficiency, or credit any overpayment, to Deposit Account Number 20-1430 (enclose an extra copy of this form).

Ericsson Inc. v. Dali Wireless Inc.
EX-1013 0078

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

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

NOTE: The Issue Fee and Publication Fee (if required) will not be accepted from anyone other than the applicant; a registered attorney or agent; or the assignee or other party in interest as shown by the records of the United States Patent and Trademark Office.

Authorized Signature Rong Liu Date 1/31/14

Typed or printed name Rong Liu Registration No. 63,066

This collection of information is required by 37 CFR 1.311. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 12 minutes to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, Virginia 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, Virginia 22313-1450.

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EX-1013 0079

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NOTICE OF ALLOWANCE AND FEE(S) DUE

20350 7590 11/08/2013

KILPATRICK TOWNSEND & STOCKTON LLP
TWO EMBARCADERO CENTER
EIGHTH FLOOR
SAN FRANCISCO, CA 94111-3834

EXAMINER
REGO, DOMINIC E

ART UNIT	PAPER NUMBER
2647	

DATE MAILED: 11/08/2013

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
13/211,243	08/16/2011	Paul Lemson	91172-821473(102300US)	3787

TITLE OF INVENTION: REMOTELY RECONFIGURABLE DISTRIBUTED ANTENNA SYSTEM AND METHODS

APPLN. TYPE	ENTITY STATUS	ISSUE FEE DUE	PUBLICATION FEE DUE	PREV. PAID ISSUE FEE	TOTAL FEE(S) DUE	DATE DUE
nonprovisional	SMALL	$890	$300	$0	$1190	02/10/2014

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: Utility patents issuing on applications filed on or after Dec. 12, 1980 may require payment of maintenance fees. It is patentee's responsibility to ensure timely payment of maintenance fees when due.

Ericsson Inc. v. Dali Wireless Inc.
EX-1013 0080

PART B - FEE(S) TRANSMITTAL

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Certificate of Mailing or Transmission
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(Depositor's name)
(Signature)
(Date)

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
13/211,243	08/16/2011	Paul Lemson	91172-821473(102300US)	3787

TITLE OF INVENTION: REMOTELY RECONFIGURABLE DISTRIBUTED ANTENNA SYSTEM AND METHODS

APPLN. TYPE	ENTITY STATUS	ISSUE FEE DUE	PUBLICATION FEE DUE	PREV. PAID ISSUE FEE	TOTAL FEE(S) DUE	DATE DUE
nonprovisional	SMALL	$890	$300	$0	$1190	02/10/2014

EXAMINER	ART UNIT	CLASS-SUBCLASS
REGO, DOMINIC E	2647	455-453000

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

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

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

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

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

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

4a. The following fee(s) are submitted:
- ❑ Issue Fee
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- ❑ A check is enclosed.
- ❑ Payment by credit card. Form PTO-2038 is attached.
- ❑ The Director is hereby authorized to charge the required fee(s), any deficiency, or credit any overpayment, to Deposit Account Number _____ (enclose an extra copy of this form).

Ericsson Inc. v. Dali Wireless Inc.
EX-1013 0081

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

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

NOTE: The Issue Fee and Publication Fee (if required) will not be accepted from anyone other than the applicant; a registered attorney or agent; or the assignee or other party in interest as shown by the records of the United States Patent and Trademark Office.

Authorized Signature _____ Date _____

Typed or printed name _____ Registration No. _____

This collection of information is required by 37 CFR 1.311. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 12 minutes to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, Virginia 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, Virginia 22313-1450.

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Ericsson, Inc. v. Dali Wireless, Inc.
EX-1013 0082

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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
13/211,243	08/16/2011	Paul Lemson	91172-821473(102300US)	3787

20350 7590 11/08/2013

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EXAMINER	
REGO, DOMINIC E	
ART UNIT	PAPER NUMBER
2647	

DATE MAILED: 11/08/2013

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

The Patent Term Adjustment to date is 184 day(s). If the issue fee is paid on the date that is three months after the mailing date of this notice and the patent issues on the Tuesday before the date that is 28 weeks (six and a half months) after the mailing date of this notice, the Patent Term Adjustment will be 184 day(s).

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 Customer Service Center of the Office of Patent Publication at 1-(888)-786-0101 or (571)-272-4200.

Ericsson Inc. v. Dali Wireless Inc.
EX-1013 0083

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

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

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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.

Notices of Allowance and Fee(s) Due mailed between October 1, 2013 and December 31, 2013

(Addendum to PTOL-85)

If the "Notice of Allowance and Fee(s) Due" has a mailing date on or after October 1, 2013 and before January 1, 2014, the following information is applicable to this application.

If the issue fee is being timely paid on or after January 1, 2014, the amount due is the issue fee and publication fee in effect January 1, 2014. On January 1, 2014, the issue fees set forth in 37 CFR 1.18 decrease significantly and the publication fee set forth in 37 CFR 1.18(d)(1) decreases to $0.

If an issue fee or publication fee has been previously paid in this application, applicant is not entitled to a refund of the difference between the amount paid and the amount in effect on January 1, 2014.

Notice of Allowability	Application No. 13/211,243	Applicant(s) LEMSON ET AL.	
	Examiner DOMINIC E. REGO	Art Unit 2647	AIA (First Inventor to File) Status No

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

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

1. ☒ This communication is responsive to *08/29/2013*.
   ☐ 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 *1 and 4-14*. 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 _____.

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DETAILED ACTION

Allowable Subject Matter

1. Claims 1 and 4-14 are allowed.

2. The examiner's reason for allowing the independent claim 1 is presented based on amended claim, updated search, and Applicant's Remarks filled on 08/29/2013.

Regarding claims 4-14, the claims are allowed as being dependent of claim 1, respectively.

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 DOMINIC E. REGO whose telephone number is (571)272-8132. The examiner can normally be reached on Monday-Friday, 9:00 am-5:30 pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Ping Y. Hsieh can be reached on 571-270-3011. 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.

/DOMINIC E REGO/
Primary Examiner, Art Unit 2647
Tel 571-272-8132

I hereby certify that this correspondence is being filed via EFS-Web with the United States Patent and Trademark Office on August 29, 2013.

KILPATRICK TOWNSEND & STOCKTON LLP

By: /Rosario G. Ysip/
Rosario G. Ysip

PATENT
Attorney Docket No.: 91172-821473-102300US
Client Ref. No.: DW-1023

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Application of:

Paul Lemson et al.

Application No.: 13/211,243

Filed: August 16, 2011

For: REMOTELY RECONFIGURABLE DISTRIBUTED ANTENNA SYSTEM AND METHODS

Customer No.: 20350

Confirmation No.: 3787

Examiner: Dominic E Rego

Technology Center/Art Unit: 2647

AMENDMENT

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

Commissioner:

In response to the Office Action mailed May 30, 2013, please enter the following amendments and remarks:

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

Remarks/Arguments begin on page 5 of this paper.

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Amendments to the Claims:

This listing of claims will replace all prior versions, and listings of claims in the application:

Listing of Claims:

1. (Currently Amended) A method for routing and switching ~~operator~~ RF signals comprising:

providing one or more remote radio units, each remote radio unit configured to ~~receive~~ transmit one or more downlink ~~radio frequencies~~ RF signals and to ~~transmit~~ receive one or more uplink ~~radio frequencies~~ RF signals[[,]];

providing at least one digital access unit configured to communicate with ~~at least some~~ the one or more remote radio units[[,]];

translating the uplink and downlink signals between RF and base band as appropriate[[,]];

packetizing the uplink and downlink base band signals, wherein the packetized signals correspond to a plurality of carriers; [[and]]

configuring each remote radio unit to receive or transmit a respective subset of the plurality of carriers, each respective subset of the plurality of carriers including a number of carriers;

reconfiguring each remote radio unit by:

determining a load percentage for each remote radio unit; and

increasing or decreasing the number of carriers in the respective subset of the plurality of carriers based on the load percentage; and

routing and switching the packetized signals among the one or more remote radio units [[and]] via the at least one digital access ~~units~~ unit according to a result of the reconfiguring.

2. - 3. (Canceled).

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4. (New) The method of claim 1 wherein each carrier corresponds to a respective RF band.

5. (New) The method of claim 1 wherein determining the load percentage comprises detecting which carriers are active for each remote radio unit.

6. (New) The method of claim 1 wherein the at least one digital access unit comprises a first digital access unit and a second digital access unit configured to communicate with each other via a first optical cable.

7. (New) The method of claim 6 wherein the one or more remote radio units comprise a first remote radio unit and a second remote radio unit, the first remote radio unit configured to communicate with the first digital access unit via a second optical cable, and the second remote radio unit configured to communicate with the second digital access unit via a third optical cable.

8. (New) The method of claim 7 wherein the first digital access unit is configured to communicate with a first base station, and the second digital access unit is configured to communicate with a second base station.

9. (New) The method of claim 8 wherein the first base station transmits or receives RF signals corresponding to a first number of carriers, and the second base station transmits or receives RF signals corresponding to a second number of carriers.

10. (New) The method of claim 9 wherein the first number of carriers and the second number of carriers correspond to different RF bands.

11. (New) The method of claim 9 wherein the first remote radio unit is configured to receive or transmit RF signals corresponding to one of the second number of carriers.

12. (New) The method of claim 9 wherein the second remote radio unit is configured to receive or transmit RF signals corresponding to one of the first number of carriers.

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13. (New) The method of claim 8 wherein the first base station and the second base station are associated with different wireless operators.

14. (New) The method of claim 8 wherein the first base station and the second base station are associated with a common wireless operator.

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REMARKS/ARGUMENTS

Claims 1 and 4-14 are pending upon entry of the present amendment. Claim 1 has been amended. Claims 2 and 3 were previously withdrawn from further consideration in response to a restriction requirement, and are canceled without prejudice by the present amendment. New claims 4-14 are added. No new matter has been added by the claim amendments or the new claims.

Claim 1 is rejected on the ground of nonstatutory obviousness-type double patenting as being unpatentable over claims 1, 10, and 18 of co-pending Application No. 13/211,247.

Claim 1 is rejected under 35 U.S.C. § 102(b) as being anticipated by Kilfoyle (U.S. 2002/0093926).

Double Patenting

Applicants submit a Terminal Disclaimer herewith to overcome the pending double patenting rejections. Accordingly, withdrawal of the of nonstatutory obviousness-type double patenting rejections is respectfully requested.

Claim Rejections -35 U.S.C. § 102

Claim 1 has been amended to recite, in part, "configuring each remote radio unit to receive or transmit a respective subset of the plurality of carriers, each respective subset of the plurality of carriers including a number of carriers; reconfiguring each remote radio unit by: determining a load percentage of each remote radio unit; and increasing or decreasing the number of carriers in the respective subset of the plurality of carriers based on the load percentage; and routing and switching the packetized signals among the one or more remote radio units via the at least one digital access unit according to a result of the reconfiguring." Applicants respectfully submit that Kilfoyle does not disclose or suggest at least the above-recited elements of amended claim 1.

As discussed in the specification, in an embodiment, the DAU monitoring module detects which carriers and corresponding time slots for each carrier are active for each RRU. If a particular carrier is loaded by a percentage greater than a predetermined threshold, the DAU

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management control module adaptively modifies the system configuration to deploy additional radio resources for use by a particular RRU that needs those radio resources within its coverage area. Similarly, the DAU management control module adaptively modifies the system configuration to remove radio resources initially allocated for use by a particular RRU that no longer needs those radio resources within its coverage area. (See the specification, paragraph [0052], and FIGS. 1, 2, and 7.)

Kilfoyle discusses a dual-scale, asymmetrical architecture for a wireless network. The architecture includes base stations (BSs) 730, at least one remote downlink transmitter (RDT) 740, and a router 720. The RDT 740 only supports downlink traffic, while the BSs 730 support both downlink and uplink traffic. (See Kilfoyle, paragraphs [0065-0067], and FIGS. 7 and 13.) In this architecture, the communication uplink is based on a macro-cellular system, and the communication downlink is based on a micro-cellular system. (See Kilfoyle, paragraph [0011].) The router 720 presents a single logical sector for all allowable downlink and uplink pairings. For example, one logical sector may be formed from a single BS sector. Another logical sector may be formed from an RDT-based downlink coupled with the uplink of a BS sector. (See Kilfoyle, paragraphs [0065-0067], and FIG. 8.)

Thus, Kilfoyle's system contrasts with the system recited in amended claim 1, which recites, in part, "configuring each remote radio unit ***to receive or transmit*** a respective subset of the plurality of carriers." (Emphasis Added.) Furthermore, Kilfoyle does not disclose or suggest "reconfiguring each remote radio unit by: determining a load percentage of each remote radio unit; and increasing or decreasing the number of carriers in the respective subset of the plurality of carriers based on the load percentage," as recited in amended claim 1.

Therefore, for at least these reasons, amended claim 1 is in condition for allowance.

Claims 4-14, which depend from amended claim 1, are in condition for allowance, for at least the reasons discussed in relation to claim 1, as well as for the additional elements they recite.

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CONCLUSION

In view of the foregoing, Applicants believe all claims now pending in this Application are in condition for allowance. The issuance of a formal Notice of Allowance at an early date is respectfully requested.

If the Examiner believes a telephone conference would expedite prosecution of this application, please contact the undersigned at 415-576-0200 or RLliu@kilpatricktownsend.com.

Respectfully submitted,

/Rong Liu/
Rong Liu
Registration No. 63,066

KILPATRICK TOWNSEND & STOCKTON, LLP
Two Embarcadero Center, Eighth Floor
San Francisco, CA 94111-3834
Tel: 415-576-0200
Attachment

CCL:R3L:rgy

65567110V.1

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PTO/SB/25 (06-11)
Approved for use through 07/31/2012. OMB 0651-0031
U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE
Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it displays a valid OMB control number.

TERMINAL DISCLAIMER TO OBVIATE A PROVISIONAL DOUBLE PATENTING REJECTION OVER A PENDING "REFERENCE" APPLICATION	Docket Number (Optional) 91172-821473-102300US

In re Application of: Paul Lemson

Application No. 13/211,243

Filed: August 16, 2011

For: REMOTELY RECONFIGURABLE DISTRIBUTED ANTENNA SYSTEM AND METHODS

The owner*, Dali Systems Co. Ltd., of one hundred percent interest in the instant application hereby disclaims, except as provided below, the terminal part of the statutory term of any patent granted on the instant application which would extend beyond the expiration date of the full statutory term of any patent granted on pending **reference** Application Number 13/211,247, filed on August 16, 2011, as such term is defined in 35 U.S.C. 154 and 173, and as the term of any patent granted on said **reference** application may be shortened by any terminal disclaimer filed prior to the grant of any patent on the pending **reference** application. The owner hereby agrees that any patent so granted on the instant application shall be enforceable only for and during such period that it and any patent granted on the **reference** application are commonly owned. This agreement runs with any patent granted on the instant application and is binding upon the grantee, its successors or assigns.

In making the above disclaimer, the owner does not disclaim the terminal part of any patent granted on the instant application that would extend to the expiration date of the full statutory term as defined in 35 U.S.C. 154 and 173 of any patent granted on said **reference** application, "as the term of any patent granted on said **reference** application may be shortened by any terminal disclaimer filed prior to the grant of any patent on the pending **reference** application," in the event that: any such patent: granted on the pending **reference** application: expires for failure to pay a maintenance fee, is held unenforceable, is found invalid by a court of competent jurisdiction, is statutorily disclaimed in whole or terminally disclaimed under 37 CFR 1.321, has all claims canceled by a reexamination certificate, is reissued, or is in any manner terminated prior to the expiration of its full statutory term as shortened by any terminal disclaimer filed prior to its grant.

Check either box 1 or 2 below, if appropriate.

1. ☐ For submissions on behalf of a business/organization (e.g., corporation, partnership, university, government agency, etc.), the undersigned is empowered to act on behalf of the business/organization.

I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code and that such willful false statements may jeopardize the validity of the application or any patent issued thereon.

2. ☒ The undersigned is an attorney of record. Reg. No. 63,066

/Rong Liu/ — Signature

August 29, 2013 — Date

Rong Liu — Typed or printed name

(415) 576-0200 — Telephone Number

☒ Terminal disclaimer fee under 37 CFR 1.20(d) is included.

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.

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

This collection of information is required by 37 CFR 1.321. 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 take12 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, VA22313-1450.**

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

I hereby certify that this correspondence is being filed via EFS-Web with the United States Patent and Trademark Office on August 28, 2013

KILPATRICK TOWNSEND & STOCKTON LLP

By: Rosario G. Ysip

PATENT
Attorney Docket No.: 91172-821473(102300US)
Client Ref. No.: DW-1023

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Application of:

Paul Lemson

Application No.: 13/211,243

Filed: August 16, 2011

For: REMOTELY RECONFIGURABLE DISTRIBUTED ANTENNA SYSTEM AND METHODS

Customer No.: 20350

Confirmation No.: 3787

Examiner: Dominic E. Rego

Technology Center/Art Unit: 2647

REQUEST TO CORRECT INVENTORSHIP UNDER 37 C.F.R. § 1.48(a)

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

Commissioner:

The applicant requests that the name of inventor Sasa Trajkovic be corrected. The error in inventor Trajkovic's name arose without the deceptive intent on his part or on the part of the other named inventors.

Pursuant to the provisions of 37 C.F.R. § 1.48(a), Applicant respectfully requests that the following inventor's name be corrected by deleting the middle name, Trajko, in the above-referenced patent application as follows:

Sasa ~~Trajko~~ Trajkovic, Burnaby, CANADA

Accompanying this Request are the following documents in support thereof:

1. Statement By Inventor Trajkovic

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2. Declaration by all inventors
3. Supplemental Application Data Sheet
4. Written Consent of Assignee
5. Statement Under 37 CFR 3.73(b)
6. Request to Correct Filing Receipt

Applicant believes that the processing fee for correcting inventorship in a patent application is $130.00 (37 C.F.R. 1.17(i)). However, if any additional fee is required for this submission, the Commissioner is authorized to charge Deposit Account No. 20-1430.

If the Office believes a telephone conference would expedite processing of this Request, please telephone the undersigned at (415) 273-4372.

Respectfully submitted,

Rong Liu
Registration No. 63,066

KILPATRICK TOWNSEND & STOCKTON LLP
Two Embarcadero Center, Eighth Floor
San Francisco, California 94111-3834
Tel: 415 576 0200
Fax: 415 576 0300

Attachments

65458417V.1

Ericsson Inc. v. Dali Wireless Inc.
EX-1013 0098

I hereby certify that this correspondence is being filed via EFS-Web with the United States Patent and Trademark Office on Aug 28, 2013

KILPATRICK TOWNSEND & STOCKTON LLP

By: Rosario D. Isip

PATENT
Attorney Docket No.: 91172-821473(102300US)
Client Ref. No.: DW-1023

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Application of:

Paul Lemson

Application No.: 13/211,243

Filed: August 16, 2011

For: REMOTELY RECONFIGURABLE DISTRIBUTED ANTENNA SYSTEM AND METHODS

Customer No.: 20350

Confirmation No.: 3787

Examiner: Dominic E. Rego

Technology Center/Art Unit: 2647

STATEMENT OF SASA TRAJKOVIC UNDER 37 C.F.R. § 1.48(a)(2)

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

Commissioner:

I, Sasa Trajkovic, residing in Burnaby, Canada, do hereby state that the error in my name as filed in the above-identified non-provisional patent application was inadvertent and without deceptive intention.

Dated: Aug 16, 2013

By: Sasa Trajkovic

65470593V.1

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EX-1013 0099

Doc Code: Oath
Document Description: Oath or declaration filed

PTO/SB/01 (09-12)
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 contains a valid OMB control number.

DECLARATION FOR UTILITY OR DESIGN PATENT APPLICATION (37 CFR 1.63)

☐ Declaration Submitted With Initial Filing OR ■ Declaration Submitted After Initial Filing (surcharge (37 CFR 1.16(f)) required)

Attorney Docket Number	91172-821473(102300US)
First Named Inventor	Paul Lemson
COMPLETE IF KNOWN	
Application Number	13/211,243
Filing Date	08/16/2011
Art Unit	2647
Examiner Name	Dominic E. Rego

I hereby declare that: (1) Each inventor's residence, mailing address, and citizenship are as stated below next to their name; and (2) I believe the inventor(s) named below to be the original and first inventor(s) of the subject matter which is claimed and for which a patent is sought on the invention titled:

REMOTELY RECONFIGURABLE DISTRIBUTED ANTENNA SYSTEM AND METHODS

(Title of the Invention)

the application of which was made or was authorized to be made by me and

☐ is attached hereto

OR

☒ was filed on (MM/DD/YYYY) 08/16/2011 as United States Application Number or PCT International Application Number 13/211,243 and was amended on (MM/DD/YYYY) 12/09/2011 and 05/28/2013 (if applicable).

I hereby state that I have reviewed and understand the contents of the above identified application, including the claims, as amended by any amendment specifically referred to above.

I acknowledge the duty to disclose information which is material to patentability as defined in 37 CFR 1.56, including for continuation-in-part applications, material information which became available between the filing date of the prior application and the national or PCT international filing date of the continuation-in-part application.

Authorization To Permit Access To Application by Participating Offices

☐ If 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 World Intellectual Property Office (WIPO), and any other intellectual property offices in which a foreign application claiming priority to the above-identified patent application is filed access to the above-identified patent application. See 37 CFR 1.14(c) and (h). This box should not be checked if the applicant does not wish the EPO, JPO, KIPO, WIPO, or other intellectual property office in which a foreign application claiming priority to the above-identified patent application is filed to have access to the above-identified patent application.

In accordance with 37 CFR 1.14(h)(3), access will be provided to a copy of the above-identified patent application with respect to: 1) the above-identified patent application-as-filed; 2) any foreign application to which the above-identified patent application claims priority under 35 U.S.C. 119(a)-(d) if a copy of the foreign application that satisfies the certified copy requirement of 37 CFR 1.55 has been filed in the above-identified patent application; and 3) any U.S. application-as-filed from which benefit is sought in the above-identified patent application.

In accordance with 37 CFR 1.14(c), access may be provided to information concerning the date of filing the Authorization to Permit Access to Application by Participating Offices.

This collection of information is required by 35 U.S.C. 115 and 37 CFR 1.63. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.11 and 1.14. This collection is estimated to take 21 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.

DECLARATION — Utility or Design Patent Application

Claim of Foreign Priority Benefits

I hereby claim foreign priority benefits under 35 U.S.C. 119(a)-(d) or (f), or 365(b) of any foreign application(s) for patent, inventor's or plant breeder's rights certificate(s), or 365(a) of any PCT international application which designated at least one country other than the United States of America, listed below and have also identified below, by checking the box, any foreign application for patent, inventor's or plant breeder's rights certificate(s), or any PCT international application having a filing date before that of the application on which priority is claimed.

Prior Foreign Application Number(s)	Country	Foreign Filing Date (MM/DD/YYYY)	Priority Not Claimed	Certified Copy Attached? YES	NO
			☐	☐	☐
			☐	☐	☐
			☐	☐	☐
			☐	☐	☐

☐ Additional foreign application number(s) are listed on a supplemental priority data sheet PTO/SB/02B attached hereto.

PTO/SB/01 (09-12)
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DECLARATION — Utility or Design Patent Application

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Address		
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Country	Telephone	Email

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.

I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under 18 U.S.C. 1001 and that such willful false statements may jeopardize the validity of the application or any patent issued thereon.

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.

NAME OF SOLE OR FIRST INVENTOR:	☐ A petition has been filed for this unsigned inventor
Given Name (first and middle [if any])	Family Name or Surname
Paul	Lemson
Inventor's Signature	Date
	8-16-12

Residence: City	State	Country	Citizenship
Woodinville	WA	US	US

Mailing Address			
20208 NE 160th Street			
City	State	Zip	Country
Woodinville	WA	98077	US

☐ Additional inventors or a legal representative are being named on the _____ supplemental sheet(s) PTO/SB/02A or 02LR attached hereto

PTO/SB/02A (07-07)
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DECLARATION

ADDITIONAL INVENTOR(S)
Supplemental Sheet

Name of Additional Joint Inventor, if any:	☐ A petition has been filed for this unsigned inventor		
Given Name (first and middle (if any))	Family Name or Surname		
Shawn Patrick	STAPLETON		
Inventor's Signature			Date August 16, 2013
Burnaby Residence: City	BC State	CA Country	CA Citizenship
7991 Woodhurst Drive Mailing Address			
Burnaby City	BC State	V5A 4C6 Zip	CA Country

Name of Additional Joint Inventor, if any:	☐ A petition has been filed for this unsigned inventor		
Given Name (first and middle (if any))	Family Name or Surname		
Sasa	TRAJKOVIC		
Inventor's Signature			Date August 16, 2013
Burnaby Residence: City	BC State	CA Country	CA Citizenship
4238 Southwood Street Mailing Address			
Burnaby City	BC State	V5J 2E9 Zip	CA Country

Name of Additional Joint Inventor, if any:	☐ A petition has been filed for this unsigned inventor		
Given Name (first and middle (if any))	Family Name or Surname		
Albert S.	LEE		
Inventor's Signature			Date August 16, 2013
San Mateo Residence: City	CA State	US Country	US Citizenship
101 Lakewood Circle Mailing Address			
San Mateo City	CA State	94402 Zip	US Country

This collection of information is required by 35 U.S.C. 115 and 37 CFR 1.63. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.11 and 1.14. This collection is estimated to take 21 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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DECLARATION – Supplemental Priority Data Sheet

Foreign applications:

Prior Foreign Application Number(s)	Country	Foreign Filing Date (MM/DD/YYYY)	Priority Not Claimed	Certified Copy Attached? YES	NO
			☐	☐	☐
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			☐	☐	☐

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Application Data Sheet 37 CFR 1.76	Attorney Docket Number	91172-821473(102300US)
	Application Number	13/211,243
Title of Invention	REMOTELY RECONFIGURABLE DISTRIBUTED ANTENNA SYSTEM AND METHODS	

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.)

Applicant Information:

Applicant 1

Applicant Authority ◉ Inventor ○ Legal Representative under 35 U.S.C. 117 ○ Party of Interest under 35 U.S.C. 118

Prefix	Given Name	Middle Name	Family Name	Suffix
	Paul		LEMSON	

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

City	Woodinville	State/Province	WA	Country of Residence	US

Citizenship under 37 CFR 1.41(b) US

Mailing Address of Applicant:

Address 1	20208 NE 106th Street		
Address 2			
City	Woodinville	State/Province	WA
Postal Code	90877	Country	US

Applicant 2

Applicant Authority ◉ Inventor ○ Legal Representative under 35 U.S.C. 117 ○ Party of Interest under 35 U.S.C. 118

Prefix	Given Name	Middle Name	Family Name	Suffix
	Shawn	Patrick	STAPLETON	

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

City	Burnaby	Country Of Residence	CA

Citizenship under 37 CFR 1.41(b) CA

Mailing Address of Applicant:

Address 1	7991 Woodhurst Drive		
Address 2			
City	Burnaby	State/Province	BC
Postal Code	V5A 4C6	Country	CA

Applicant 3

Applicant Authority ◉ Inventor ○ Legal Representative under 35 U.S.C. 117 ○ Party of Interest under 35 U.S.C. 118

Prefix	Given Name	Middle Name	Family Name	Suffix
	Sasa	~~Trajko~~	TRAJKOVIC	

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

City	Burnaby	Country Of Residence	CA

Ericsson Inc. v. Dali Wireless Inc.
EX-1013 0105

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Application Data Sheet 37 CFR 1.76	Attorney Docket Number	91172-821473(102300US)
	Application Number	13/211,243
Title of Invention	REMOTELY RECONFIGURABLE DISTRIBUTED ANTENNA SYSTEM AND METHODS	

Citizenship under 37 CFR 1.41(b)	CA		
Mailing Address of Applicant:			
Address 1	4238 Southwood Street		
Address 2			
City	Burnaby	**State/Province**	BC
Postal Code	V5J 2E9	**Country**	CA

Applicant 4

Applicant Authority (•) Inventor ( ) Legal Representative under 35 U.S.C. 117 ( ) Party of Interest under 35 U.S.C. 118

Prefix	Given Name	Middle Name	Family Name	Suffix
	Albert	S.	LEE	

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

City	San Mateo	**State/Province**	CA	**Country of Residence**	US
Citizenship under 37 CFR 1.41(b)	US				

Mailing Address of Applicant:			
Address 1	101 Lakewood Circle		
Address 2			
City	San Mateo	**State/Province**	CA
Postal Code	94402	**Country**	US

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

Correspondence Information:

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

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

Customer Number	20350		
Email Address		Add Email	Remove Email

Application Information:

Title of the Invention	REMOTELY RECONFIGURABLE DISTRIBUTED ANTENNA SYSTEM AND METHODS		
Attorney Docket Number	91172-821473(102300US)	**Small Entity Status Claimed**	☒
Application Type	Nonprovisional		
Subject Matter	Utility		
Suggested Class (if any)		**Sub Class (if any)**	
Suggested Technology Center (if any)			
Total Number of Drawing Sheets (if any)	7	**Suggested Figure for Publication (if any)**	

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Application Data Sheet 37 CFR 1.76	Attorney Docket Number	91172-821473(102300US)
	Application Number	13/211,243
Title of Invention	REMOTELY RECONFIGURABLE DISTRIBUTED ANTENNA SYSTEM AND METHODS	

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).
Enter either Customer Number or complete the Representative Name section below. If both sections are completed the Customer Number will be used for the Representative Information during processing.

Please Select One:	◉ Customer Number	○ US Patent Practitioner	○ Limited Recognition (37 CFR 11.9)
Customer Number	20350		

Domestic Benefit/National Stage Information:

This section allows for the applicant to either claim benefit under 35 U.S.C. 119(e), 120, 121, or 365(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)(2) or CFR 1.78(a)(4), and need not otherwise be made part of the specification.

Prior Application Status	Expired		Remove
Application Number	Continuity Type	Prior Application Number	Filing Date (YYYY-MM-DD)
	non provisional of	61382836	2010-09-14

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

Foreign Priority Information:

This section allows for the applicant to claim benefit of foreign priority and to identify any prior foreign application for which priority is not claimed. 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(a).

Remove

Application Number	Country	Parent Filing Date (YYYY-MM-DD)	Priority Claimed
			◉ Yes ○ No

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

Assignee Information:

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.

Assignee 1

Ericsson Inc. v. Dali Wireless Inc.
EX-1013 0107

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Application Data Sheet 37 CFR 1.76	Attorney Docket Number	91172-821473(102300US)
	Application Number	13/211,243
Title of Invention	REMOTELY RECONFIGURABLE DISTRIBUTED ANTENNA SYSTEM AND METHODS	

If the Assignee is an Organization check here. ☒			
Organization Name	Dali Systems Co. Ltd.		
Mailing Address Information:			
Address 1	Offices of Maples Corporate Services Limited		
Address 2	P. O. Box 309GT, Ugland House South Church Street		
City	George Town Grand Cayman	**State/Province**	
Country	~~KY~~ CAYMAN	Postal Code	KY1-1104
Phone Number		Fax Number	
Email Address			
Additional Assignee Data may be generated within this form by selecting the **Add** button.			

Signature:

A signature of the applicant or representative is required in accordance with 37 CFR 1.33 and 10.18. Please see 37 CFR 1.4(d) for the form of the signature.					
Signature	Rong Liu			Date (YYYY-MM-DD)	2013-08-28
First Name	Rong	Last Name	Liu	Registration Number	63066

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

I hereby certify that this correspondence is being filed via EFS-Web with the United States Patent and Trademark Office on Aug. 28, 2013

KILPATRICK TOWNSEND & STOCKTON LLP

By: Rosann E. Lyons

PATENT
Attorney Docket No.: 91172-821473(102300US)
Client Ref. No.: DW-1023

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Application of:

Paul Lemson

Application No.: 13/211,243

Filed: August 16, 2011

For: REMOTELY RECONFIGURABLE DISTRIBUTED ANTENNA SYSTEM AND METHODS

Customer No.: 20350

Confirmation No.: 3787

Examiner: Dominic E. Rego

Technology Center/Art Unit: 2647

WRITTEN CONSENT OF ASSIGNEE TO CHANGE INVENTORSHIP UNDER 37 C.F.R. § 1.48(a)(5)

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

Commissioner:

I, Albert S. Lee, on behalf of Dali Systems Co. Ltd., the assignee of interest in U.S. Patent Application Serial No. 13/211,243, as established in a Statement under 37 C.F.R. § 3.73(b), filed with the above-referenced application, consent to the correction of inventorship of U.S. Patent Application No. 13/211,243 so as to update inventor Trajkovic's name.

Dali Systems Co. Ltd.

Dated: August 23, 2013

By: Albert S. Lee

Name: Albert S. Lee
Title: Chief Executive Officer

65470361V.1

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

Applicant/Patent Owner: Paul Lemson

Application No./Patent No.: 13/211,243 Filed/Issue Date: August 16, 2011

Titled: REMOTELY RECONFIGURABLE DISTRIBUTED ANTENNA SYSTEM AND METHODS

DALI SYSTEMS CO. LTD. a corporation
(Name of Assignee) (Type of Assignee, e.g., corporation, partnership, university, government agency, etc.)

states that it is:

1. ☒ the assignee of the entire right, title, and interest in;
2. ☐ an assignee of less than the entire right, title, and interest in
   (The extent (by percentage) of its ownership interest is %); or
3. ☐ the assignee of an undivided interest in the entirety of (a complete assignment from one of the joint inventors was made)

the patent application/patent identified above, by virtue of either:

A. ☒ An assignment from the inventor(s) of the patent application/patent identified above. The assignment was recorded in the United States Patent and Trademark Office at Reel 031057, Frame 0546, or for which a copy therefore is attached.

OR

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

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

☐ Additional documents in the chain of title are listed on a supplemental sheet.

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

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

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

Rong Liu	August 28, 2013
Signature	Date
Rong Liu, Reg. No. 63,066	Patent Scientist/Engineer
Printed or Typed Name	Title

This collection of information is required by 37 CFR 3.73(b). The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.11 and 1.14. This collection is estimated to take 12 minutes to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

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United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
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Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
13/211,243	08/16/2011	Paul Lemson	91172-821473(102300US)	3787

20350 7590 05/30/2013

KILPATRICK TOWNSEND & STOCKTON LLP
TWO EMBARCADERO CENTER
EIGHTH FLOOR
SAN FRANCISCO, CA 94111-3834

EXAMINER	
REGO, DOMINIC E	

ART UNIT	PAPER NUMBER
2647	

NOTIFICATION DATE	DELIVERY MODE
05/30/2013	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):

ipefiling@kilpatricktownsend.com
jlhice@kilpatrick.foundationip.com
mcollins@kilpatricktownsend.com

Ericsson Inc. v. Dali Wireless Inc.
EX-1013 0111

Office Action Summary	Application No. 13/211,243	Applicant(s) LEMSON ET AL.	
	Examiner DOMINIC E. REGO	Art Unit 2647	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* MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, 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 *16 August 2011*.

☐ 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) *1-3* is/are pending in the application.

5a) Of the above claim(s) *2 and 3* is/are withdrawn from consideration.

6)☐ Claim(s) _____ is/are allowed.

7)☒ Claim(s) *1* 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 *16 August 2011* 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.

Interim copies:

a)☐ All b)☐ Some c)☐ None of the: Interim copies of the priority documents have been received.

Attachment(s)

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

2) ☒ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.

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

4) ☐ Other: _____.

DETAILED ACTION

Double Patenting

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

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

Effective January 1, 1994, a registered attorney or agent of record may sign a terminal disclaimer. A terminal disclaimer signed by the assignee must fully comply with 37 CFR 3.73(b).

2. Claim 1 is rejected on the ground of nonstatutory obviousness-type double patenting as being unpatentable over claims 1, 10, and 18 of co-pending application #13/211,247. Although the conflicting claims are not identical, they are not patentably distinct from each other.

Claim Rejections - 35 USC § 102

3. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –

> (e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

4. Claim 1 is rejected under 35 U.S.C. 102(b) as being anticipated by Kilfoyle (US Pub. No. 2002/0093926).

Regarding claim 1, Kilfoyle teaches a method for routing and switching operator RF signals comprising

providing one or more remote radio units *(See abstract; Paragraphs [0015] and [0065], the remote downlink transmitter (RDT) depicted in FIG. 13 teaches the limitation of "remote radio unit" in the instant application)*, each configured to receive one or more downlink radio frequencies and to transmit one or more uplink radio frequencies (Paragraphs [0065]-[0067]),

providing at least one digital access unit configured to communicate with at least some remote radio units (Paragraphs [0065]- [0067]),

translating the uplink and downlink signals between RF and base band as appropriate (Paragraphs [0065]- [0067]), packetizing the uplink and downlink base band signals (Paragraphs [0065]- [0067]), and routing and switching the packetized signals among the one or more radio units and the at least one digital access units (Paragraph [0066]).

Conclusion

5. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure. Francos et al. (US Pub. No. 2010/0087227), Wu et al. (US Pub. No. 2007/0177552), Mao et al. (US Pub. No. 2005/0206564), Morrison et al. (US Patent #7,855,977).

Any inquiry concerning this communication or earlier communications from the examiner should be directed to DOMINIC E. REGO whose telephone number is (571)272-8132. The examiner can normally be reached on Monday-Friday, 9:00 am-5:30 pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Andrew Wendell can be reached on 571-272-0557. 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.

/DOMINIC E REGO/
Primary Examiner, Art Unit 2647
Tel 571-272-8132

I hereby certify that this correspondence is being filed via EFS-Web with the United States Patent and Trademark Office on May 28, 2013.

KILPATRICK TOWNSEND & STOCKTON LLP

By: /Rosario G. Ysip/
Rosario G. Ysip

PATENT
Attorney Docket No.: 91172-821473-102300US
Client Ref. No.: DW-1023

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Application of:	Confirmation No.: 3787
Paul Lemson	Examiner: Dominic E Rego
Application No.: 13/211,243	Technology Center/Art Unit: 2647
Filed: Aug 16, 2011	
For: REMOTELY RECONFIGURABLE DISTRIBUTED ANTENNA SYSTEM AND METHODS	PRELIMINARY AMENDMENT
Customer No.: 20350	

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

Commissioner:

Prior to examination of the above-identified application, please enter the following amendments and remarks:

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

Remarks/Arguments begin on page 4 of this paper.

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Amendments to the Claims:

This listing of claims will replace all prior versions, and listings of claims in the application:

Listing of Claims:

1. (Currently Amended) A method for routing and switching operator RF signals comprising

providing one or more remote radio units, each remote radio unit configured to receive one or more downlink radio frequencies and to transmit one or more uplink radio frequencies,

providing at least one digital access unit configured to communicate with at least some of the one or more remote radio units,

translating the uplink and downlink signals between RF and base band ~~as appropriate~~,

packetizing the uplink and downlink base band signals, and

routing and switching the packetized signals among the one or more remote radio units [[and]] via the at least one digital access ~~units~~ unit.

2. - 3. (Canceled).

4. (New) The method of claim 1 wherein the packetized signals comprise a plurality of carriers, each carrier corresponding to a respective RF bandwidth.

5. (New) The method of claim 4 wherein routing and switching the packetized signals comprises configuring each remote radio unit to receive or transmit a subset of the plurality of carriers, the subset including a number of carriers.

6. (New) The method of claim 5 wherein configuring each remote radio unit comprises:

determining a load percentage for each remote radio unit, and

increasing or decreasing the number of carriers in the subset of the plurality of carriers based on the load percentage.

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7. (New) The method of claim 6 wherein determining the load percentage comprises detecting which carriers are active for each remote radio unit.

8. (New) The method of claim 4 wherein the at least one digital access unit comprises a plurality of digital access units, and the one or more remote radio units comprises a plurality of remote radio units, the plurality of digital access units being configured to communicate with each other, and each digital access unit being configured to communicate with a respective subset of the plurality of remote radio units.

9. (New) The method of claim 8 wherein routing and switching the packetized signals comprises routing and switching a respective subset of the plurality carriers via a corresponding digital access unit.

10. (New) The method of claim 9 wherein each digital access unit is configured to communicate with a respective one of a plurality of base stations.

11. (New) The method of claim 10 wherein each of the plurality of base stations is associated with a different wireless operator.

12. (New) The method of claim 10 wherein each of the plurality of base stations is associated with a same wireless operator.

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REMARKS/ARGUMENTS

Claims 1, 4-12 are pending upon entry of the present amendment. Claim 1 has been amended. Claims 2 and 3 are canceled without prejudice. New claims 4-12 are added. No new matter has been added by the claim amendments or the new claims.

CONCLUSION

In view of the foregoing, Applicant believes all claims now pending in this Application are in condition for allowance. The issuance of a formal Notice of Allowance at an early date is respectfully requested.

If the Examiner believes a telephone conference would expedite prosecution of this application, please telephone the undersigned at 415-273-4372.

Respectfully submitted,

/Rong Liu/

Rong Liu
Registration No. 63,066

KILPATRICK TOWNSEND & STOCKTON LLP
Two Embarcadero Center, Eighth Floor
San Francisco, California 94111-3834
Tel: 415-576-0200
Fax: 415 576 0300
R3L/rgy

65443609V.1

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I hereby certify that this correspondence is being filed via EFS-Web with the United States Patent and Trademark Office on December 9, 2011.

KILPATRICK TOWNSEND & STOCKTON LLP

By: /Joni E. Peterson/
Joni E. Peterson

PATENT
Attorney Docket No.: 91172-821473(102300US)
Client Reference No.: DW-1023U

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re application of:	Confirmation No. 3787
Lemson et al.	Examiner: Maung, Nay Aung
Application No.: 13/211,243	Technology Center/Art Unit: 2618
Filed: August 16, 2011	PRELIMINARY AMENDMENT
For: REMOTELY RECONFIGURABLE DISTRIBUTED ANTENNA SYSTEMS AND METHODS	
Customer No.: 20350	

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

Commissioner:

Prior to examination of the above-referenced application, please enter the following amendments and remarks:

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

Remarks/Arguments begin on page 5 of this paper.

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Amendments to the Specification:

Please replace paragraph [001] with the following amended paragraph:

[001] This application claims the benefit of U.S. Patent Application S.N. 61/382,836, filed on September 14, 2010, entitled REMOTELY RECONFIGURABLE DISTRIBUTED ANTENNA SYSTEM AND METHODS, which is hereby incorporated by reference for all purposes. ~~the following U.S. Patent applications, all of which are incorporated herein by reference:~~

~~Serial Number~~	~~Filing Date~~	~~Title~~
~~60/877,035~~	~~12/26/2006~~	~~Method For Baseband Predistortion Linearization in Multi-Channel Wideband Communication Systems~~
~~60/925,603~~	~~4/23/2007~~	~~Digital Hybrid Mode Power Amplifier System~~
~~60/925,577~~	~~4/23/2007~~	~~N-Way Doherty Distributed Power Amplifier~~
~~61/012,416~~	~~12/8/2007~~	~~Baseband Derived RF Digital Predistortion~~
~~11/961,969~~	~~12/20/2007~~	~~A Method for Baseband Predistortion Linearization in Multi-Channel Wideband Communication Systems~~
~~61/041,164~~	~~3/31/2008~~	~~An Efficient Peak Cancellation Method for Reducing The Peak-To-Average Power Ratio in Wideband Communication Systems~~
~~12/108,502~~	~~4/23/2008~~	~~Digital Hybrid Mode Power Amplifier System~~
~~61/172,642~~	~~4/24/2009~~	~~Remotely Reconfigurable Power Amplifier System~~
~~12/603,419~~	~~10/21/2009~~	~~N-Way Doherty Distributed Power Amplifier with Power Tracking~~

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~~61/288,838~~	~~12/21/2009~~	~~Multi-Band Wideband Power Amplifier Digital Predistortion System and Method~~
~~61/288,840~~	~~12/21/2009~~	~~Remote Radio Head Unit System with Wideband Power Amplifier and Metho~~
~~61/288,844~~	~~12/21/2009~~	~~Modulation Agnostic Digital Hybrid Mode Power Amplifier System and Method~~
~~61/288,847~~	~~12/21/2009~~	~~High Efficiency, Remotely Reconfigurable Remote Radio Head Unit System and Method for Wireless Communications~~
~~12/767,669~~	~~4/24/2010~~	~~Remotely Reconfigurable Power Amplifier System and Metho~~
~~61/374,593~~	~~8/17/2010~~	~~Neutral Host Architecture for a Distributed Antenna System~~
~~61/382,836~~	~~9/14/2010~~	~~Remotely Reconfigurable Distributed Antenna System and Methods~~
~~12/928,931~~	~~12/21/2010~~	~~Modulation Agnostic Digital Hybrid Mode Power Amplifier System and Method~~
~~12/928,933~~	~~12/21/2010~~	~~Remote Radio Head Unit System with Wideband Power Amplifier and Method~~
~~12/928,934~~	~~12/21/2010~~	~~Multi-Band Wideband Power Amplifier Digital Predistortion System and Method~~
~~12/928,943~~	~~12/21/2010~~	~~High Efficiency, Remotely Reconfigurable Remote~~

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		~~Radio Head Unit System and Method~~
~~61/439,940~~	~~2/7/2011~~	~~Daisy Chained Ring of Remote Units for a Distributed Antenna System~~
~~[not assigned yet]~~	~~8/16/2011~~	~~Neutral Host Architecture for a Distributed Antenna System~~
~~[not assigned yet]~~	~~8/16/2011~~	~~Remotely Reconfigurable Distributed Antenna System and Methods~~
~~[not assigned yet]~~	~~8/16/2011~~	~~Daisy Chained Ring of Remote Units for a Distributed Antenna System~~

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REMARKS/ARGUMENTS

The specification has been amended to correct clerical errors in the originally filed priority information. As indicated in the amended specification and the Supplemental Application Data Sheet being filed herewith, the application claims priority to U.S. Provisional Patent Application No: 61/382,836, filed on September 14, 2010.

CONCLUSION

Applicants believe all claims now pending in this Application are in condition for allowance. The issuance of a formal Notice of Allowance at an early date is respectfully requested.

Respectfully submitted,

/Craig C. Largent/
Craig C. Largent
Reg. No. 56,400

KILPATRICK TOWNSEND & STOCKTON LLP
Two Embarcadero Center, Eighth Floor
San Francisco, California 94111-3834
Tel: 650-326-2400
Fax: 415-576-0300
63843520 v1

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IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

APPLICATION

FOR

UNITED STATES PATENT

FOR

REMOTELY RECONFIGURABLE DISTRIBUTED ANTENNA SYSTEM AND METHODS

INVENTORS

Paul LEMSON, Woodinville, Washington, Citizen of the United States

Shawn Patrick STAPLETON, Burnaby, British Columbia, Citizen of Canada

Sasa TRAJKOVIC, Burnaby, British Columbia, Citizen of Canada

Albert S. LEE, San Mateo, California, Citizen of the United States

SPECIFICATION

RELATED APPLICATIONS

[001] This application claims the benefit of the following U.S. Patent applications, all of which are incorporated herein by reference:

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Serial Number	Filing Date	Title
60/877,035	12/26/2006	Method For Baseband Predistortion Linearization in Multi-Channel Wideband Communication Systems
60/925,603	4/23/2007	Digital Hybrid Mode Power Amplifier System
60/925,577	4/23/2007	N-Way Doherty Distributed Power Amplifier
61/012,416	12/8/2007	Baseband Derived RF Digital Predistortion
11/961,969	12/20/2007	A Method for Baseband Predistortion Linearization in Multi-Channel Wideband Communication Systems
61/041,164	3/31/2008	An Efficient Peak Cancellation Method For Reducing The Peak-To-Average Power Ratio in Wideband Communication Systems
12/108,502	4/23/2008	Digital Hybrid Mode Power Amplifier System
61/172,642	4/24/2009	Remotely Reconfigurable Power Amplifier System
12/603,419	10/21/2009	N-Way Doherty Distributed Power Amplifier with Power Tracking
61/288,838	12/21/2009	Multi-Band Wideband Power Amplifier Digital Predistortion System and Method

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61/288,840	12/21/2009	Remote Radio Head Unit System with Wideband Power Amplifier and Method
61/288,844	12/21/2009	Modulation Agnostic Digital Hybrid Mode Power Amplifier System and Method
61/288,847	12/21/2009	High Efficiency, Remotely Reconfigurable Remote Radio Head Unit System and Method for Wireless Communications
12/767,669	4/26/2010	Remotely Reconfigurable Power Amplifier System and Method
61/374,593	8/17/2010	Neutral Host Architecture for a Distributed Antenna System
61/382,836	9/14/2010	Remotely Reconfigurable Distributed Antenna System and Methods
12/928,931	12/21/2010	Modulation Agnostic Digital Hybrid Mode Power Amplifier System and Method
12/928,933	12/21/2010	Remote Radio Head Unit System with Wideband Power Amplifier and Method
12/928,934	12/21/2010	Multi-Band Wideband Power Amplifier Digital Predistortion System and Method

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12/928,943	12/21/2010	High Efficiency, Remotely Reconfigurable Remote Radio Head Unit System and Method for Wireless Communications
61/439,940	2/7/2011	Daisy Chained Ring of Remote Units for a Distributed Antenna System
[not assigned yet]	8/16/2011	Neutral Host Architecture for a Distributed Antenna System
[not assigned yet]	8/16/2011	Remotely Reconfigurable Distributed Antenna System and Methods
[not assigned yet]	8/16/2011	Daisy Chained Ring of Remote Units for a Distributed Antenna System

FIELD OF THE INVENTION

[002] The present invention generally relates to wireless communication systems employing Distributed Antenna Systems (DAS) as part of a distributed wireless network. More specifically, the present invention relates to a DAS utilizing software defined radio (SDR).

BACKGROUND OF THE INVENTION

[003] Wireless and mobile network operators face the continuing challenge of building networks that effectively manage high data-traffic growth rates.

Mobility and an increased level of multimedia content for end users requires end-to-end network adaptations that support both new services and the increased demand for broadband and flat-rate Internet access. One of the most difficult challenges faced by network operators is caused by the physical movement of subscribers from one location to another, and particularly when wireless subscribers congregate in large numbers at one location. A notable example is a business enterprise facility during lunchtime, when a large number of wireless subscribers visit a cafeteria location in the building. At that time, a large number of subscribers have moved away from their offices and usual work areas. It's likely that during lunchtime there are many locations throughout the facility where there are very few subscribers. If the indoor wireless network resources were properly sized during the design process for subscriber loading as it is during normal working hours when subscribers are in their normal work areas, it is very likely that the lunchtime scenario will present some unexpected challenges with regard to available wireless capacity and data throughput.

[004] To accommodate this variation in subscriber loading, there are several candidate prior art approaches.

[005] One approach is to deploy many low-power high-capacity base stations throughout the facility. The quantity of base stations is determined based on the coverage of each base station and the total space to be covered. Each of these base stations is provisioned with enough radio resources, i.e., capacity and broadband data throughput to accommodate the maximum subscriber loading which occurs during the course of the workday and work week. Although this approach typically yields a high quality of service, the notable disadvantage of this approach is that during a major part of the time many of the base stations' capacity is being wasted. Since a typical indoor

wireless network deployment involves capital and operational costs which are assessed on a per-subscriber basis for each base station, the typically high total life cycle cost for a given enterprise facility is far from optimal.

[006] A second candidate approach involves deployment of a DAS along with a centralized group of base stations dedicated to the DAS. A conventional DAS deployment falls into one of two categories. The first type of DAS is "fixed", where the system configuration doesn't change based on time of day or other information about usage. The remote units associated with the DAS are set up during the design process so that a particular block of base station radio resources is thought to be enough to serve each small group of DAS remote units. A notable disadvantage of this approach is that most enterprises seem to undergo frequent re-arrangements and re-organizations of various groups within the enterprise. Therefore, it's highly likely that the initial setup will need to be changed from time to time, requiring deployment of additional staff and contract resources with appropriate levels of expertise regarding wireless networks.

[007] The second type of DAS is equipped with a type of network switch which allows the location and quantity of DAS remote units associated with any particular centralized base station to be changed manually. Although this approach would seem to allow dynamic reconfiguration based on the needs of the enterprise or based on time of day, it frequently requires deployment of additional staff resources for real-time management of the network. Another issue is that it's not always correct or best to make the same DAS remote unit configuration changes back and forth on each day of the week at the same times of day. Frequently it is difficult or impractical for an enterprise IT manager to monitor the subscriber loading on each base station. And it is almost certain

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that the enterprise IT manager has no practical way to determine the loading at a given time of day for each DAS remote unit; they can only guess.

[008] Another major limitation of prior art DAS deployments is related to their installation, commissioning and optimization process. Some challenging issues which must be overcome include selecting remote unit antenna locations to ensure proper coverage while minimizing downlink interference from outdoor macro cell sites, minimizing uplink interference to outdoor macro cell sites, and ensuring proper intra-system handovers while indoors and while moving from outdoors to indoors (and vice-versa). The process of performing such deployment optimization is frequently characterized as trial-and-error and as such, the results may not be consistent with a high quality of service.

[009] A major limitation of prior art DAS equipment employing digital transmission links such as optical fiber or wired Ethernet is the fact that the prior-art RF-to-digital conversion techniques utilize an approach whereby the system converts a single broad RF bandwidth of e.g., 10 to 25 MHz to digital. Therefore all the signals, whether weak or strong, desired or undesired, contained within that broad bandwidth are converted to digital, whether those signals are desired or not. This approach frequently leads to inefficiencies within the DAS which limit the DAS network capacity. It would be preferable to employ an alternative approach yielding greater efficiencies and improved flexibility, particularly for neutral host applications.

[0010] In 2008 the FCC further clarified its E-911 requirements with regard to Phase 2 accuracy for mobile wireless networks. The information required in Phase 2 is the mobile phone number and the physical location, within a few dozen yards, from which the call was made. The Canadian government is reportedly considering enacting similar requirements. Also the FCC is eager to

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see US mobile network operators provide positioning services with enhanced accuracy for E-911 for indoor subscribers. There is a reported effort within the FCC to try to mandate Phase 2 accuracy indoors, within the next 2 years.

[0011] Many wireless networks employ mobile and fixed broadband wireless terminals which employ GPS-based E-911 location services. It has been demonstrated that GPS signals from satellites outdoors don't propagate well into the indoor space. Therefore an alternative, more robust E-911 location determination approach is required for indoors, particularly if the FCC requirements are changed to be more stringent.

[0012] Several US operators have expressed concern about how they can practically and cost-effectively obtain these enhanced location accuracy capabilities. Operators are very eager to identify a cost-effective approach which can be deployed indoors for enhanced location accuracy.

[0013] One proposed approach toward indoor location accuracy enhancement for CDMA networks would employ a separate unit known as a CDMA Pilot Beacon. A notable disadvantage of this approach for an indoor DAS application is that since the CDMA Pilot Beacon unit is a separate and dedicated device and not integrated within the DAS, it would likely be costly to deploy. The Pilot Beacon approach for CDMA networks employs a Pilot Beacon with a unique PN code (in that area) which effectively divides a particular CDMA network coverage area (e.g., indoors) into multiple small zones (which each correspond to the coverage area of a low-power Pilot Beacon). Each Pilot Beacon's location, PN code and RF Power level are known by the network. Each Pilot Beacon must be synchronized to the CDMA network, via GPS or local base station connection. A variable delay setting permits each Pilot Beacon to have the appropriate system timing to permit triangulation and/or Cell ID position

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determination. One optional but potentially costly enhancement to this approach would employ a Wireless Modem for each Pilot Beacon to provide remote Alarms, Control and Monitoring of each CDMA Pilot Beacon. No known solution for indoor location accuracy enhancement has been publicly proposed for WCDMA networks.

[0014] One candidate technically-proven approach toward indoor location accuracy enhancement for GSM networks would employ a separate unit known as a Location Measurement Unit or LMU. A notable disadvantage of this approach for an indoor DAS application is that, since the LMU is a separate and dedicated device and not integrated within the DAS, it is costly to deploy. Each LMU requires a backhaul facility to a central server which analyzes the LMU measurements. The LMU backhaul cost adds to the total cost of deploying the enhanced accuracy E-911 solution for GSM networks. Despite the availability of the already technically-proven LMU approach, it has not been widely deployed in conjunction with indoor DAS.

[0015] Based on the prior art approaches described herein, it is apparent that a highly efficient, easily deployed and dynamically reconfigurable wireless network is not achievable with prior art systems and capabilities.

SUMMARY OF THE INVENTION

[0016] The present invention substantially overcomes the limitations of the prior art discussed above. The advanced system architecture of the present invention provides a high degree of flexibility to manage, control, enhance and facilitate radio resource efficiency, usage and overall performance of the

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distributed wireless network. This advanced system architecture enables specialized applications and enhancements including flexible simulcast, automatic traffic load-balancing, network and radio resource optimization, network calibration, autonomous/assisted commissioning, carrier pooling, automatic frequency selection, radio frequency carrier placement, traffic monitoring, traffic tagging, and indoor location determination using pilot beacons. The present invention can also serve multiple operators, multi-mode radios (modulation-independent) and multi-frequency bands per operator to increase the efficiency and traffic capacity of the operators' wireless networks.

[0017] Accordingly, it is an object of the present invention to provide a capability for Flexible Simulcast. With Flexible Simulcast, the amount of radio resources (such as RF carriers, CDMA codes or TDMA time slots) assigned to a particular RRU or group of RRUs by each RRU Access Module can be set via software control as described hereinafter to meet desired capacity and throughput objectives or wireless subscriber needs. To achieve these and other objects, an aspect of the present invention employs software-programmable frequency selective Digital Up-Converters (DUCs) and Digital Down-Converters (DDCs). A software-defined Remote Radio Head architecture is used for cost-effective optimization of the radio performance. Frequency selective DDCs and DUCs at the Remote Radio Head enable a high signal to noise ratio (SNR) which maximize the throughput data rate. An embodiment shown in Figure 1 depicts a basic structure and provides an example of a Flexible Simulcast downlink transport scenario. Figure 2 depicts an embodiment of a basic structure of a Flexible Simulcast uplink transport scenario.

[0018] It is a further object of the present invention to facilitate conversion and transport of several discrete relatively narrow RF bandwidths. In another

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aspect of the invention, an embodiment converts only that plurality of specific, relatively narrow bandwidths that carry useful information. Thus, this aspect of the present invention allows more efficient use of the available optical fiber transport bandwidth for neutral host applications, and facilitates transport of more operators' band segments over the optical fiber. To achieve the above result, the present invention utilizes frequency-selective filtering at the Remote Radio Head which enhances the system performance. In some embodiments of this aspect of the invention, noise reduction via frequency- selective filtering at the Remote Radio Head is utilized for maximizing the SNR and consequently maximizing the data throughput. It is a further object of the present invention to provide CDMA and WCDMA indoor location accuracy enhancement. In an aspect of the present invention, an embodiment provides enhanced location accuracy performance by employing pilot beacons. Figure 3 depicts a typical indoor system employing multiple Remote Radio Head Units (RRUs) and a central Digital Access Unit (DAU). The Remote Radio Heads have a unique beacon that is distinct and identifies that particular indoor cell. The mobile user will use the beacon information to assist in the localization to a particular cell. .

[0019] It is a further object of the present invention to enhance GSM and LTE indoor location accuracy.. In another aspect, an embodiment of the present invention provides localization of a user based on the radio signature of the mobile device. Figure 4 depicts a typical indoor system employing multiple Remote Radio Head Units (RRUs) and a central Digital Access Unit (DAU). In accordance with the invention, each Remote Radio Head provides unique header information on data received by that Remote Radio Head. The system of the invention uses this header information in conjunction with the mobile user's radio signature to localize the user to a particular cell.

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It is a further object of the present invention to re-route local traffic to Internet VOIP, Wi-Fi or WiMAX. In this aspect of the invention, an embodiment determines the radio signatures of the individual users within a DAU or Island of DAUs and uses this information to identify if the users are located within the coverage area associated with a specific DAU or Island of DAUs. The DAUs track the radio signatures of all the active users within its network and record a running data base containing information pertaining to them. One embodiment of the present invention is for the Network Operations Center (NOC) to inform the DAU that, e.g., two specific users are collocated within the same DAU or Island of DAUs, as depicted in Figure 6. The DAUs then reroute the users to Internet VOIP, Wi-Fi or WiMAX as appropriate. Another embodiment of the present invention is to determine the Internet Protocol (IP) addresses of the individual users' Wi-Fi connections. If the individual users' IP addresses are within the same DAU or Island of DAUs, the data call for these users is rerouted over the internal network.

[0020] Applications of the present invention are suitable to be employed with distributed base stations, distributed antenna systems, distributed repeaters, mobile equipment and wireless terminals, portable wireless devices, and other wireless communication systems such as microwave and satellite communications. The present invention is also field upgradable through a link such as an Ethernet connection to a remote computing center.

[0021] Appendix I is a glossary of terms used herein, including acronyms.

THE FIGURES

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[0022] Further objects and advantages of the present invention can be more fully understood from the following detailed description taken in conjunction with the accompanying drawings in which:

[0023] Figure 1 is a block diagram according to one embodiment of the invention showing the basic structure and an example of a Flexible Simulcast downlink transport scenario based on having 2 DAU and 4 DRU.

[0024] Figure 2 is a block diagram in accordance with an embodiment of the invention showing the basic structure and an example of a Flexible Simulcast uplink transport scenario based on having 2 DAU and 4 DRU.

[0025] Figure 3 shows an embodiment of an indoor system employing multiple Remote Radio Head Units (RRUs) and a central Digital Access Unit (DAU).

[0026] Figure 4 shows an embodiment of an indoor system in accordance with the invention which employs multiple Remote Radio Head Units (RRUs) and a central Digital Access Unit (DAU).

[0027] Figure 5 illustrates an embodiment of a cellular network system employing multiple Remote Radio Heads according to the present invention.

[0028] Figure 6 is a depiction of local connectivity according to one embodiment of the present invention.

[0029] Figure 7 illustrates an embodiment of the basic structure of the embedded software control modules which manage key functions of the DAU and RRU, in accordance with the present invention.

DETAILED DESCRIPTION OF THE INVENTION

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[0030] The present invention is a novel Reconfigurable Distributed Antenna System that provides a high degree of flexibility to manage, control, re-configure, enhance and facilitate the radio resource efficiency, usage and overall performance of the distributed wireless network. An embodiment of the Reconfigurable Distributed Antenna System in accordance with the present invention is shown in Figure 1. The Flexible Simulcast System 100 can be used to explain the operation of Flexible Simulcast with regard to downlink signals. The system employs a Digital Access Unit functionality (hereinafter "DAU"). The DAU serves as an interface to the base station (BTS). The DAU is (at one end) connected to the BTS, and on the other side connected to multiple RRUs. For the downlink (DL) path, RF signals received from the BTS are separately down-converted, digitized, and converted to baseband (using a Digital Down-Converter). Data streams are then I/Q mapped and framed. Specific parallel data streams are then independently serialized and translated to optical signals using pluggable SFP modules, and delivered to different RRUs over optical fiber cable. For the uplink (UL) path optical signals received from RRUs are de-serialized, deframed, and up-converted digitally using a Digital Up-Converter. Data streams are then independently converted to the analog domain and up-converted to the appropriate RF frequency band. The RF signal is then delivered to the BTS. An embodiment of the system is mainly comprised of DAU1 indicated at 101, RRU1 indicated at 103, RRU2 indicated at 104, DAU2 indicated at 102, RRU3 indicated at 105, and RRU4 indicated at 106. A composite downlink input signal 107 from, e.g., a base station belonging to one wireless operator enters DAU1 at the DAU1 RF input port. Composite signal 107 is comprised of Carriers 1-4. A second composite downlink input signal from e.g., a second base station belonging to the same wireless operator enters

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DAU2 at the DAU2 RF input port. Composite signal 108 is comprised of Carriers 5-8. The functionality of DAU1, DAU2, RRU1, RRU2, RRU3 and RRU4 are explained in detail by U.S. Provisional Application S.N. 61/374593, entitled "Neutral Host Architecture for a Distributed Antenna System," filed August 17, 2010 and attached hereto as an appendix. One optical output of DAU1 is fed to RRU1. A second optical output of DAU1 is fed via bidirectional optical cable 113 to DAU2. This connection facilitates networking of DAU1 and DAU2, which means that all of Carriers 1-8 are available within DAU1 and DAU2 to transport to RRU1, RRU2, RRU3 and RRU4 depending on software settings within the networked DAU system comprised of DAU1 and DAU2. The software settings within RRU1 are configured either manually or automatically such that Carriers 1-8 are present in the downlink output signal 109 at the antenna port of RRU1. The presence of all 8 carriers means that RRU1 is potentially able to access the full capacity of both base stations feeding DAU1 and DAU2. A possible application for RRU1 is in a wireless distribution system is e.g., a cafeteria in an enterprise building during the lunch hour where a large number of wireless subscribers are gathered. RRU2 is fed by a second optical port of RRU1 via bidirectional optical cable 114 to RRU2. Optical cable 114 performs the function of daisy chaining RRU2 with RRU1. The software settings within RRU2 are configured either manually or automatically such that Carriers 1, 3, 4 and 6 are present in downlink output signal 110 at the antenna port of RRU2. The capacity of RRU2 is set to a much lower value than RRU1 by virtue of its specific Digital Up Converter settings. The individual Remote Radio Units have integrated frequency selective DUCs and DDCs with gain control for each carrier. The DAUs can remotely turn on and off the individual carriers via the gain control parameters.

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[0031] In a similar manner as described previously for RRU1, the software settings within RRU3 are configured either manually or automatically such that Carriers 2 and 6 are present in downlink output signal 111 at the antenna port of RRU3. Compared to the downlink signal 110 at the antenna port of RRU2, the capacity of RRU3 which is configured via the software settings of RRU3 is much less than the capacity of RRU2. RRU4 is fed by a second optical port of RRU3 via bidirectional optical cable 115 to RRU4. Optical cable 115 performs the function of daisy chaining RRU4 with RRU3. The software settings within RRU4 are configured either manually or automatically such that Carriers 1, 4, 5 and 8 are present in downlink output signal 112 at the antenna port of RRU4. The capacity of RRU4 is set to a much lower value than RRU1. The relative capacity settings of RRU1, RRU2, RRU3 and RRU4 and can be adjusted dynamically as discussed in connection with Figure 7 to meet the capacity needs within the coverage zones determined by the physical positions of antennas connected to RRU1, RRU2, RRU3 and RRU4 respectively.

[0032] The present invention facilitates conversion and transport of several discrete relatively narrow RF bandwidths. This approach allows conversion of only those multiple specific relatively narrow bandwidths which carry useful or specific information. This approach also allows more efficient use of the available optical fiber transport bandwidth for neutral host applications, and allows transport of more individual operators' band segments over the optical fiber. As disclosed in U.S. Provisional Application S.N. 61/374593, entitled "Neutral Host Architecture for a Distributed Antenna System," filed August 17, 2010 and also referring to Figure 1 of the instant patent application, Digital Up Converters located within the RRU which are dynamically software-

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programmable as discussed hereinafter can be re-configured to transport from the DAU input to any specific RRU output any specific narrow frequency band or bands, RF carriers or RF channels which are available at the respective RF input port of either DAU. This capability is illustrated in Figure 1 where only specific frequency bands or RF carriers appear at the output of a given RRU.

[0033] A related capability of the present invention is that not only can the Digital Up Converters located within each RRU be configured to transport any specific narrow frequency band from the DAU input to any specific RRU output, but also the Digital Up Converters within each RRU can be configured to transport any specific time slot or time slots of each carrier from the DAU input to any specific RRU output. The DAU detects which carriers and corresponding time slots are active. This information is relayed to the individual RRUs via the management control and monitoring protocol software discussed hereinafter. This information is then used, as appropriate, by the RRUs for turning off and on individual carriers and their corresponding time slots.

[0034] Referring to Figure 1 of the instant patent application, an alternative embodiment of the present invention may be described as follows. In a previous description of Figure 1, a previous embodiment involved having downlink signals from two separate base stations belonging to the same wireless operator enter DAU1 and DAU2 input ports respectively. In an alternative embodiment, a second composite downlink input signal from e.g., a second base station belonging to a different wireless operator enters DAU2 at the DAU2 RF input port. In this embodiment, signals belonging to both the first operator and the second operator are converted and transported to RRU1, RRU2, RRU3 and RRU4 respectively. This embodiment provides an example of a neutral host wireless system, where multiple wireless operators share a common

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infrastructure comprised of DAU1, DAU2, RRU1, RRU2, RRU3 and RRU4. All the previously mentioned features and advantages accrue to each of the two wireless operators.

[0035] As disclosed in U.S. Provisional Application S.N. 61/374593, entitled "Neutral Host Architecture for a Distributed Antenna System," filed August 17, 2010 and also referring to Figure 1 of the instant patent application, the Digital Up Converters present in the RRU can be programmed to process various signal formats and modulation types including FDMA, CDMA, TDMA, OFDMA and others. Also, the Digital Up Converters present in the respective RRUs can be programmed to operate with signals to be transmitted within various frequency bands subject to the capabilities and limitations of the system architecture disclosed in U.S. Provisional Application S.N. 61/374593, entitled "Neutral Host Architecture for a Distributed Antenna System," filed August 17, 2010. In one embodiment of the present invention where a wideband CDMA signal is present within e.g., the bandwidth corresponding to carrier 1 at the input port to DAU1, the transmitted signal at the antenna ports of RRU1, RRU2 and RRU4 will be a wideband CDMA signal which is virtually identical to the signal present within the bandwidth corresponding to carrier 1 at the input port to DAU1.

[0036] As disclosed in U.S. Provisional Application S.N. 61/374593, entitled "Neutral Host Architecture for a Distributed Antenna System," filed August 17, 2010 and also referring to Figure 1 of the instant patent application, it is understood that the Digital Up Converters present in the respective RRUs can be programmed to transmit any desired composite signal format to each of the respective RRU antenna ports. As an example, the Digital Up Converters present in RRU1 and RRU2 can be dynamically software-reconfigured as

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described previously so that the signal present at the antenna port of RRU1 would correspond to the spectral profile shown in Figure 1 as 110, and also that the signal present at the antenna port of RRU2 would correspond to the spectral profile shown in Figure 1 as 109. The application for such a dynamic re-arrangement of RRU capacity would be e.g., if a company meeting were suddenly convened in the area of the enterprise corresponding to the coverage area of RRU2. Although the description of some embodiments in the instant application refers to base station signals 107 and 108 as being on different frequencies, the system and method of the present invention readily supports configurations where one or more of the carriers which are part of base station signals 107 and 108 and are identical frequencies, since the base station signals are digitized, packetized, routed and switched to the desired RRU.

[0037] Another embodiment of the Distributed Antenna System in accordance with the present invention is shown in Figure 2. As disclosed in U.S. Provisional Application S.N. 61/374593, entitled "Neutral Host Architecture for a Distributed Antenna System," filed August 17, 2010 and also as shown in Figure 2 the Flexible Simulcast System 200 can be used to explain the operation of Flexible Simulcast with regard to uplink signals. As discussed previously with regard to downlink signals and by referring to Figure 1, the uplink system shown in Figure 2 is mainly comprised of DAU1 indicated at 201, RRU1 indicated at 203, RRU2 indicated at 204, DAU2 indicated at 202, RRU3 indicated at 205, and RRU4 indicated at 206. In a manner similar to the downlink operation explained by referring to Figure 1, the operation of the uplink system shown in Figure 2 can be understood as follows.

[0038] The Digital Down Converters present in each of RRU1, RRU2, RRU3 and RRU4 are dynamically software-configured as described previously so that

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uplink signals of the appropriate desired signal format(s) present at the receive antenna ports of the respective RRU1, RRU2, RRU3 and RRU4 are selected based on the desired uplink band(s) to be processed and filtered, converted and transported to the appropriate uplink output port of either DAU1 or DAU2. The DAUs and RRUs frame the individual data packets corresponding to their respective radio signature using the Common Public Interface Standard (CPRI). Other Interface standards are applicable provided they uniquely identify data packets with respective RRUs. Header information is transmitted along with the data packet which indentifies the RRU and DAU that corresponds to the individual data packet.

[0039] In one example for the embodiment shown in Figure 2, RRU1 and RRU3 are configured to receive uplink signals within the Carrier 2 bandwidth, whereas RRU2 and RRU4 are both configured to reject uplink signals within the Carrier 2 bandwidth. When RRU3 receives a strong enough signal at its receive antenna port within the Carrier 2 bandwidth to be properly filtered and processed, the Digital Down Converters within RRU3 facilitate processing and conversion. Similarly, when RRU1 receives a strong enough signal at its receive antenna port within the Carrier 2 bandwidth to be properly filtered and processed, the Digital Down Converters within RRU1 facilitate processing and conversion. The signals from RRU1 and RRU3 are combined based on the active signal combining algorithm, and are fed to the base station connected to the uplink output port of DAU1. The term simulcast is frequently used to describe the operation of RRU1 and RRU3 with regard to uplink and downlink signals within Carrier 2 bandwidth. The term Flexible Simulcast refers to the fact that the present invention supports dynamic and/or manual rearrangement of

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which specific RRU are involved in the signal combining process for each Carrier bandwidth.

[0040] Referring to Figure 2, the Digital Down Converters present in RRU1 are configured to receive and process signals within Carrier 1-8 bandwidths. The Digital Down Converters present in RRU2 are configured to receive and process signals within Carrier 1, 3, 4 and 6 bandwidths. The Digital Down Converters present in RRU3 are configured to receive and process signals within Carrier 2 and 6 bandwidths. The Digital Down Converters present in RRU4 are configured to receive and process signals within Carrier 1, 4, 5 and 8 bandwidths. The respective high-speed digital signals resulting from processing performed within each of the four RRU are routed to the two DAUs. As described previously, the uplink signals from the four RRUs are combined within the respective DAU corresponding to each base station.

[0041] An aspect of the present invention includes an integrated Pilot Beacon function within the each RRU. In an embodiment, each RRU comprises a unique software programmable Pilot Beacon as discussed hereinafter This approach is intended for use in CDMA and/or WCDMA indoor DAS networks. A very similar approach can be effective for indoor location accuracy enhancement for other types of networks such as LTE and WiMAX. Because each RRU is already controlled and monitored via the DAUs which comprise the network, there is no need for costly deployment of additional dedicated wireless modems for remote monitoring and control of pilot beacons.

[0042] An RRU-integrated Pilot Beacon approach is employed for both CDMA and WCDMA networks. Each operational pilot beacon function within an RRU employs a unique PN code (in that area) which effectively divides the WCDMA or CDMA indoor network coverage area into multiple small “zones”

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(which each correspond to the coverage area of a low-power Pilot Beacon). Each Pilot Beacon's location, PN code and RF Power level are known by the network. Each Pilot Beacon is synchronized to the WCDMA or CDMA network, via its connection to the DAU.

[0043] Unlike the transmit signal from a base station which is "dynamic", the Pilot Beacon transmit signal will be effectively "static" and its downlink messages will not change over time based on network conditions.

[0044] For a WCDMA network, in Idle mode each mobile subscriber terminal is able to perform Pilot Signal measurements of downlink signals transmitted by base stations and Pilot Beacons. When the WCDMA mobile subscriber terminal transitions to Active mode, it reports to the serving cell all its Pilot Signal measurements for base stations and for Pilot Beacons. For CDMA networks, the operation is very similar. For some RRU deployed in an indoor network, the RRU can be provisioned as either a Pilot Beacon or to serve mobile subscribers in a particular operator bandwidth, but not both.

[0045] For a WCDMA network, existing inherent capabilities of the globally-standardized networks are employed. The WCDMA mobile subscriber terminal is able to measure the strongest CPICH RSCP (Pilot Signal Code Power) in either Idle mode or any of several active modes. Also, measurements of CPICH Ec/No by the mobile subscriber terminal in either Idle mode or any of several active modes are possible. As a result, the mobile subscriber terminal reports all available RSCP and Ec/No measurements via the serving base station (whether indoor or outdoor) to the network. Based on that information, the most likely mobile subscriber terminal location is calculated and/or determined. For CDMA networks, the operation is very similar to the process described herein.

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[0046] A previously described embodiment of the present invention referring to Figure 1 involved having a wideband CDMA signal present within e.g., the bandwidth corresponding to carrier 1 at the input port to DAU1. In the previously described embodiment, the transmitted signal at the antenna ports of RRU1, RRU2 and RRU4 is a wideband CDMA signal which is virtually identical to the signal present within the bandwidth corresponding to carrier 1 at the input port to DAU1. An alternative embodiment of the present invention is one where a wideband CDMA signal is present within e.g., the bandwidth corresponding to carrier 1 at the input port to DAU1. However, in the alternative embodiment the transmitted signal at the antenna port of RRU1 differs slightly from the previous embodiment. In the alternative embodiment, a wideband CDMA signal is present within e.g., the bandwidth corresponding to carrier 1 at the input port to DAU1. The transmitted signal from RRU1 is a combination of the wideband CDMA signal which was present at the input port to DAU1, along with a specialized WCDMA pilot beacon signal. The WCDMA pilot beacon signal is intentionally set well below the level of the base station pilot signal.

[0047] A further alternative embodiment can be explained referring to Figure 1 which applies in the case where CDMA signals are generated by the base station connected to the input port of DAU1. In this further alternative embodiment of the present invention, the transmitted signal at the antenna port of RRU1 is a combination of the CDMA signal which was present at the input port to DAU1, along with a specialized CDMA pilot beacon signal. The CDMA pilot beacon signal is intentionally set well below the level of the base station pilot signal.

[0048] An embodiment of the present invention provides enhanced accuracy for determining location of indoor wireless subscribers. Figure 4 depicts a typical

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indoor system employing multiple Remote Radio Head Units (RRUs) and a central Digital Access Unit (DAU). Each Remote Radio Head provides a unique header information on data received by that Remote Radio Head. This header information in conjunction with the mobile user's radio signature are used to localize the user to a particular cell. The DAU signal processing can identify the individual carriers and their corresponding time slots. A header is included with each data packet that uniquely identifies the corresponding RRU. The DAU can detect the carrier frequency and the corresponding time slot associated with the individual RRUs. The DAU has a running data base that identifies each carrier frequency and time slot with a respective RRU. The carrier frequency and time slot is the radio signature that uniquely identifies the GSM user.

[0049] The DAU communicates with a Network Operation Center (NOC) via a Ethernet connection or an external modem, as depicted in Figure 5. Once a E911 call is initiated the Mobile Switching Center (MSC) in conjunction with the NOC can identify the corresponding BaseTransceiver Station (BTS) where the user has placed the call. The user can be localized within a BTS cell. The NOC then makes a request to the individual DAUs to determine if the E911 radio signature is active in their indoor cell. The DAU checks its data base for the active carrier frequency and time slot. If that radio signature is active in the DAU, then that DAU will provide the NOC with the location information of the corresponding RRU.

[0050] A further embodiment of the present invention includes LTE to provide enhanced accuracy for determining the location of indoor wireless subscribers. GSM uses individual carriers and time slots to distinguish users whereas LTE uses multiple carriers and time slot information to distinguish users. The DAU can simultaneously detect multiple carriers and their corresponding time slots to

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uniquely identify the LTE user. The DAU has a running data base that identifies the carrier frequencies and time slot radio signature for the respective RRU. This information can be retrieved from the NOC once a request is made to the DAU.

[0051] Referring next to Figure 7, the DAU embedded software control module and RRU embedded software control module can be better understood in connection with the operation of key functions of the DAU and RRU. One such key function is determining and/or setting the appropriate amount of radio resources (such as RF carriers, CDMA codes or TDMA time slots) assigned to a particular RRU or group of RRUs to meet desired capacity and throughput objectives. The DAU embedded software control module comprises a DAU Monitoring module that detects which carriers and corresponding time slots are active for each RRU. The DAU embedded software control module also comprises a DAU Management Control module which communicates with the RRU over a fiber optic link control channel via a control protocol with the RRU Management Control module. In turn, the RRU Management Control module sets the individual parameters of all the RRU Digital Up-Converters to enable or disable specific radio resources from being transmitted by a particular RRU or group of RRUs, and also sets the individual parameters of all the RRU Digital Down-Converters to enable or disable specific uplink radio resources from being processed by a particular RRU or group of RRUs.

[0052] In an embodiment, an algorithm operating within the DAU Monitoring module, that detects which carriers and corresponding time slots for each carrier are active for each RRU, provides information to the DAU Management Control module to help identify when, e.g., a particular downlink carrier is loaded by a percentage greater than a predetermined threshold whose value is communicated to the DAU Management Control module by the DAU's Remote

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Monitoring and Control function. If that occurs, the DAU Management Control module adaptively modifies the system configuration to slowly begin to deploy additional radio resources (such as RF carriers, CDMA codes or TDMA time slots) for use by a particular RRU which need those radio resources within its coverage area. At the same time, in at least some embodiments the DAU Management Control module adaptively modifies the system configuration to slowly begin to remove certain radio resources (such as RF carriers, CDMA codes or TDMA time slots) for use by a particular RRU which no longer needs those radio resources within its coverage area. Another such key function of the DAU embedded software control module and RRU embedded software control module is determining and/or setting and/or analyzing the appropriate transmission parameters and monitoring parameters for the integrated Pilot Beacon function contained within each RRU. These Pilot Beacon transmission and monitoring parameters include Beacon Enable/Disable, Beacon Carrier Frequencies, Beacon Transmit Power, Beacon PN Code, Beacon Downlink BCH Message Content, Beacon Alarm, Beacon Delay Setting and Beacon Delay Adjustment Resolution. The RRU Pilot Beacon Control module communicates with the pilot beacon generator function in the RRU to set and monitor the pilot beacon parameters as listed herein.

[0053] In summary, the Reconfigurable Distributed Antenna System of the present invention described herein efficiently conserves resources and reduces costs. The reconfigurable system is adaptive or manually field-programmable, since the algorithms can be adjusted like software in the digital processor at any time.

[0054] Although the present invention has been described with reference to the preferred embodiments, it will be understood that the invention is not limited

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to the details described thereof. Various substitutions and modifications have been suggested in the foregoing description, and others will occur to those of ordinary skill in the art. Therefore, all such substitutions and modifications are intended to be embraced within the scope of the invention as defined in the appended claims.

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What is Claimed is:

1. A method for routing and switching operator RF signals comprising

providing one or more remote radio units, each configured to receive one or more downlink radio frequencies and to transmit one or more uplink radio frequencies,

providing at least one digital access unit configured to communicate with at least some remote radio units,

translating the uplink and downlink signals between RF and base band as appropriate,

packetizing the uplink and downlink base band signals, and

routing and switching the packetized signals among the one or more radio units and the at least one digital access units.

2. A method for locating a wireless network subscriber within a network of radio units comprising

generating at each radio unit a unique pilot beacon adapted to be received by a subscriber device,

receiving at a central location, from a subscriber device, indicia identifying the at least one pilot beacon received by the subscriber device, and

determining, based on the received indicia, the approximate location of the subscriber.

3. A method for locating a wireless network subscriber within a network of radio units comprising

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receiving at at least one radio unit within a network of radio units, from a subscriber device, an emergency signal on a carrier frequency and time slot and forwarding the emergency signal to a remote station,

receiving at a plurality of radio units, from the remote station, a query as to whether an identified carrier frequency and time slot used by the emergency signal is active

responding, at the radio unit where the identified carrier frequency and time slot are active, and

determining, based on the response, the approximate location of the subscriber.

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ABSTRACT

The present disclosure is a novel utility of a software defined radio (SDR) based Distributed Antenna System (DAS) that is field reconfigurable and support multi-modulation schemes (modulation-independent), multi-carriers, multi-frequency bands and multi-channels. The present disclosure enables a high degree of flexibility to manage, control, enhance, facilitate the usage and performance of a distributed wireless network such as flexible simulcast, automatic traffic load-balancing, network and radio resource optimization, network calibration, autonomous/assisted commissioning, carrier pooling, automatic frequency selection, frequency carrier placement, traffic monitoring, traffic tagging, pilot beacon, etc. As a result, the SDR DAS can increase the efficiency and traffic capacity of the operators' wireless network.

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