

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

ERICSSON INC.
Petitioner,

v.

DALI WIRELESS, INC.
Patent Owner.

U.S. Patent No. 10,750,382

Issue Date: Aug. 18, 2020

Title: OPTIMIZATION OF TRAFFIC LOAD IN A DISTRIBUTED ANTENNA
SYSTEM

Inter Partes Review No.: IPR2023-00795

**PETITION FOR *INTER PARTES* REVIEW OF U.S. PAT. NO. 10,750,382
UNDER 35 U.S.C. §§ 311-319 and 37 C.F.R. §§ 42.1-.80, 42.100-.107**

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Petitioner's Exhibit List

<i>Exhibit #</i>	<i>Description</i>
1001	U.S. Patent No. 10,750,382 (the "'382 Patent")
1002	Select portions of prosecution history of the '382 Patent ("File History")
1003	Declaration of Petitioner's Expert Henry Houh, Ph.D. ("Houh")
1004	International Application Publication WO 2009/021359 A1 published on February 19, 2009 ("Leng")
1005	Certified English Translation of Leng (EX-1004)
1006	U.S. Pat No. 9,398,464 ("Kummetz")
1007	<i>Ericsson Inc. v. Dali Wireless, Inc.</i> , IPR2022-01419, Paper 11, March 9, 2023
1008	<i>Dali Wireless, Inc. v. Cellco Partnership d/b/a Verizon Wireless, et al.</i> U.S.D.C. WDTX Case No. 6:22-cv- 01313-ADA, Docket No. 31 (Feb 2, 2023)
1009	U.S. Patent No. 8,270,387 ("Cannon")
1010	U.S. Patent Application Publication US2010/0128676 ("Wu")
1011	U.S. Publication No. 2012/0057572 ("Evans")
1012	Common Public Radio Interface: Interface Specification v4.1 ("CPRI v4.1") February 18, 2009
1013	U.S. Publication No. 2012/0177026 ("Uyehara")
1014	U.S. Publication No. 2012/0057572 ("Kobayshi")
1015	U.S. Patent Application Publication US2008/0045254A1 ("Gupta")
1016	Related Patents

I. INTRODUCTION

Pursuant to 35 U.S.C. §§ 311 *et seq.* and 37 C.F.R. §§ 42.1 *et seq.*, Ericsson Inc. (“Petitioner”) hereby petitions for an *inter partes* review of U.S. Patent No. 10,750,382 (the “’382 Patent”). Petitioner respectfully submits that Claims 1-19 (the “Challenged Claims”) of the ’382 Patent are unpatentable under 35 U.S.C. §103 in view of the prior art references discussed herein. This Petition demonstrates by a preponderance of the evidence that there is a reasonable likelihood that Petitioner will prevail with respect to at least one of these claims.

II. OVERVIEW

The Challenged Claims are unpatentable as obvious over the prior art. The claims are directed to a distributed antenna system (DAS) that reconfigures the carrier channels allocated to remote antenna units based on key performance indicators (KPIs) of the DAS network. The KPIs are described as traffic measurements which are typically a function of the number of users on the network, and are measured and analyzed by a traffic monitoring unit which triggers reconfiguration of the carrier channels.

Both Kummetz (EX-1006) and Leng (EX-1005 (English Translation)) are directed to the same problem and provide the same solution as that provided by the ’382 Patent. Both Kummetz and Leng disclose substantially the same DAS as the ’382 Patent for reconfiguring the carrier channels of the remote antenna units

based on KPIs determined by a traffic monitoring unit. In Kummetz, the KPI is the number of users in a coverage zone, and in Leng the KPI is load information, which includes the number of registered users.

A comparison of the DASs described in the '382 Patent, Kummetz, and Leng is illustrated below with common elements highlighted in the same color:¹

'382 Patent

¹ All annotation of figures and text by color, bolding, or italicizing is added by Petitioner unless identified as original.

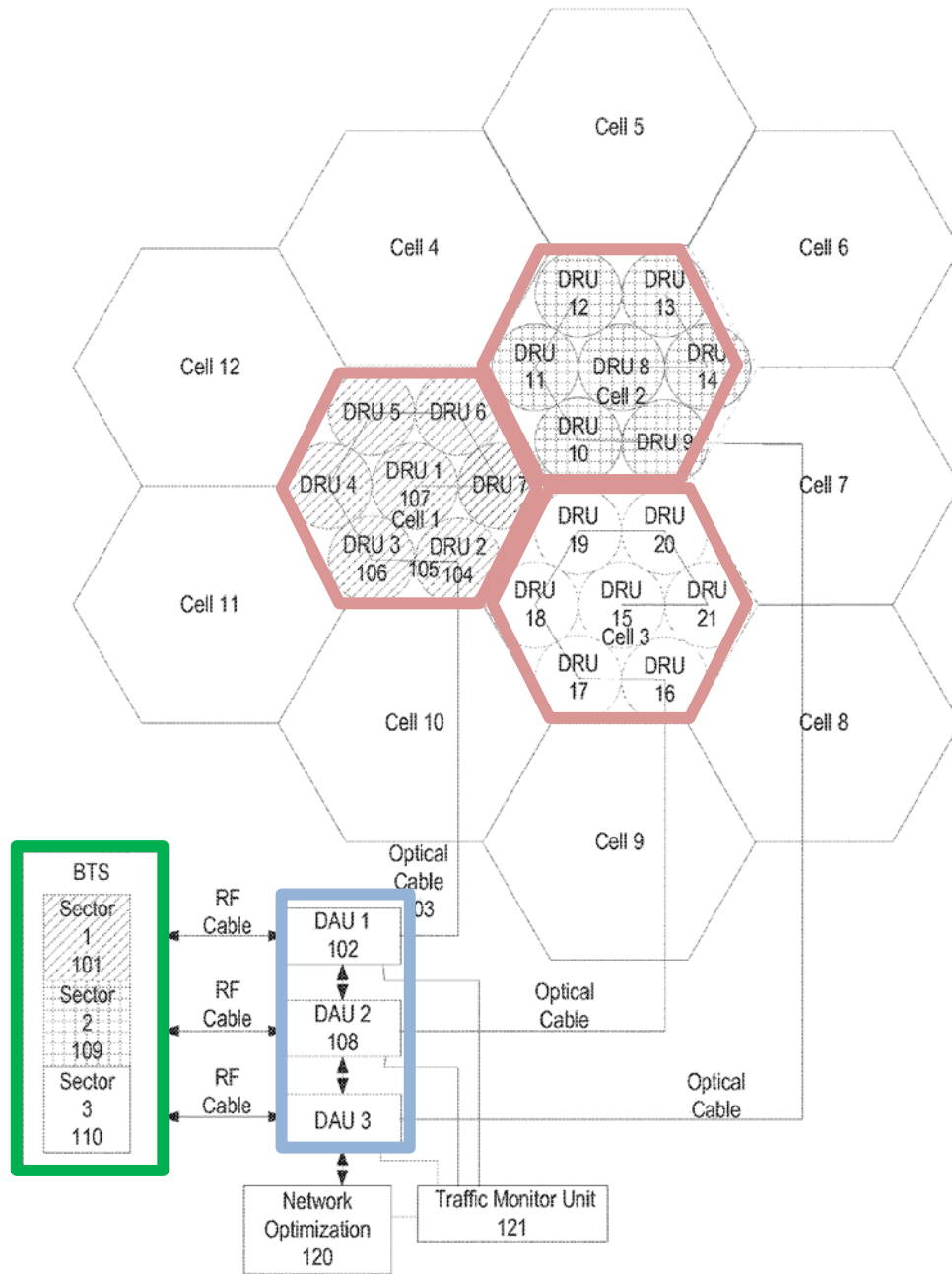


FIG. 1

EX-1001 FIG. 1; EX-1003 ¶34

Kummetz

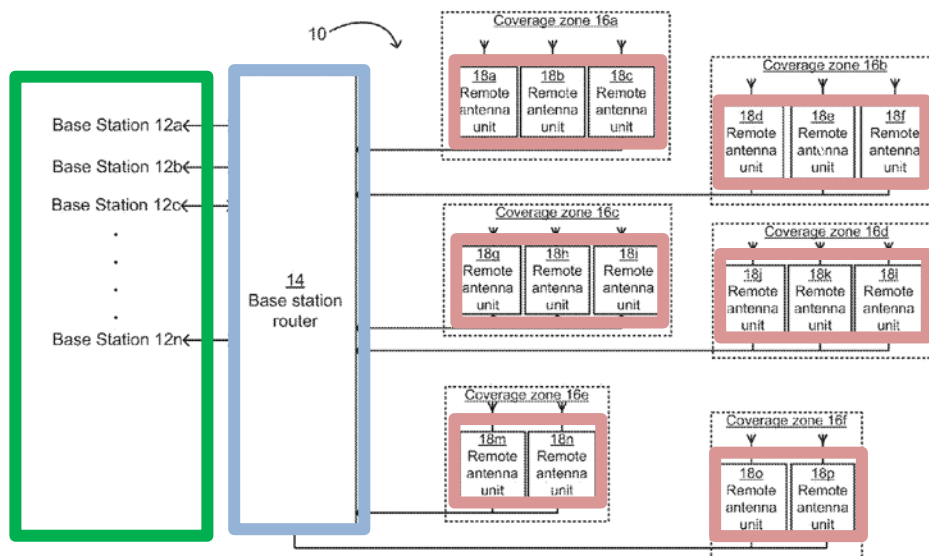


FIG. 1

EX-1006 FIG. 1; EX-1003 ¶35.

Leng

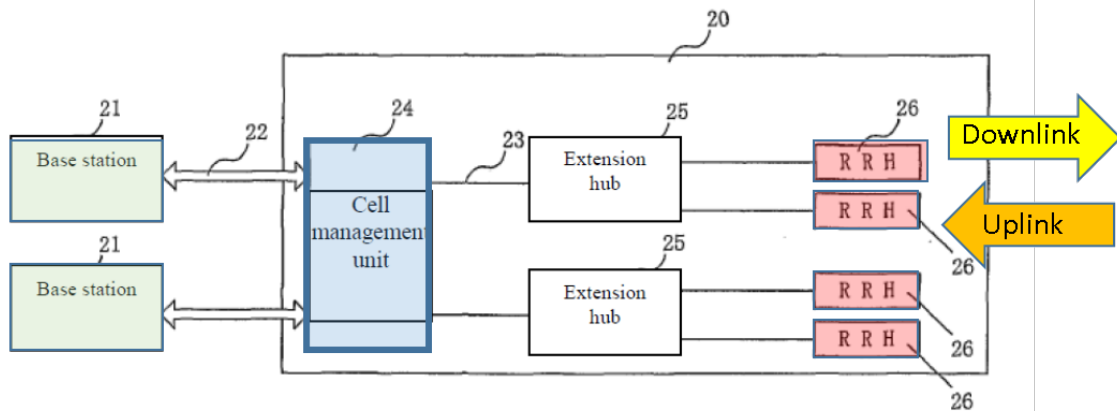


Fig. 2

EX-1005 FIG. 2; EX-1003 ¶36

'382 Patent	Kummetz	Leng
Remote Radio Unit (RRU)	Remote Antenna Unit	Remote Radio Head (RRH)
Digital Access Unit (DAU)	Base Station Router	Cell Management Unit (CMU)
Base Station (BTS)	Base Station	Base Station

EX-1003 ¶36

III. GROUNDS FOR STANDING (37 C.F.R. § 42.104(A))

Petitioner certifies that the '382 Patent is available for IPR and that
 Petitioner is not barred or estopped from requesting an IPR of the Challenged

Claims on the grounds identified herein. 37 C.F.R. § 42.104(a). This Petition is filed pursuant to 37 C.F.R. § 42.106(a).

IV. REASONS FOR THE REQUESTED RELIEF

As explained in §§ II and V-VIII of this Petition and in the attached Declaration of Petitioner's Expert(EX-1003), the systems described and claimed in the '382 Patent were obvious over the prior art to a person of ordinary skill in the art ("POSA") at the time of the invention.

V. BACKGROUND

A. Summary of the '382 Patent

The '382 Patent is directed to systems for dynamically routing signals in a DAS as part of a distributed wireless network. EX-1001 1:49-50. The '382 Patent describes a traffic monitoring unit to manage, control, enhance, and facilitate radio resource efficiency and usage, and the overall performance of the network. EX-1001 1:21-25, 4:19-23. One example of a DAS is provided in FIG. 1:

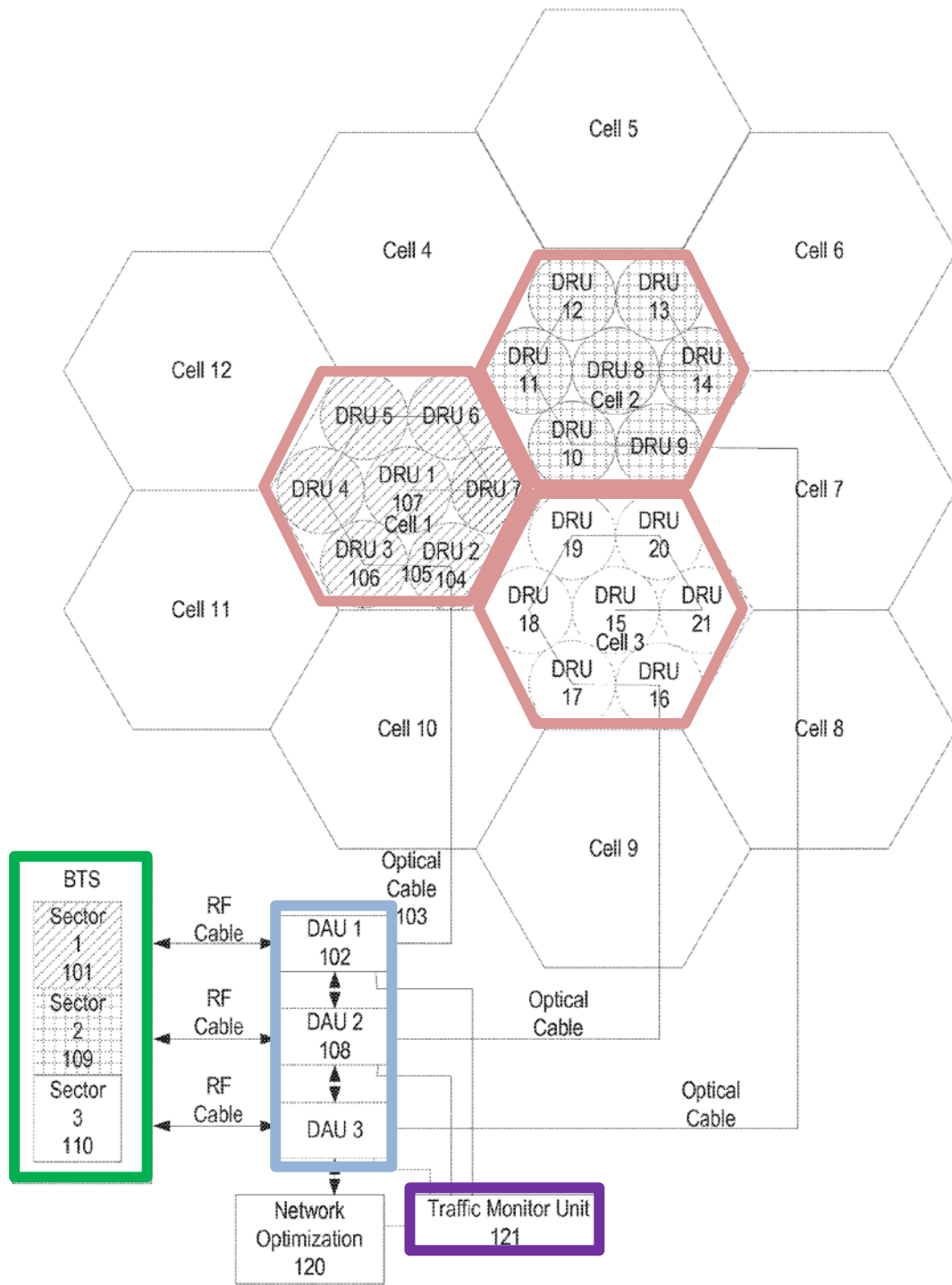


FIG. 1

EX-1001 FIG. 1.

FIG. 1 shows a DAS employing multiple Digital Access Units (DAUs) (blue) and Digital Remote Units (DRUs) arranged in cells (red). In this example, a three-sector base station (BTS) (green) including sectors 101, 109, and 110, provides downlink signals to DAU 1 (102), DAU 2 (108) and DAU 3, respectively, with each sector using a different radio resource, e.g., “[a] typical base station comprises 3 independent radio resources, commonly known as sectors.” EX-1001 2:26-30, 5:8-13; 5:60–6:1. The DAUs “function as the interface between the base stations and digital remote units (DRUs).” EX-1001 4:66-5:2. DAU 1 is connected to and transports signals to DAU 2, and DAU 2 is connected to DAU 3. EX-1001 6:29-32; 7:8-10. The radio resources from the BTS sectors are transported to a daisy-chained network of DRUs to provide coverage to a geographical area. EX-1001 6:60-66. For example, DRUs 1-7 are daisy-chained to provide coverage to the geographical area of Cell 1. EX-1001 7:1-10. EX-1001 6:4-7; 6:60-67.

Traffic Monitoring Unit 121 (purple) tracks and collects traffic load at each DAU in the network, and stores this information in the network optimization unit 120. EX-1001 7:14-19, FIG. 9 (element 910). Network performance may be expressed by KPIs collected from different parts of the network. EX-1001 5:58-62. For example, KPIs may comprise information such as number of blocked calls, number of active calls, average power of uplink channels, average power of

downlink ports, External Ports and PEER Ports, traffic on each sector, failed calls, number of satisfied users, number of unsatisfied users, number of users through a given DRU, and the like. EX-1001 10:37-45.

The '382 Patent describes using the KPIs from the network traffic to load balance the DRUs. In one example, the '382 Patent describes that system performance may be improved by allocating a DRU from a first sector to a second sector thereby shifting traffic from the first sector to the second sector. EX-1001 11:6-12.

The Petition challenges independent claims 1 and 10 and dependent claims 2–9 and 11–19. Claim 1 illustrates the Challenged Claims at issue:

1. [i]. *A system comprising:*
 - [ii]. *one or more Digital Access Units (DAUs) operable to receive at least one signal from at least one of a first signal source and a second signal source from one or more of a plurality of signal sources,*
 - [iii]. *each DAU of the one or more DAUs including an input port configured as an uplink/downlink port and an output port configured as an uplink/downlink port;*
 - [iv]. *one or more Digital Remote Units (DRUs) connectable to the one or more DAUs and operable to transport signals between one or more of the one or more DRUs and the one or more DAUs;*

[v]. *a plurality of radio resources formed from the one or more DRUs comprising a first radio resource and a second radio resource different from the first radio resource,*

[vi]. *each radio resource comprising a subset of the plurality of DRUs; and;*

[vii]. *a traffic monitoring unit coupled to at least one of the DAUs, wherein the traffic monitoring unit is configured to:*

[a] *determine one or more of: one or more key performance indicators (KPIs) and/or a quality of service (QoS) of a network traffic for the one or more DAUs, wherein the QoS is a function of the one or more KPIs; and*

[b] *reconfigure the plurality of radio resources based on one or more of the one or more KPIs and/or the QoS by allocating at least one DRU from the first radio resource to the second radio resource.*

B. Prosecution History

The '382 Patent issued from U.S. Pat. App. No. 16/661,368 filed October 23, 2019 with one claim. In the first Office Action, Claim 1 was rejected as anticipated by U.S. Pat. Publication No. 2013/0128810, and was rejected on obvious-type double patenting over its parent, U.S. Pat No. 10,506,454 (the "'454 Patent").

In response, Applicant amended Claim 1, and added Claims 2-19, and submitted a terminal disclaimer. The Office subsequently issued a Notice of Allowance for Claims 1-19.

C. Claim Construction

The claims should be given “their ordinary and customary meaning” as understood by a POSA at the time of the claimed invention. *Phillips v. AWH Corp.*, 415 F.3d 1303, 1312, 1327 (Fed. Cir. 2005).

Petitioner proposes that each claim term in the Challenged Claims be given its plain and ordinary meaning in this proceeding, and that no specific construction of any claim term is required because the prior art relied on in this Petition meets each of the claim terms under any reasonable construction.

The term “radio resources” has previously been construed by the Board in IPRs related to PO’s other patents directed to DASs, most recently in IPR2022-01419, and in litigation, most recently in *Dali Wireless, Inc. v. Cellco Partnership d/b/a Verizon Wireless, et al.* U.S.D.C. WDTX Case No. 6:22-cv- 01313-ADA.²

² *Ericsson Inc. v. Dali Wirelesss, Inc.*, IPR2022-01419, Paper 11, (Mar. 9, 2023)(EX-1007); *Dali Wireless, Inc. v. Cellco Partnership d/b/a Verizon Wireless, et al.* U.S.D.C. WDTX Case No. 6:22-cv- 01313-ADA, Docket No. 31 (Feb 02, 2023)(EX-1008).

Petitioner believes these constructions are consistent with the plain and ordinary meaning of the terms. EX-1003 ¶44.

D. Priority Date of the Challenged Claims

The application for the '382 Patent was filed on October 23, 2019, as a continuation of the '454 Patent and claims priority of provisional application No. 61/678,016 filed on July 31, 2012. Solely for the purposes of this IPR, Petitioner assumes the priority date is July 31, 2012.

E. Person of Ordinary Skill in the Art

With respect to the '382 Patent, a POSA in July 2012 would have been familiar with managing and configuring radio resources in a DAS. EX-1003 ¶46. A POSA would have gained knowledge of these concepts through a mixture of training and work experience, such as by having a Bachelor's degree in electrical engineering and four years of experience; or by obtaining a Master's degree in electrical engineering, but having only one to two years of experience; or by having no formal education but experience in cellular communications of at least eight years. EX-1003 ¶46.

F. State of the Art

The following section describes the state of the art for DAS networks and reconfiguring the use of radio resources by the DAS as of July 2012. EX-1003 ¶47. The prior art references, and the discussions of what was known to a POSA, provide the factual support for the general description of the state of the art at the

time of the invention, assist in understanding how a POSA understood the disclosures of the prior art, and provide the motivation to modify or combine the teachings of references.

1. Prior Art DASs

A DAS is a network of spatially separated antenna nodes connected to a common node via a transport medium that provides wireless service within a geographic area or structure. Common wireless communication system configurations employ a host unit as the common node, which is located at a centralized location (for example, at a facility that is controlled by a wireless service provider). The antenna nodes and related broadcasting and receiving equipment, located remote from the host unit (for example, at a facility or site that is not controlled by the wireless service provider), are also referred to as “remote units.” Radio frequency (RF) signals are communicated between the host unit and one or more remote units. In such a DAS, the host unit is typically communicatively coupled to one or more base stations (for example, via wired connection or via wireless connection) which allow bidirectional communications between wireless subscriber units within the DAS service area and communication networks such as, but not limited to, cellular phone networks, the public switch telephone network (PSTN) and the Internet. A DAS can provide an infrastructure

within a community that can scatter remote units across a geographic area for providing wireless services across that area. EX-1009 1:14-36; EX-1003 ¶48.

2. Reconfiguring remote radio units based on performance metrics

It was known to reconfigure the radio resources of a DAS based on KPIs of the DAS network. One such prior art DAS that reconfigures the carrier frequencies of the remote radio units based on loading is shown below in FIG. 1.

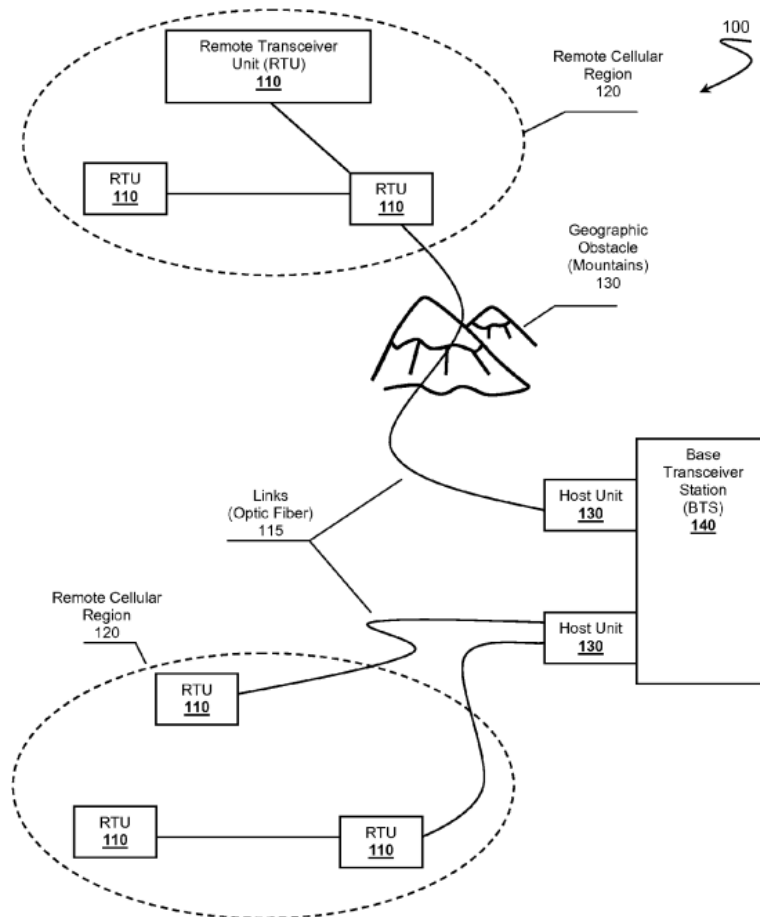


Figure 1

EX-1010 FIG. 1; EX-1003 ¶49.

Base transceiver stations (BTSSs) communicate signals to remote transceiver units (RTUs) via one or more host units. EX-1010 Title, ¶0030; EX-1003 ¶50. The system provides control over the communication by splitting carrier channels from their bands and routing only selected channels to RTUs according to a routing policy. EX-1010 ¶0009; EX-1003 ¶50. The carrier channels may be routed “individually, collectively as shown, or in arbitrary groups” to RTUs using a matrix switch according to a routing policy, where the routing policy could be updated or reconfigured as desired. EX-1010 ¶¶0049, 0009, 0011, 0038-39, 0047; EX-1003 ¶50. One example is that “more channels” could be allocated when needed to increase the bandwidth available in a particular region. EX-1010 ¶¶0046; 0039-45; EX-1003 ¶50.

A processor can be used to analyze traffic metrics *e.g.*, data rate, call rate, consumed bandwidth, etc.) in order to reconfigure channels to increase efficiency and optimization of the DAS such as through load balancing. EX-1010 0044; EX-1003 ¶51.

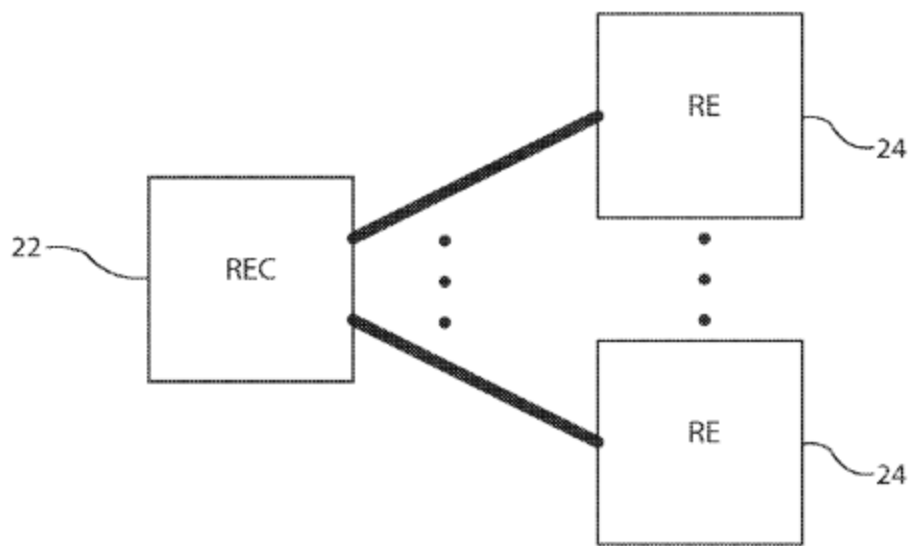
3. Prior art DAS topographies

By July 2012, multiple hosts could serve a base station and transmissions between host units and remote units were preferably occurring according to suitable standards such as the Common Public Radio Interface (CPRI) Standard. EX-1010 ¶¶0031, 0049; EX-1003 ¶52. Many different topologies for DASs were available

to connect the remote transceivers to the host and to each other. The CPRI Standard defines “a publicly available specification for the data transfer interfaces between the radio equipment (RE) and radio equipment controllers (REC) of transceiver systems, including base stations and distributed antenna systems (DAS).” EX-1011 [0005]; EX-1003 ¶52.

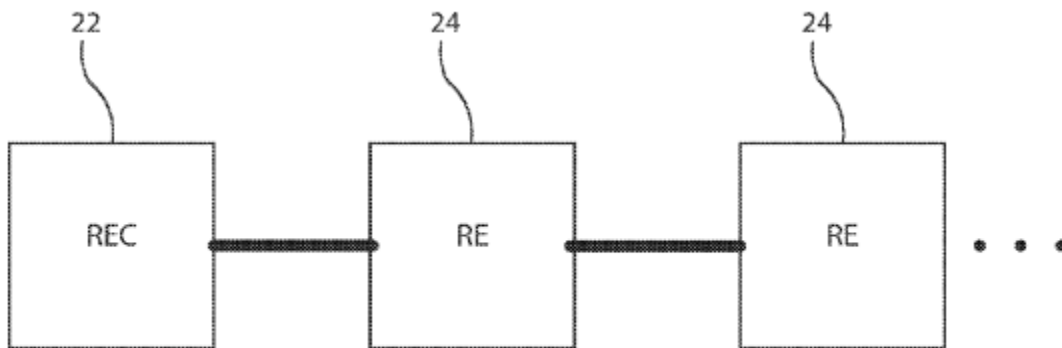
Using CPRI, the REC (host unit) is responsible for processing baseband signals and communicating with the core telecommunication network, whereas each RE (remote unit performs) performs the radio frequency (RF) processing for transmission of signals over the antenna to mobile devices. EX-1011 [0005]; EX-1012 9, 13; EX-1003 ¶53. Well-known topographies for a DAS included “point-to-point, multiple point-to-point, chain, star, tree, ring and combinations thereof” (EX-1011 [0005]), “daisy-chained” (EX-1013 [0086]), and “bus type, a star type or a hybrid type” (EX-1014 [0033]). EX-1003 ¶53. Several of these basic topologies are illustrated below:

Star Type



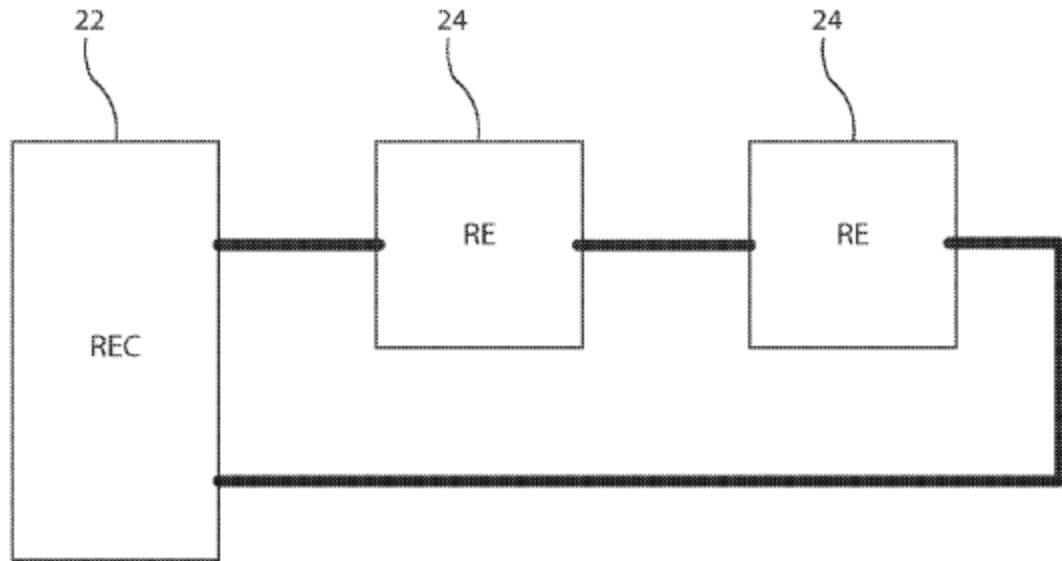
EX-1011 [0005], FIG. 3; EX-1012 FIG. 5; EX-1003 ¶54.

Chain or Daisy Chain Type



EX-1011 FIG. 4; EX-1012 FIG. 5A; EX-1003 ¶55.

Ring or Loop Type



EX-1011 FIG. 6; EX-1012 FIG. 5C; EX-1003 ¶56.

It was also known to couple components of a DAS, for example coupling multiple host units, coupling host to remote units etc., *via* optical fiber. EX-1015 FIG. 6, [0029]; EX-1003 ¶57.

VI. IDENTIFICATION OF CHALLENGES

A. Challenged Claims

Claims 1-19 of the '382 Patent are challenged in this Petition.

B. Statutory Grounds for Challenges

The Challenges are set forth in detail below and summarized as follows:

Ground	Claims	Basis	Reference
1	1-8, 10-19	§ 103	Kummetz
2	1-19	§ 103	Leng

Ground 1:

U.S. Patent 9,398,464 (“Kummetz”) is titled BASE STATION ROUTER FOR DISTRIBUTED ANTENNA SYSTEMS and issued July 19, 2016 from an application filed July 11, 2012 and claiming priority to provisional application 61/506,363 filed July 11, 2011. (EX-1006). Kummetz qualifies as prior art under §102(e). Kummetz was not cited or applied by the examiner. As discussed below, Kummetz was considered by the Board in IPR2021-00408 challenging the ’454 Patent.

Ground 2:

International Published Application WO 2009/090414 (“Leng”) is titled CELL MANAGEMENT SET, DISTRIBUTED ANTENNAE AND RECONFIGURATION THEREOF and published February 19, 2009 from an application filed August 14, 2007. (EX-1004)³. Leng qualifies as prior art under §102(e). Leng was not cited or applied by the examiner.

VII. IDENTIFICATION OF HOW THE CHALLENGED CLAIMS ARE UNPATENTABLE

A. Ground 1: Claims 1-8, 10-19 are unpatentable over Kummetz

1. Kummetz

Kummetz describes a method for load balancing in a DAS. EX-1006 Abstract, 1:40–2:4. Like the ’382 Patent, Kummetz discloses techniques for

³ Citations to Leng are to the English Translation EX-1005.

monitoring traffic in the DAS and reallocating network resources based on predefined criteria. EX-1006 1:40–2:4, 2:40–48. Also like the '382 Patent, Kummetz describes a mechanism to “execute the configuration management function in response to the detection of a traffic indicator” and to “redistribute signal capacity among coverage zones.” EX-1006 9:40-65; EX-1003 ¶61.

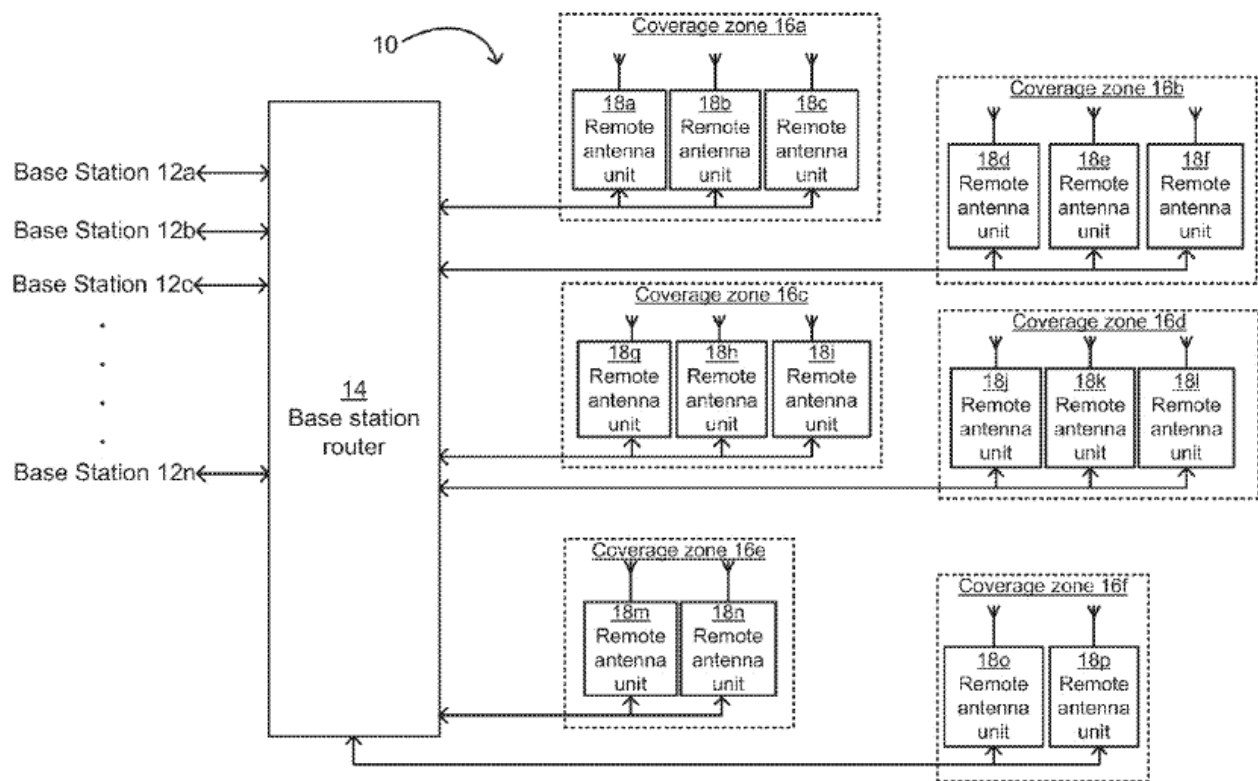


FIG. 1

EX-1006 FIG. 1; EX-1003 ¶61.

FIG. 1 illustrates a DAS embodiment of Kummetz. Base station router 14 communicates with a plurality of base stations 12a–n and a plurality of remote antenna units 18a–p that are distributed into different coverage zones (*e.g.*, in

stadiums, office buildings, or other confined environments). EX-1006 5:14–16; EX-1003 ¶62. “Different base stations 12a–n can be associated with different sectors of one telecommunication system operator and/or be associated with different sectors of different telecommunication system operators.” EX-1006 5:19–23; EX-1003 ¶62. The DAS can also be configured to have a plurality of interconnected base station routers to expand coverage. EX-1006 FIG., 6, 11:39–52; EX-1003 ¶62.

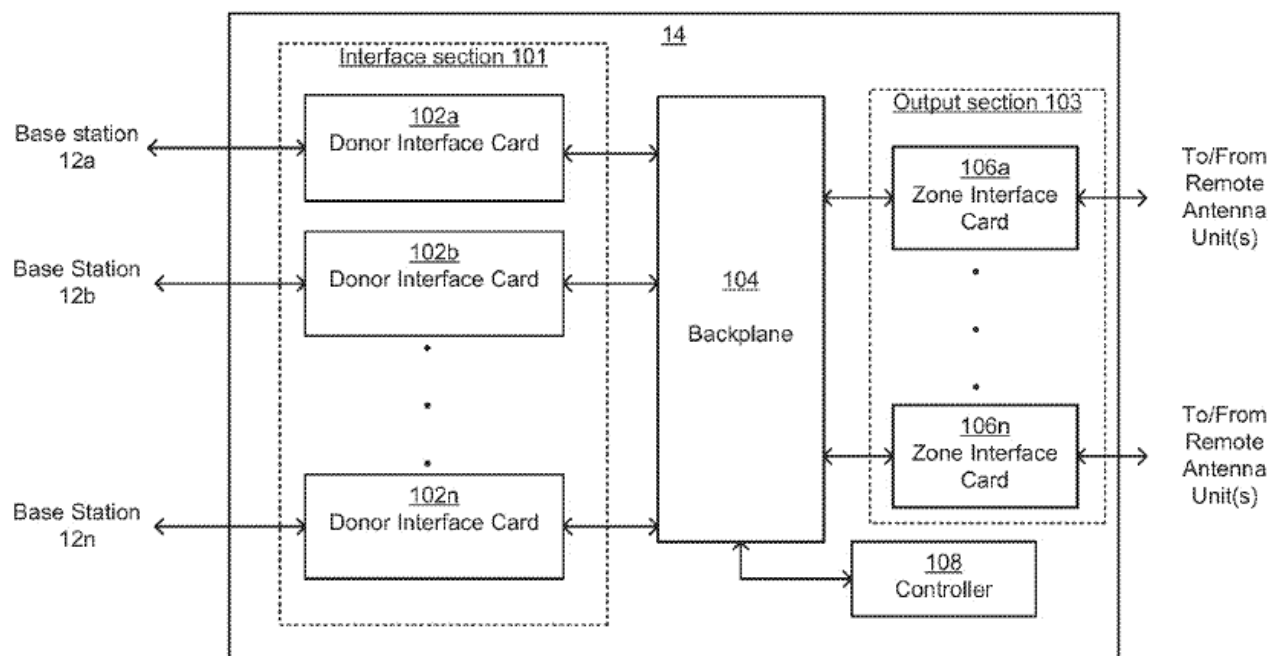


FIG. 2

EX-1006 FIG. 2; EX-1003 ¶62.

FIG. 2 is one example of a base station router, which includes an interface section 101 for bidirectional connections to the base stations and an output section 103 for bidirectional connections to the remote antenna units. EX-1006 7:45–8:53; EX-1003 ¶63. Router 14 is coupled to controller 108, which can be disposed in the router or in a separate device external to and in communication with the router. EX-1006 8:54–62; EX-1003 ¶63. Controller 108 reconfigures the digital signal processing circuitry to change the routing of signals between the base stations and remote antenna units. EX-1006 8:54-62; EX-1003 ¶63. Controller 108 comprises a configuration engine 210 that causes controller 108 to redistribute capacity in the DAS based on the detection of a “traffic indicator.” EX-1006 9:22–30, 9:40–44; EX-1003 ¶63.

A traffic indicator can include data describing or otherwise corresponding to a number of mobile devices in each coverage zone. Examples of a traffic indicator can include a scheduled event of a game, concert, or other type of event, a scheduled sequence of events with pre-game, game, and post-game configurations, traffic measurements passing low or high thresholds, base transceiver station failure events, and loss of capacity due to high inter-sector interference. In some aspects, the controller 108 can detect traffic and perform measurements independent of a wireless network standard and protocol.

EX-1006 9:44–54; EX-1003 ¶63.

Kummetz further describes that controller 108 can implement any process for measuring uplink signals for traffic and other types of information. EX-1006 9:55–65; EX-1003 ¶64.

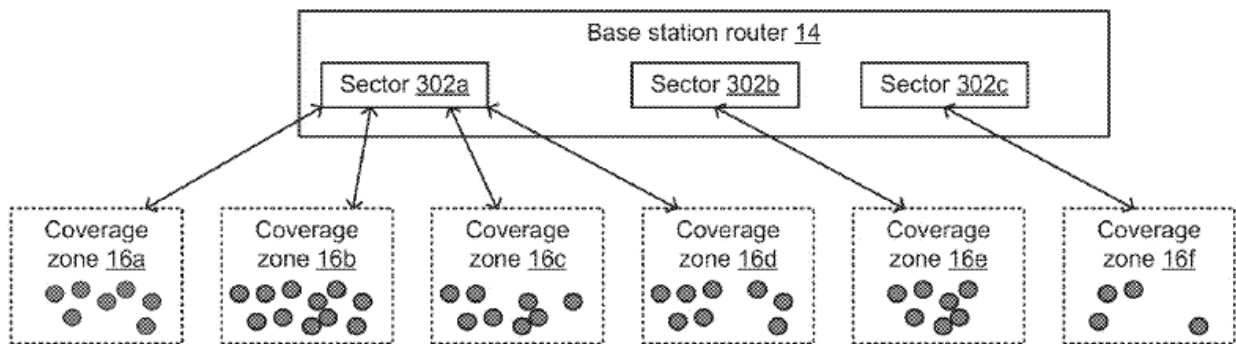


FIG. 4

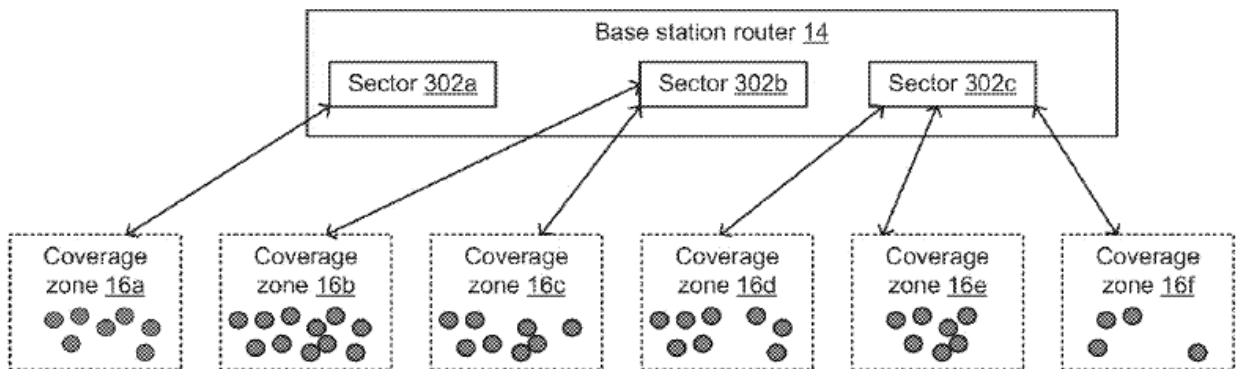


FIG. 5

EX-1006 FIG. 5; EX-1003 ¶64.

For instance, in response to a traffic indicator, the controller can cause base station router 14 to redistribute capacity by changing which sectors are provided to which coverage zones. EX-1006 9:40-54, 10:30-43; EX-1003 ¶65. FIGs. 4 and 5

illustrate the three sectors 302a-c distributing radio resources to the remote antenna units in coverage zones 16a–f. EX-1006 10:30–63; EX-1003 ¶65.

Kummetz uses the example of a stadium (coverage zones 16a–d) and the surrounding parking lot (coverage zones 16e–f), wherein before an event begins, the radio resources provided by a single sector 302a sufficiently cover the entire stadium. EX-1006 10:64–11:12; EX-1003 ¶66. When there are more wireless devices concentrated within the stadium than in the parking lot, the base station router can redistribute capacity such that the remote antenna units in coverage zones 16b–d are reallocated to different sectors 302b–c. EX-1006 11:13–28; EX-1003 ¶66.

2. Detailed Application of Kummetz

a. Claim 1

i. A system comprising:

Kummetz discloses a reconfigurable DAS. EX-1006 Abstract; EX-1003 ¶67.

ii. one or more Digital Access Units (DAUs) operable to receive at least one signal from at least one of a first signal source and a second signal source from one or more of a plurality of signal sources,

Kummetz discloses a DAU in the form of base station router 14 shown in FIG. 2 that includes an interface section 101, an output section 103, and a

backplane 104. Interface section 101 includes donor interface cards 102a-n. In the downlink direction, donor interface cards 102a-n transform RF signals received from base stations 12a-n into one or more digital data streams (*operable to receive at least one signal from at least one of a first signal source and a second signal source from one or more of a plurality of signal sources*). EX-1006 7:45-53.

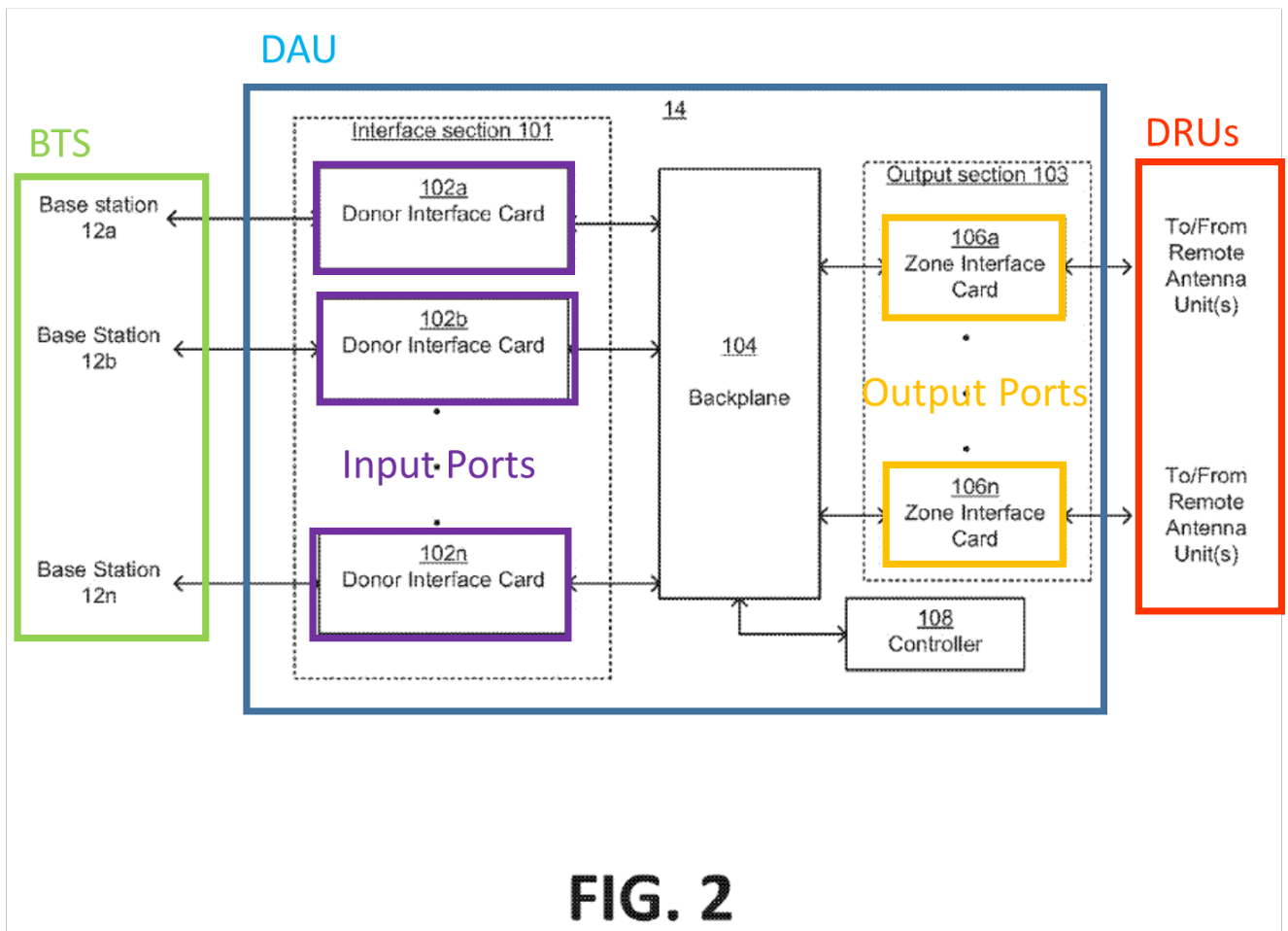


FIG. 2

EX-1006 FIG. 2; EX-1003 ¶68.

- iii. *each DAU of the one of more DAUs including an input port configured as an uplink/downlink port and an output port configured as an uplink/downlink port;*

Kummetz discloses that the base station router (*DAU*) includes donor interface cards (purple) (*input port configured as an uplink/downlink port*) that transform RF signals received from base stations 12a–n into one or more digital data streams in the downlink direction and transform digital data streams into uplink signals to be provided to base stations 12a–n in the uplink direction. EX-1006 7:50–8:1; EX-1003 ¶69.

Kummetz further discloses base station router 14 (*DAU*) includes zone interface cards 106a–n (green) (*output port configured as an uplink/downlink port*) that transforms the combined data streams into downlink signals to be provided to the remote antenna units of one or more coverage zones and receives uplink signals from one or more remote antenna units. EX-1006 8:23–54; EX-1003 ¶70.

iv. one or more Digital Remote Units (DRUs) connectable to the one or more DAUs and operable to transport signals between one or more of the one or more DRUs and the one or more DAUs;

Kummetz discloses one or more remote antenna units (*DRUs*) (blue) connectable to the one of more base station routers (*DAUs*) (red) operable to transport signals between the DRUs and DAUs. EX-1006 7:50-8:53; EX-1003 ¶71. Kummetz discloses that each base station router (*DAU*) comprises zone interface cards 106a–n and that each card “can transform the combined data streams into downlink signals to be provided to the remote antenna units [*DRUs*]

of one or more coverage zones ... [and] can receive one or more uplink signals from the one or more remote antenna units [DRUs].” EX-1006 8:27-42; EX-1003 ¶71.

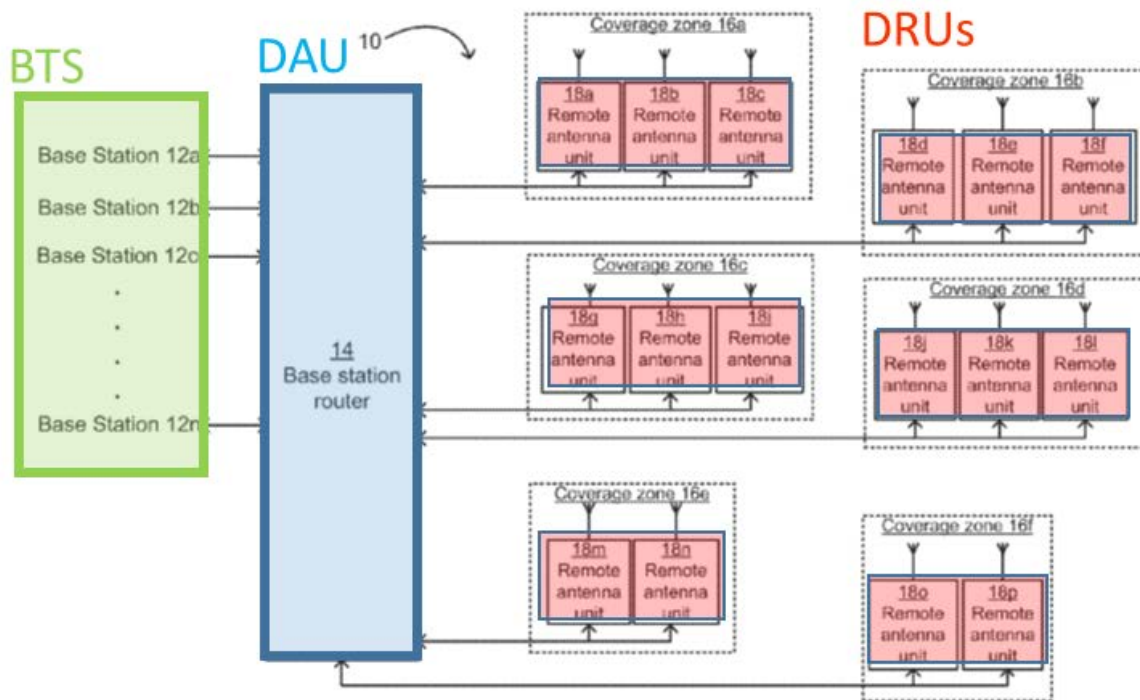


FIG. 1

EX-1006 FIG. 1; EX-1003 ¶71.

- v. *a plurality of radio resources formed from the one or more DRUs comprising a first radio resource and a second radio resource different from the first radio resource,*

Kummetz discloses that a sector can include an RF channel to be distributed to all of the remote antenna units (DRUs) in a coverage zone. EX-1006 2:48-52;

3:20-24; EX-1003 ¶72. As shown below in FIG. 4, Kummetz discloses that the channels associated with Sector 302a (green), 302b (blue) and 302c (gold) (*a plurality of radio resources*) formed from one or more remote antenna units (*DRUs*) comprising a first channel (green) (*a first radio resource*) and a second channel (blue) (*a second radio resource different from the first radio resource*).

EX-1006 10:56-63, FIG 4:

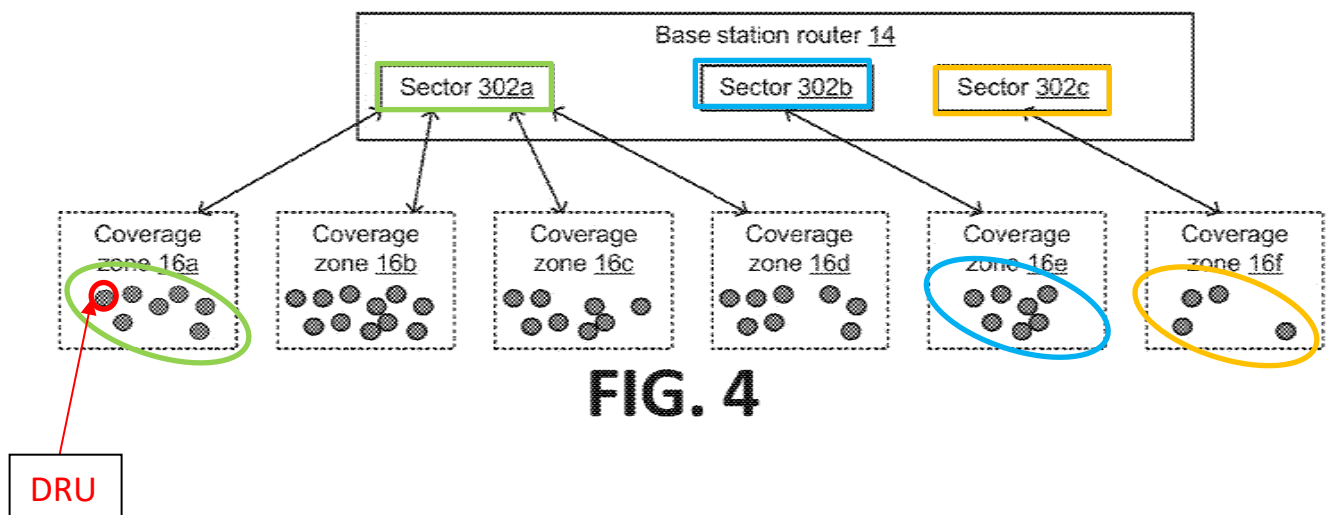


FIG. 4

EX-1006 FIG. 4; EX-1003 ¶72.

Kummetz is consistent with the disclosure in the '382 Patent that: “A typical base station comprises 3 independent radio resources, commonly known as sectors. These 3 sectors are typically used to cover 3 separate geographical areas without

creating co-channel interference between users in the 3 distinct sectors.” EX-1001

5:8-13; EX-1003 ¶73. This is illustrated in FIG. 1 of the ’382 Patent:

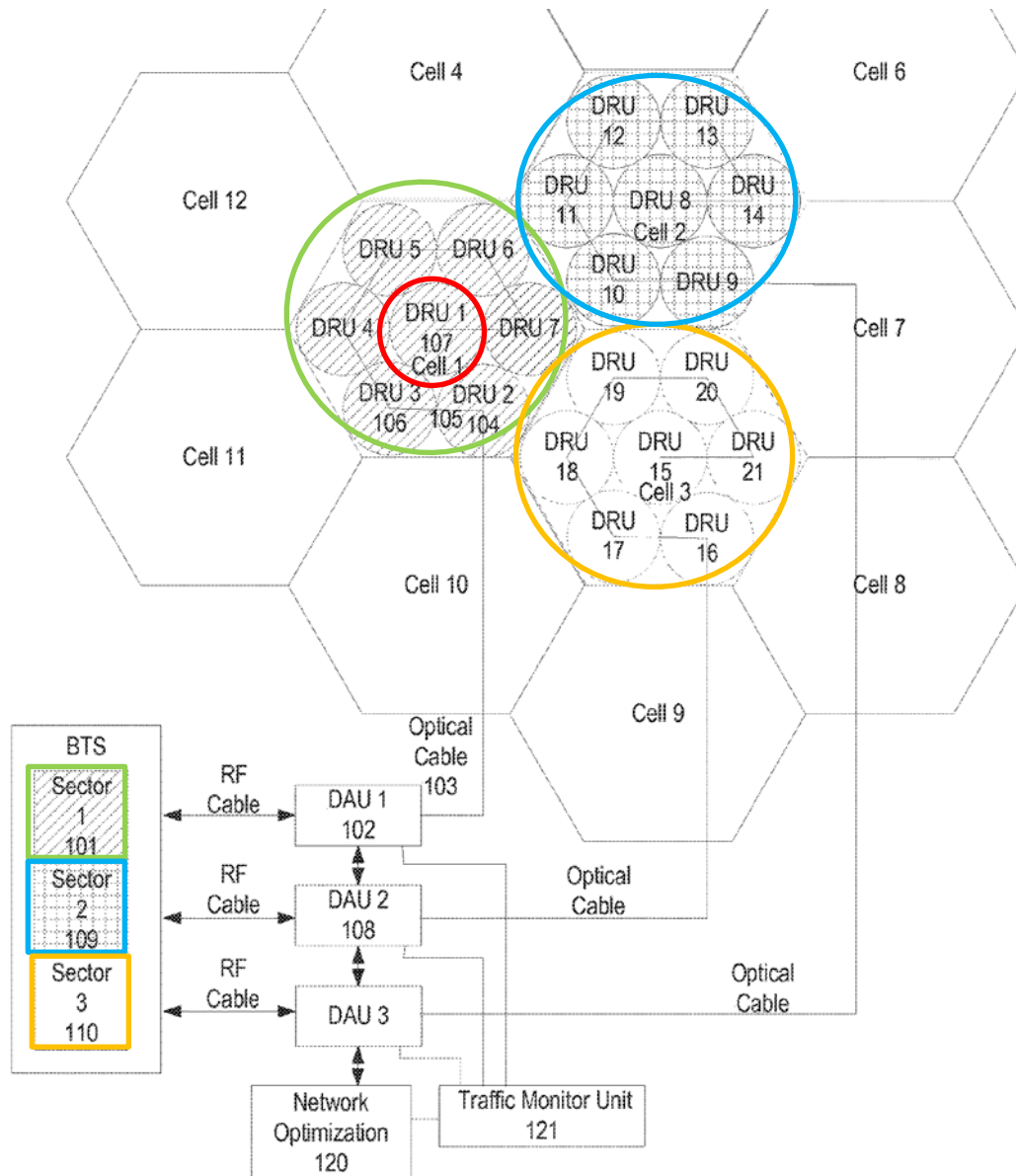


FIG. 1

EX-1001 Fig. 1; EX-1003 ¶73.

- vi. each radio resource comprising a subset of the plurality of DRUs;*

Kummetz discloses that the RF channels (*each radio resource*) of a sector are assigned to a coverage zone comprising a subset of the plurality of remote antenna units (*DRUs*) as illustrated in FIG. 4, above. EX-1003 ¶74.

vii. and a traffic monitoring unit coupled to at least one of the DAUs,

Kummetz discloses that controller 108 (dark green) (*traffic monitoring unit*) coupled to the backplane of router 14 (*DAU*) can detect traffic and perform measurements independent of a wireless network standard and protocol. EX-1006 9:53-54, 9:57-61; EX-1003 ¶75.

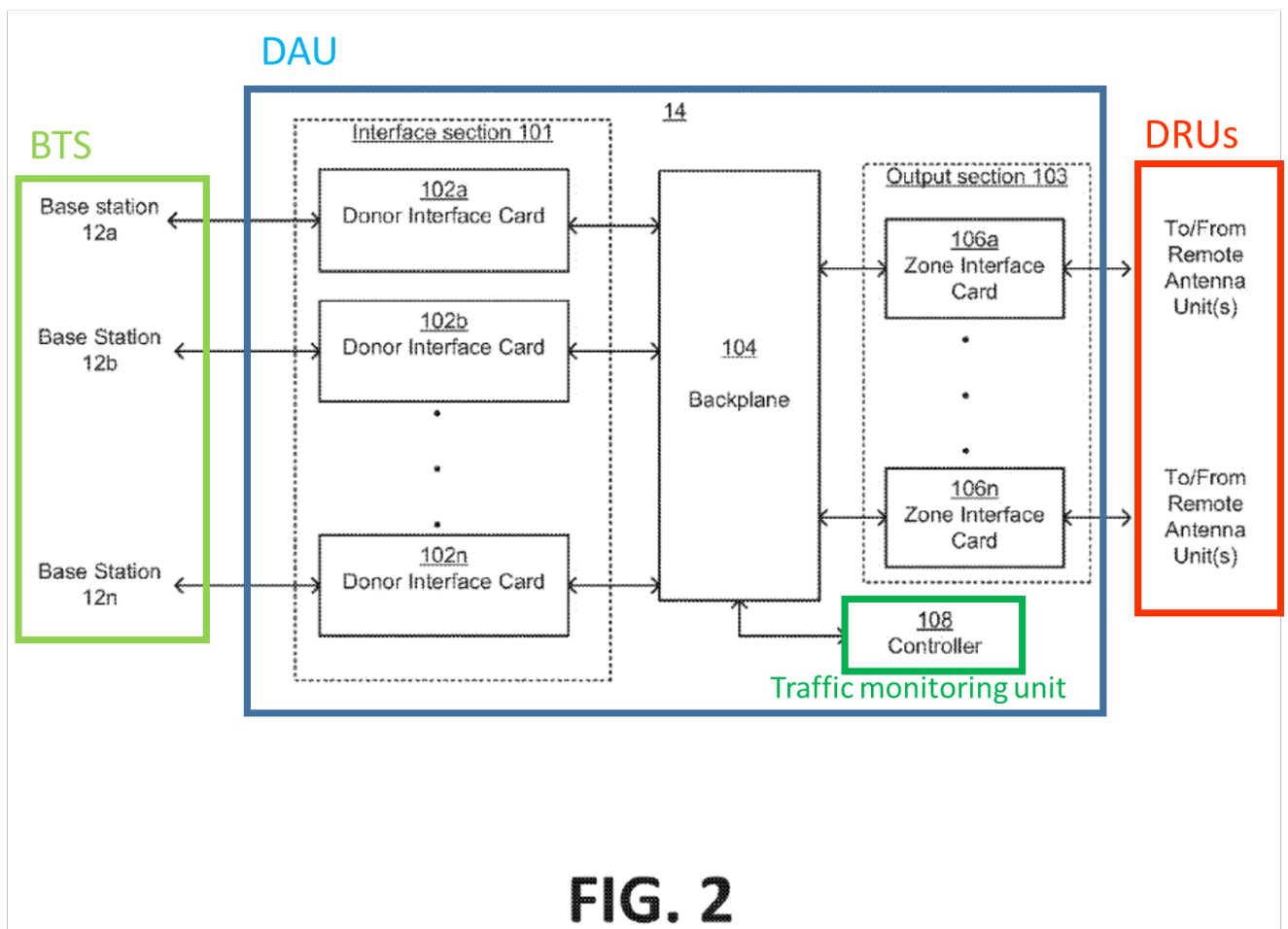


FIG. 2

EX-1006 Fig. 2; EX-1003 ¶75.

- (a) *wherein the traffic monitoring unit is configured to: determine one or more of: one or more key performance indicators (KPIs) and/or a quality of service (QoS) of a network traffic for the one or more DAUs, wherein the QoS is a function of the one or more KPIs;*

Kummetz discloses that controller 108 (*traffic monitoring unit*) determines one or more KPIs, such as the number of mobile devices in each coverage zone, traffic measurements passing low or high thresholds, base transceiver station failure events, and loss of capacity due to high inter-sector interference. EX-1006 9:40-54; EX-1003 ¶76. Kummetz further describes that capacity provided by a coverage area can be increased by decreasing the number of coverage zones assigned to a sector. Thus as the number of users in a coverage area increases, the density requirement of a sector increases the number of sectors:

The base station router can redistribute capacity such that the capacity requirements or capacity density match the provided capacity.

EX-1006 3:32-34; EX-1003 ¶76.

Increasing the number of coverage zones to which a sector is distributed can decrease the capacity density of each coverage zone. Decreasing the number of coverage zones to which a sector is distributed can increase the capacity density of each zone. The level of

the capacity density can determine how many mobile devices can use telecommunication services and capacity in a given coverage zone. In some aspects, a maximum capacity density can be achieved by distributing the sector to a minimum size coverage zone. A non-limiting example of a minimum size coverage zone is a single remote unit or a single antenna unit.

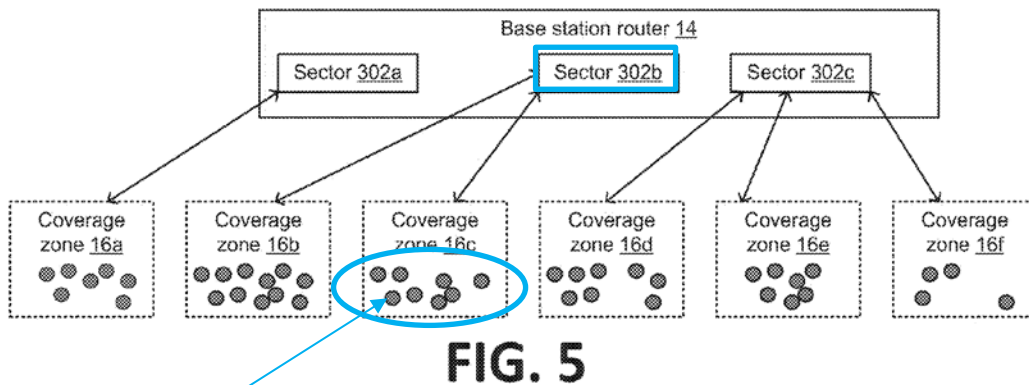
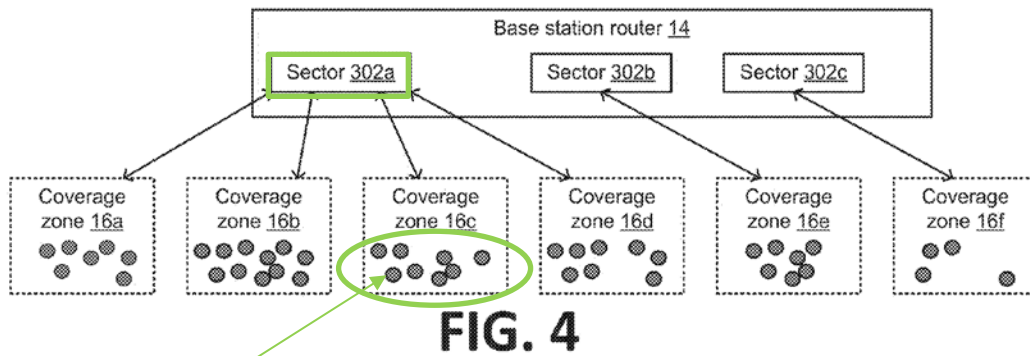
EX-1006 3:43-53; EX-1003 ¶76.

(b) and reconfigure the plurality of radio resources based on one or more of the one or more KPIs and/or the QoS by allocating at least one DRU from the first radio resource to the second radio resource.

Kummetz discloses that controller 108 (*traffic monitoring unit*) includes a configuration engine 210 that causes the controller to redistribute capacity in the DAS by reconfiguring the RF channels assigned to a remote antenna unit (*allocating at least one DRU from the first radio resource to the second radio resource*). EX-1006 9:22-25; EX-1003 ¶77. Specifically, the configuration engine includes a configuration management function for determining how to redistribute signal capacity among coverage zones in response to the detection of a traffic indicator. EX-1006 9:40-44; EX-1003 ¶77.

FIGs. 4 and 5 disclose an example of the traffic monitoring unit reconfiguring the channels assigned to the remote antenna units (depicted as

darkened circles) based on the number of wireless devices (*KPI*) in a coverage zone. EX-1003 ¶78.



EX-1006 10:30-37, FIGS.4, 5; EX-1003 ¶78.

FIG. 4 depicts the base station router (*DAU*), according to an initial configuration, providing the channels of sectors 302a-c to the remote antenna units (*DRUs*) in coverage zones 16a-f. Initially, the channels of sector 302a are configured for the remote antenna units in zones 16a-d, such that the carrier signals of the remote antenna units in zone 16c are provided by sector 302a (green circle). Kummetz describes that this initial configuration can be used for a football stadium

where zones 16a-d correspond to different sections of the stadium and zones 16e-f correspond to the parking lot. Before a stadium event begins, fewer wireless devices are in the stadium than the parking lot and therefore zones 16a-d require less capacity, thus sector 302a can provide sufficient capacity density for zones 16a-d. On the other hand, many wireless devices may be concentrated in the parking lot before the stadium event begins, and therefore zones 16e-f require more capacity than zones 16a-d and thus sector 302b is assigned to zone 16e and sector 302c is assigned to zone 16f. EX-1006 10:64-11:12; EX-1003 ¶79.

FIG. 5 depicts reconfiguration after the stadium event begins and the number of mobile devices in the stadium (zones 16a-d) increases and the number in the parking lot (zones 16e-f) decreases. The base station router (*DAU*) is reconfigured by the controller (*traffic monitoring unit*) in response to the concentration of mobile devices (*KPIs*) in the coverage zones. Specifically, channels of sector 302a are provided to zone 16a, channels of sector 302b are provided to zones 16b-c, and channels of sector 302c are provided to zones 16d-f. The reconfiguration results in increasing the density capacity of zones 16a-d where the concentration of mobile devices has increased. EX-1006 11:13-28; EX-1003 ¶80. As a result, the remote antenna units in zone 16c which were originally provided with the channels assigned to sector 302a (green circle in FIG. 4), have been reconfigured such that

the channels assigned to sector 302b are provided to the remote antenna units in the coverage zone 16c (blue circle in FIG. 5). EX-1003 ¶80.

Thus, Kummetz discloses that the controller (*traffic monitoring unit*) reconfigures channels assigned to sectors (*the plurality of radio resources*) based on the number of mobile devices in a coverage zone (*KPIs*) by allocating at least one DRU from the first radio resource (green circle in FIG. 4) to the second radio resource (blue circle in FIG. 5) EX-1003 ¶81.

b. Claim 2

The system of claim 1, further comprising a one or more Base Transceiver Stations (BTSs) coupled to the one or more DAUs, wherein each BTS comprises the plurality of radio resources.

Kummetz discloses a system comprising a plurality of base transceiver stations 12a–n (*one or more BTSs*) (green) coupled to the one or more DAUs, wherein each BTS comprises the plurality of RF channels assigned to sectors as illustrated in annotated FIG. 2. EX-1006 5:14–23, 7:45–8:7; EX-1003 ¶82.

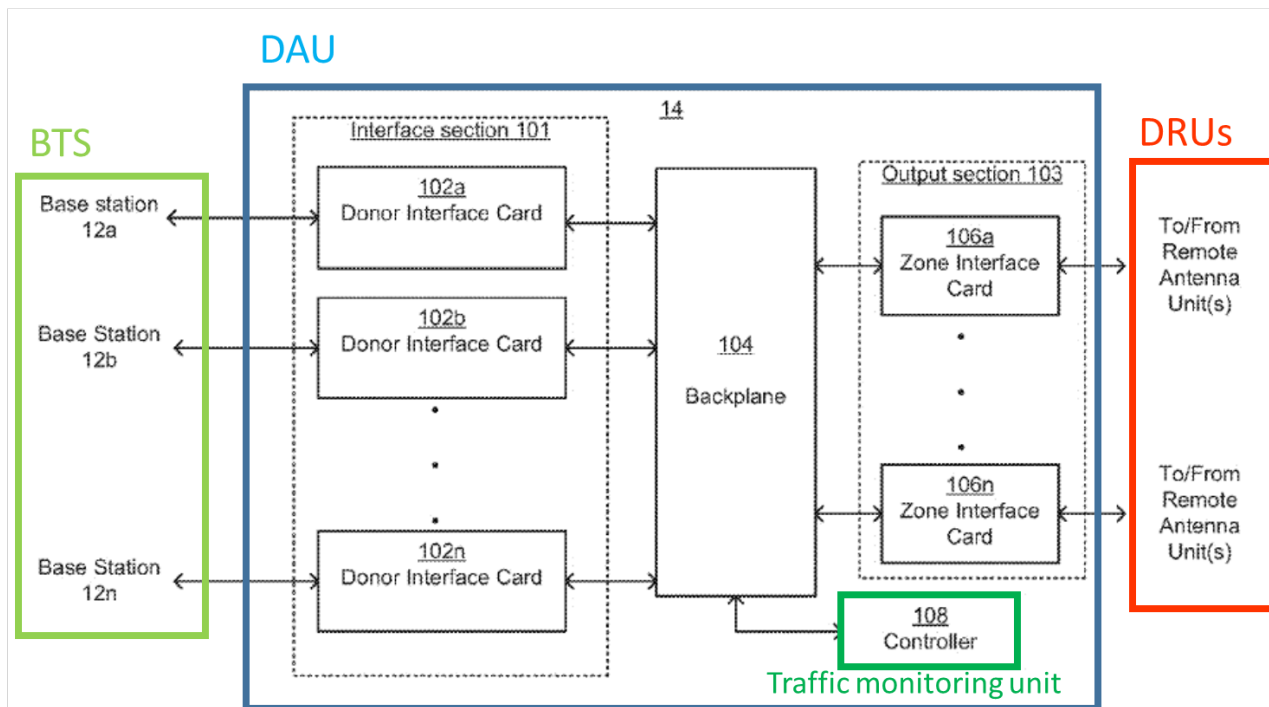


FIG. 2

EX-1006 FIG. 2; EX-1003 ¶82.

Kummetz further discloses that each base station 12a–n comprises one or more sectors. EX-1006 5:50–54 (“Routing the signals can include combining the signals of the sectors from one or more base stations 12a–n.”); 4:5-19; 5:19-22; EX-1003 ¶83. Further, a POSA understood that a base station could comprise multiple sectors, as acknowledged by the ’382 Patent. EX-1001, 5:8-13; EX-1003 ¶83. Base station router 14 (DAU) can combine signals from multiple sectors from base stations 12a–n. EX-1006 5:54–58; EX-1003 ¶83. Base station router 14 then

distributes the sectors of each base station 12a–n to the coverage zones. EX-1006 3:15–30, 10:30–43; EX-1003 ¶83.

c. Claim 3

The system of claim 2, further comprising a network optimization goal comprising a percentage of users associated with each of the plurality of radio resources.

Kummetz further discloses a network optimization goal comprising a percentage of users associated with each of the plurality of sectors. For example, as discussed above for Claim [1.vii], Kummetz discloses reconfiguring the capacity of base station sectors to different groups of remote antenna units in coverage zones 16a–f based on the number of mobile devices in the coverage zones. EX-1003 ¶84.

A POSA understood that the number of mobile devices represents the number of users in a coverage zone. Kummetz further discloses that “[t]he base station router can redistribute capacity such that the capacity requirements or capacity density match the provided capacity,” where the “capacity density” is the capacity per physical area (i.e., coverage zone) and the “provided capacity” is the capacity provided by each of the sectors. EX-1006 1:43–46, 1:66–67, 3:32–34, 3:55–58; EX-1003 ¶85. This can be achieved by “changing which sectors are provided to which coverage zones.” EX-1006, 3:15–16; EX-1003 ¶85. A POSA understood that redistributing capacity by matching “capacity density” and

“provided capacity” discloses a network optimization goal, i.e., “[t]he level of the capacity density can determine how many mobile devices can use telecommunication services and capacity in a given coverage zone.” EX-1006 3:47–49; EX-1003 ¶85. Thus, increasing the number of coverage zones to which the provided capacity of a sector is distributed decreases the capacity density of the coverage zones and increases the number of mobile devices or users that are using the provided capacity across the coverage zones. EX-1006 3:43–53; EX-1003 ¶85. In contrast, decreasing the number of coverage zones to which the provided capacity of a sector is distributed increases the capacity density of the coverage zones and decreases the number of mobile devices or users that are using the provided capacity across the coverage zones. EX-1006, 3:54–61; EX-1003 ¶85.

Thus, Kummetz discloses redistributing capacity such that capacity density matches provided capacity, which shifts the percentage of mobile devices (i.e., users) associated with each of the plurality of sectors (i.e., network optimization goal). EX-1003 ¶86. To the extent that PO argues that Kummetz does not expressly recite that the optimization goal is based on a percentage of users using the channels assigned to the sectors, a POSA would be motivated to modify Kummetz to use the percentages of users based on the express teachings of Kummetz that:

Capacity can be redistributed in whole or in part from the first coverage zone to the second coverage zone based on the second coverage zone having a greater capacity requirement (i.e., a larger number of mobile devices).

EX-1006 3:39–42; EX-1003 ¶86.

Further, Kummetz discloses that “[t]he base station router can distribute capacity to sub-divide a larger cell into smaller cells.” EX-1006 3:36–37; EX-1003 ¶87. When the larger cell is sub-divided into smaller cells, the mobile devices or users associated with the larger cell are split among the smaller cells, which increases or decreases the number of users per cell. EX-1003 ¶87. Further, Kummetz discloses “[i]ncreasing the bandwidth associated with a sector can increase the capacity represented by the sector.” EX-1006 3:19–20; EX-1003 ¶87. A POSA understood that when the capacity represented by a sector is increased, more mobile devices or users can use the additional capacity of the sector associated with their coverage zone(s) or cell(s), and this results in adjusting the percentage of users per cell. Thus, a POSA would be motivated to implement an optimization plan that uses a percentage of users in a coverage zone that can be supported by the available bandwidth. The disclosure of Kummetz is consistent with the teachings of the ’382 Patent of a network optimization goal based on the number of users on the system which utilizes a base station having three sectors serving multiple DRUs. EX-1001 4:50-54, 5:66-6:15; EX-1003 ¶87.

d. **Claim 4**

The system of claim 1, wherein the traffic monitoring unit is external to the one or more DAUs.

Kummetz discloses that controller 108 (*traffic monitoring unit*) “can be disposed in a separate device external to and in communication with the base station router 14” (*DAU*). EX-1006 8:59-62; EX-1003 ¶88.

e. **Claim 5**

The system of claim 1, wherein the traffic monitoring unit is provided as a component of each of the one or more DAUs.

Kummetz discloses that controller 108 (*traffic monitoring unit*) can be provided as a component of a base station router (*DAU*) as shown in FIG. 2. EX-1006 8:58-59; EX-1003 ¶89.

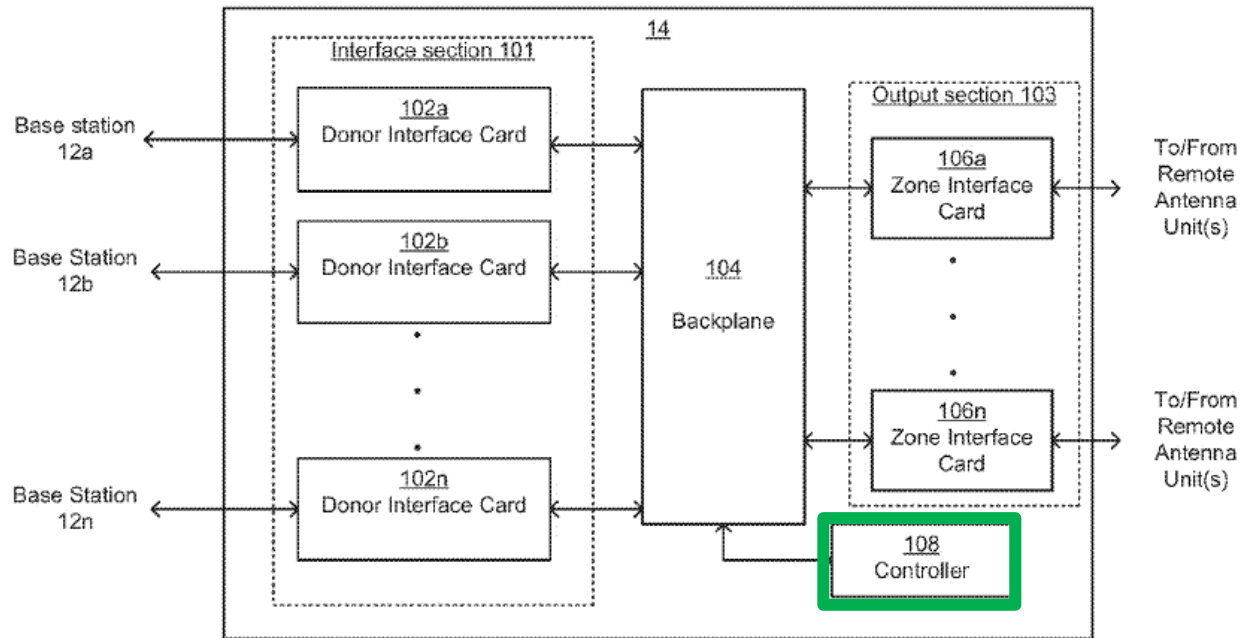


FIG. 2

EX-1006 Fig. 2; EX-1003 ¶89.

f. Claim 6

The system of claim 1, wherein the traffic monitoring unit is external to the one or more DRUs.

Kummetz discloses this limitation for the same reason as discussed regarding Claim [1.vii] and Claim 5 showing the controller external to the remote antenna unit. EX-1006 5:14–16, 8:54–62; FIGS. 1-2; EX-1003 ¶90.

g. Claim 7

The system of claim 1, wherein the traffic monitoring unit is provided as a component of each of the one or more DRUs.

Kummetz discloses that KPIs include traffic measurements and that a POSA understood one such measurement to be uplink power. EX-1006 9:40-54; EX-1001 10:37-45; EX-1003 ¶91. Kummetz further discloses that each remote antenna unit measures the RSSI of uplink signals from mobiles. EX-1006 4:48-54; EX-1003 ¶91. Thus, Kummetz discloses a traffic monitoring unit in the form of a component located in the remote antenna unit (*DRU*) that determines the uplink power. EX-1003 ¶91.

h. Claim 8

The system of claim 1, wherein the traffic monitoring unit is configured to analyze Key Performance Indicators (KPIs) of the DAS.

Kummetz discloses the traffic monitoring unit is configured to analyze KPIs. In one example, Kummetz discloses that controller 108 (*traffic monitoring unit*) includes a configuration engine 210 for determining how to redistribute signal capacity among coverage zones in response to the detection of a traffic indicator (*analyze Key Performance Indicators (KPIs) of the DAS*). EX-1006 9:40-54; EX-1003 ¶92.

i. Claim 10

i. A system comprising:

See Claim [1.i].

ii. one or more Digital Access Units (DAUs) operable to receive at least one signal from at

least one of a first signal source and a second signal source from one or more of a plurality of signal sources,

See Claim [1.ii].

- iii. each DAU of the one or more DAUs including an input port configured as an uplink/downlink port and an output port configured as an uplink/downlink port;*

See Claim [1.iii].

- iv. one or more Digital Remote Units (DRUs) couplable to the one or more DAUs and operable to transport signals between the one or more DRUs and the one or more DAUs;*

See Claim [1.iv].

- v. a plurality of radio resources formed from the one or more DRUs comprising a first radio resource and a second radio resource different from the first radio resource,*

See Claim [1.v].

- vi. each radio resource comprising a subset of the one or more DRUs; and*

See Claim [1.vi].

- vii. a traffic monitoring unit external to and couplable to at least one of the DAUs*

See Claim [1.vii].

- (a) *wherein the traffic monitoring unit is configured to: determine one or more of one or more key performance indicators (KPIs) and/or a quality of service (QoS) of a network traffic for the one or more DAUs, wherein the QoS is a function of the one or more KPIs; and*

See Claim [1.vii(a)].

- (b) *reconfigure the plurality of radio resources based on one or more of the one or more KPIs and/or the QoS by allocating at least one DRU from the first radio resource to the second radio resource.*

See Claim [1.vii(b)].

j. **Claim 11**

The system of claim 10, wherein the traffic monitoring unit is external to one or more Base Transceiver Stations (BTSs) and coupled to each of the one or more BTSs.

Kummetz discloses that controller 108 (*traffic monitoring unit*) may be provided as a component of base station router 14 (*DAU*) and router 14 is external and coupled to each of base stations 12a–n (*BTSs*). EX-1006 5:14–16, 7:50–8:7, 8:54–62, FIGS. 1-2; EX-1003 ¶94.

k. **Claim 12**

The system of claim 10, further comprising a network optimization processor coupled to the traffic monitoring unit.

Kummetz further discloses a network optimization processor coupled to the traffic monitoring unit. For example, Kummetz discloses that controller 108 (*traffic monitoring unit*) includes configuration engine 210 (*network optimization processor*) that, when executed by processor 202, “can cause the controller 108 to redistribute capacity in the DAS 100” including “in response to changes [in] concentration of wireless devices in the respective coverage zones.” EX-1006 9:22-25; 9:55-61; 11:13-15, FIG. 3; EX-1003 ¶95. Thus, configuration engine 210 executed by processor 202 is an optimization processor coupled to the controller (*traffic monitoring unit*) for optimizing the DAS as described with respect to Claim 3. EX-1003 ¶95.

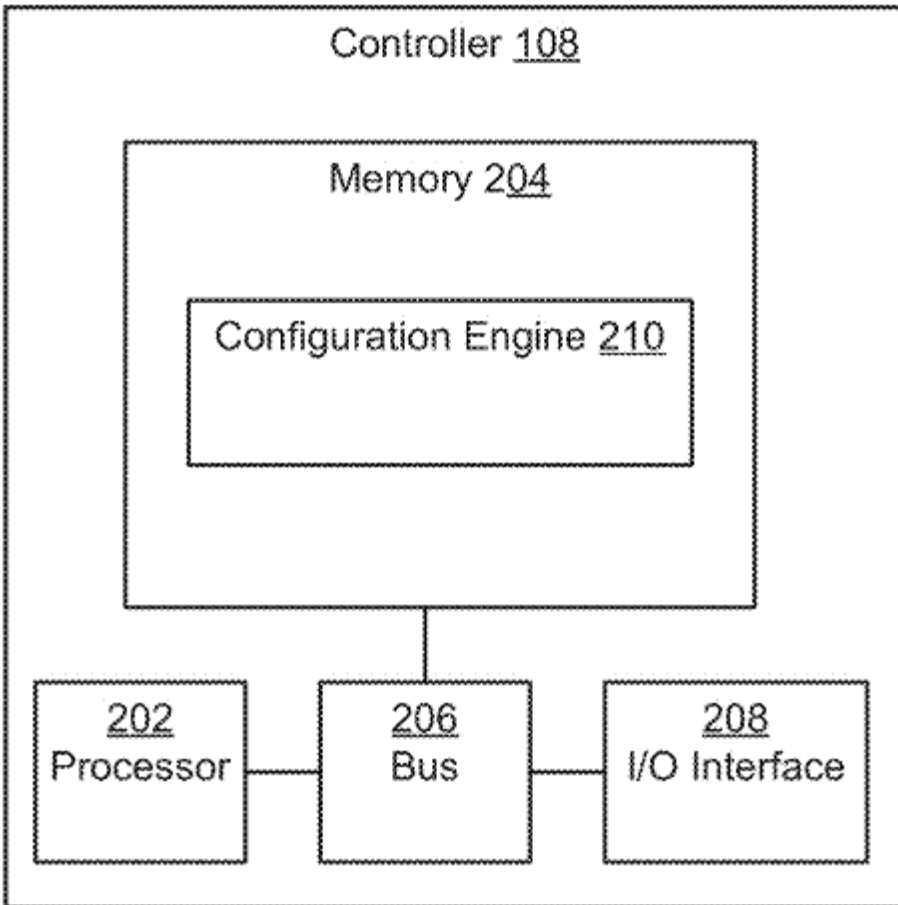


FIG. 3

EX-1006 FIG. 3, 8:64–9:5; EX-1003 ¶95.

I. Claim 13

The system of claim 10, wherein the one or more DAUs are coupled via at least one of an ethernet cable, optical fiber, microwave line of sight link, wireless link, and/or satellite link.

Kummetz discloses an embodiment of the system comprising a plurality of base station routers 14a-c (DAUs)(red) as illustrated in FIG. 6 below:

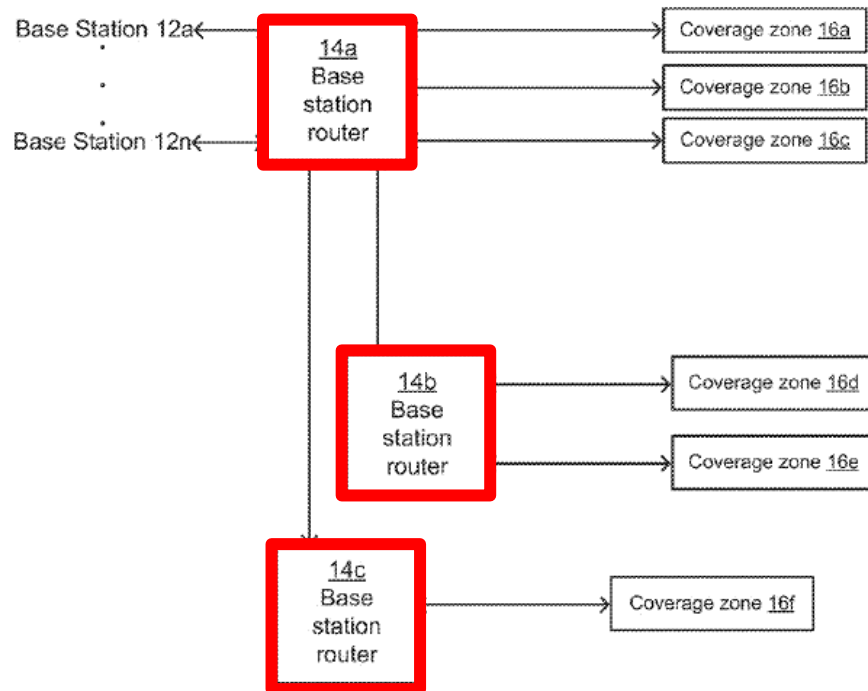


FIG. 6

EX-1006 FIG. 6; EX-1003 ¶96.

Kummetz further states that the base station routers (*DAUs*) are coupled via at least one of an ethernet cable, optical fiber, microwave line of sight link, wireless link, and/or satellite link:

The interconnections between multiple base station routers can use different media. Examples of interconnections between base station routers can include (but are not limited to) wired connections, optical connections, free-air paths, etc. Examples of wired connections can include (but are not limited to) coaxial cables and twisted pair cables. Examples of optical connections can include optical fiber or other optical guides. Examples of free-air paths can include using radiated RF signals or radiated optical signals.

EX-1006 4:61-5:4; EX-1003 ¶97.

m. Claim 14

The system of claim 10, wherein the one or more DAUs are coupled to the one or more DRUs via at least one of an ethernet cable, optical fiber, microwave line of sight link, wireless link, and/or satellite link.

Kummetz discloses that the base station routers (*DAUs*) are coupled to the remote antenna units (*DRUs*) via at least one of an ethernet cable, optical fiber, microwave line of sight link, wireless link, and/or satellite link:

The remote antenna units 18a–p can communicate with the base station router 14 via any communication medium capable of carrying signals between the base station router 14 and the remote antenna units 18a–p. Examples of a suitable communication medium include copper wire (such as a coaxial cable), optical fiber, and microwave or optical link. The link can transport the signals in analog or in digitized form.

EX-1006 7:12-19; EX-1003 ¶98.

n. Claim 15

The system of claim 10, wherein the one or more DRUs are connected in a daisy chain configuration.

Kummetz discloses several functional schematic examples of multiple DRU's connected to a DAU, and DRUs connected to one another, but does not provide details of the physical connections between one or more DRUs and the

DAU. However, as discussed in the State of the Art section, a POSA understood that there were many different topology configurations used in DASs to connect DRU's including "point-to-point, multiple point-to-point, chain, star, tree, ring and combinations thereof" (EX-1011 0005), "daisy-chained" (EX-1013 0086), and "bus type, a star type or a hybrid type" (EX-1014 0033); EX-1003 ¶99. Kummetz does not disclose any preference or any restriction for any topology, and thus a POSA understood that Kummetz's teachings include using a daisy chain configuration. EX-1003 ¶99.

To the extent that PO argues that Kummetz does not expressly teach a daisy chain configuration, a POSA would be motivated to use a daisy chain as there is a finite number of choices, and a daisy chain is a well-known implementation. Specifically, Kummetz explicitly references the CPRI specification as a preferred protocol for use with the DAS embodiments (EX-1006) and as discussed in the State of the Art section, the CPRI standard as well as prior art DAS systems using CPRI have identified a daisy chain as a suitable topography. EX-1011, 0005, FIG. 4; EX-1012 FIG. 5A; EX-1003 ¶100. A POSA understood that different topologies of remote antenna units provide different coverage areas and those topologies can provide the necessary or desired coverage for particular venues, such as stadiums and office buildings. A POSA would have reasonably expected to succeed with the different topologies because the arrangement of the remote

antenna units would provide predictable coverage areas for the particular venues or location. Thus, based on the advanced state of the art, implementing such topologies would have been routine, and would have led to predictable results.

EX-1003 ¶100.

o. Claim 16

The system of claim 10, wherein the one or more DRUs are connected to the one or more DAUs in a star configuration.

This limitation is disclosed for the same reasons as discussed with respect to Claim 15. Specifically, the use of a star configuration was well known in the art and implementing such topologies would have been routine, and would have led to predictable results. EX-1011 [0005] FIG. 3; EX-1012 FIG. 5; EX-1014 0033; EX-1003 ¶101.

p. Claim 17

The system of Claim 10, wherein the one or more DAUs are connected to one or more BTSs via at least one of an ethernet cable, optical fiber, microwave line of sight link, wireless link and/or satellite link.

Kummetz discloses that the base station router 14 “can receive signals from the base station 12a–n via a wired or wireless communication medium.” EX-1006 5:24–25. A POSA understood that such connection medium included at least

one of an ethernet cable, optical fiber, microwave line of sight link, wireless link and/or satellite link. EX-1003 ¶102.

Additionally, as discussed with respect to Claims 13 and 14, Kummetz describes examples of such wired and wireless communication mediums in the context of other connections to the base station router 14 such as coaxial cables, twisted pair cables, optical fiber, microwave link, optical link, radiated RF signals, and radiated optical signals. EX-1006 4:66–5:4; 7:16–20; EX-1003 ¶103.

q. Claim 18

The system of claim 10, wherein the one or more DRUs are connected in a loop to one or more of the one or more DAUs.

This limitation is disclosed for the same reason as discussed with respect to Claim 15. Specifically, the use of a loop configuration was well known in the art and implementing such topologies would have been routine, and would have led to predictable results. EX-1011, FIG. 6; EX-1012 FIG. 5C; EX-1003 ¶104.

r. Claim 19

The system of claim 10, wherein a single DAU port is connected to one or more BTSs.

This limitation is disclosed for the same reason as discussed with respect to Claim [10.iii] because a single port of the donor interface card 102a is connected to base station 12a as illustrated in FIG 2. EX-1003 ¶105.

B. Ground 2: Claims 1-19 are Unpatentable Over Leng

1. Leng

Leng relates to DAS technology, and more particularly to a cell management apparatus, a DAS , and a reconfiguration method thereof, which are capable of reallocating a carrier to effectively adapt to load changes when communication traffic of a region varies greatly. EX-1005 Abstract; EX-1003 ¶106

FIG. 2 of Leng illustrates one embodiment of DAS 20. Remote Radio Heads (RRHs) 26 are placed around the building. Cell management device (CMU) 24 is connected to base station 21 and is configured to distribute a downlink wireless signal to RRH 26, collect an uplink wireless signal, and transmit the uplink signal to base station 21. CMU 24 also collects load information of DAS 20 and reconfigures the DAS based on the load information. The RRH corresponds to the RRU of the '382 Patent, and the CMU corresponds to the DAU of the '382 Patent. EX-1005 3:20-25; EX-1003 ¶107.

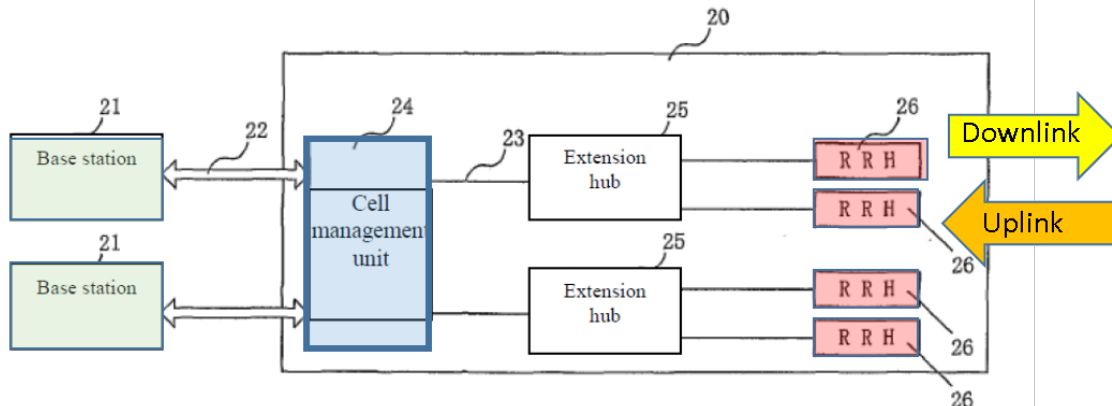


Fig. 2

EX-1005 FIG. 2; EX-1003 ¶107.

Leng describes several problems with prior art DAS implementations. First, once the DAS has been installed, the allocation of the RF spectrum is fixed. Such systems are not suitable for areas where communication traffic varies greatly, such as auditoriums, conference halls, and the like. If too much spectrum is allocated to such areas, spectrum resources are wasted when these areas are idle. However, if only a small amount of spectrum resources are allocated to these areas, when these areas become crowded, spectrum resources may be insufficient. EX-1005 1:19-23; EX-1003 ¶108.

Second, Leng explains the disadvantages of most existing DASs include the inability to dynamically reassign carriers to effectively adapt to load changes when necessary. Some DASs include manual offline reconfiguration, which requires the

administrator to manually reconfigure based on the expected load distribution. This manual approach does not dynamically reconfigure in a timely and efficient manner based on real-time traffic distribution, and interrupts continuity during reconfiguration. EX-1005 1:24-30; EX-1003 ¶109.

Leng describes that its solution to these problems is dynamically reconfiguring a DAS that is capable of reallocating carriers in a timely and efficient manner to meet the changing communication traffic needs of a region. The DAS collects load information and reconfigures the system based on the load information. EX-1005 1:33-36; EX-1003 ¶110. As part of the reconfiguration, Leng describes that the RRHs switch their carriers upon notification from the carrier reconfiguration module. EX-1005 9:1-10; EX-1003 ¶110.

FIGs. 4 and 5 illustrate an embodiment of the reconfigurable DAS. FIG. 4 shows the initial configuration of DAS 20. RRH A and RRH B use carrier 1 (red), RRH C and RRH D use carrier 2 (blue), and RRH E and RRH F use carrier 3 (green). EX-1005 4:18-22; EX-1003 ¶111.

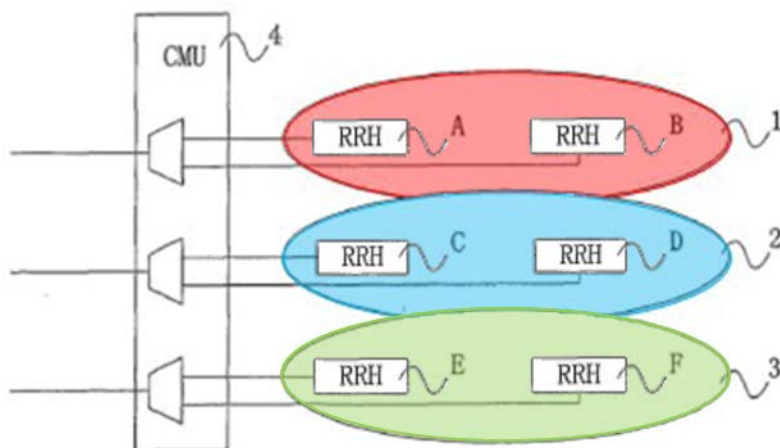


图 4

EX-1005 FIG. 4; EX-1003 ¶111.

When CMU 24 detects that RRH A and RRH B become areas of high load, DAS 20 is reconfigured as shown in FIG. 5. After reconfiguration, RRH B is reconfigured to use carrier 2 (blue), and RRHs C and D are reconfigured to use carrier 3, along with RRHs E and F (green). As a result, RRH A uses carrier 1 and RRH B uses carrier 2. Thus DAS 20 is reconfigured to split the heavy load which was previously only on carrier 1 between carriers 1 and 2. Carrier 3 which was being used before configuration only by RRH E and RRH F, is now shared with RRH C and RRH D since it is sufficient to carry the load of all four RRHs. EX-1005 4:18-27; EX-1003 ¶112.

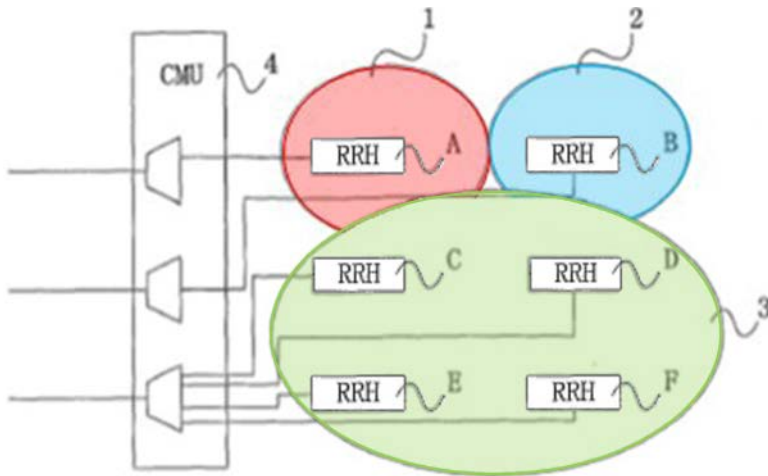


图 5

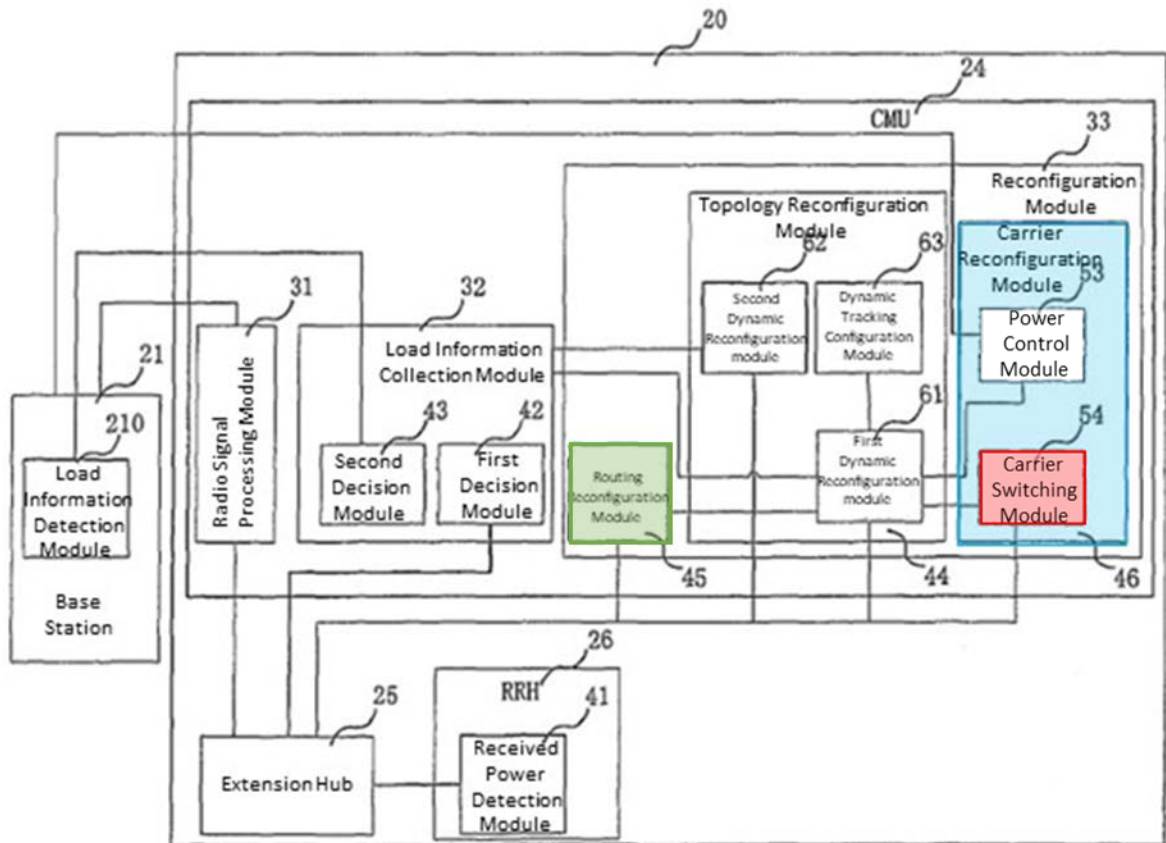
EX-1005 FIG. 5; EX-1003 ¶112.

Although the examples in FIGs. 4 and 5 show each RRH using one carrier, Leng discloses that “the RRHs can also support multiple carriers.” EX-1005 3:31-32. Similar to the disclosure in the ’382 Patent, Leng discloses a DAS which may be dynamically reconfigured to accommodate areas with large changes in communication traffic, such as auditoriums, conference halls, etc., by dynamically allocating RF resources according to the current traffic state to balance the traffic load and improve system efficiency. EX-1005 2:14-17; EX-1003 ¶113.

Leng discloses several different embodiments of a CMU 24, all of which include load information collecting module 32 and reconfiguration module 33. EX-1005 FIGs. 6, 8, 15. Module 32 is configured to collect load information and reconfiguration module 33 is configured to collect the load information from module 32 and determine the new topology, re-allocate the carrier in the

corresponding RRH, and reconfigure the routing of the wireless signals. EX-1005 4:15-17; EX-1003 ¶114.

Leng further describes an embodiment of FIG. 15 that can be used to reconfigure RRHs as illustrated in FIGs. 4 and 5. EX-1005 10:1-3; EX-1003 ¶115.



EX-1005 FIG. 15; EX-1003 ¶115.

The reconfiguration of the wireless signal routing is performed by routing reconfiguration module 45 (green), and the reallocation of the carrier in the corresponding RRH is performed by carrier reconfiguration module 46 (blue). EX-1005 10:21-27; EX-1003 ¶116. Leng discloses that switching module 54 (red) is configured to notify the high-load RRH 26 to switch the carrier to the carrier of

the corresponding low-load RRH according to the new topology determined by module 44. EX-1005 11:17-21; EX-1003 ¶116.

Leng further discloses that each RRH may support multiple carriers. EX-1005 1:15-18, 3:39-43; EX-1003 ¶117.

2. Detailed Application Of Leng

a. Claim 1

i. A system comprising:

Leng discloses a reconfigurable DAS. EX-1005 Abstract; EX-1003 ¶118.

ii. one or more Digital Access Units (DAUs) operable to receive at least one signal from at least one of a first signal source and a second signal source from one or more of a plurality of signal sources,

Leng discloses CMU 24 (blue) (DAU) operable to receive at least one signal from base stations 21(green) (*at least one of a first signal source and a second signal source from one or more of a plurality of signal sources*):

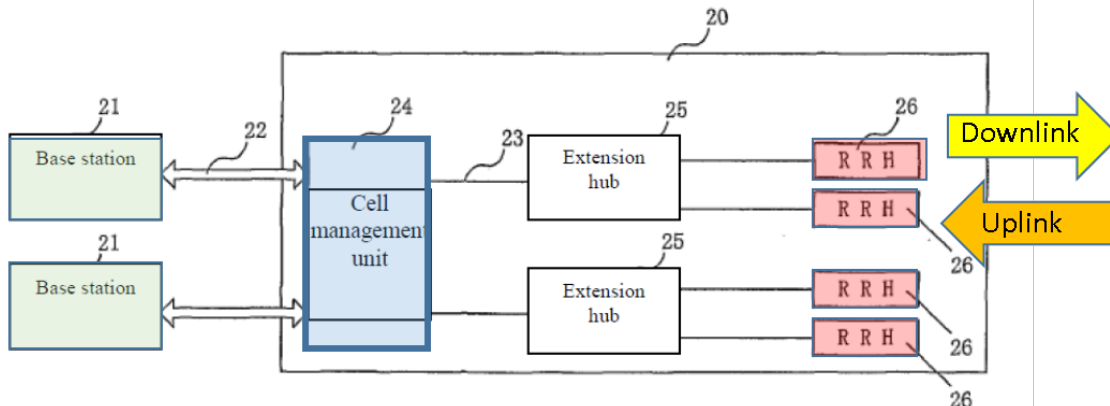


Fig. 2

EX-1005 Fig. 2; EX-1003 ¶119.

CMU 24 is connected to base station 21 and is configured to distribute a downlink wireless signal to RRHs 26, collect an uplink wireless signal, and transmit the uplink signal to base station 21. CMU 24 also collects load information of DAS 20 and reconfigures the DAS based on the load information. The RRH corresponds to the DRU of the '382 Patent, and the CMU corresponds to the DAU of the '382 Patent. EX-1005 3:20-25; EX-1003 ¶120.

iii. each DAU of the one of more DAUs including an input port configured as an uplink/downlink port and an output port configured as an uplink/downlink port;

Leng describes that CMU 24 is connected to base station 21 using an interface 22 (yellow), and is connected to the extension hub 25 through transmission medium 23(light blue):

The interface 22 between the CMU 24 and the base station 21 can be the standard Open Base Station Architecture Initiative interface (OBSAI), the Common Public Radio Interface (CPRI), or a special local communication interface.

The transmission medium 23 of the distributed antenna system 20 may be an optical fiber or a UTP/STP cable, etc., the transmission network may be Gigabit Ethernet, and the transmitted radio signals are digital baseband signals.

EX-1005 3:31-33, 3:36-38; EX-1003 ¶121.

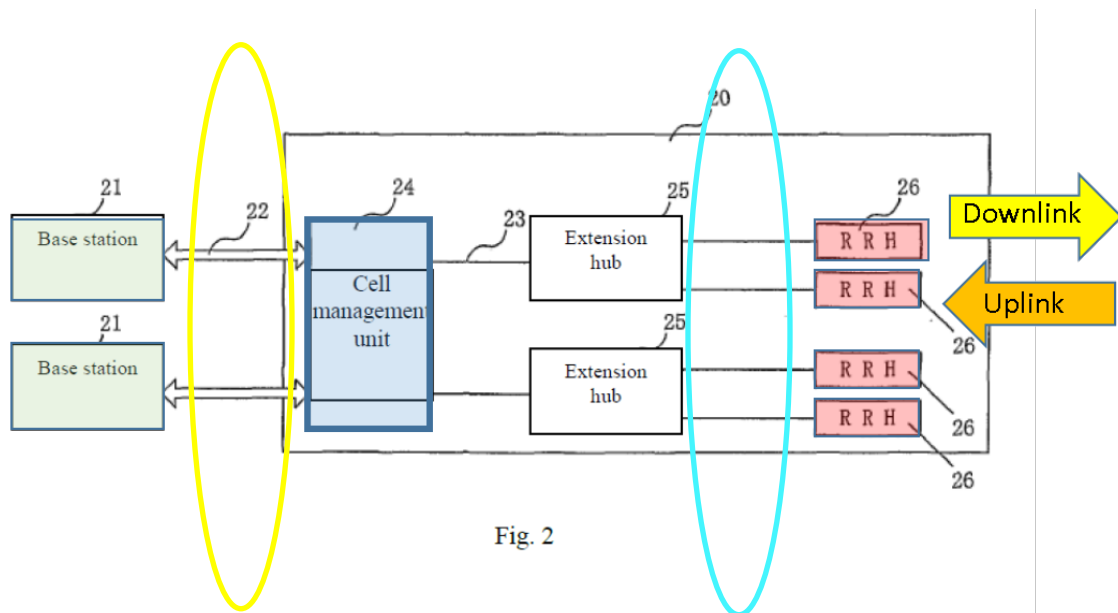


Fig. 2

EX-1005 FIG. 2; EX-1003 ¶121.

A POSA understood that interface 22 (yellow) would be connected to the CMU unit through an input port which is configured to receive downlink signals from base station 21, and configured to send uplink signals to base station 21. EX-

1003 ¶122. Further, a POSA understood that transmission medium 23 (light blue) would be connected to the CMU through an output port which is configured to receive uplink signals from extension hub 25, and configured to send downlink signals to the extension hub. EX-1003 ¶122. This disclosure is consistent with the disclosure of the '382 Patent which shows that RF cable (yellow) is connected to the input port of the DAU and optical cable (light blue) is connected to the output port of the DAU:

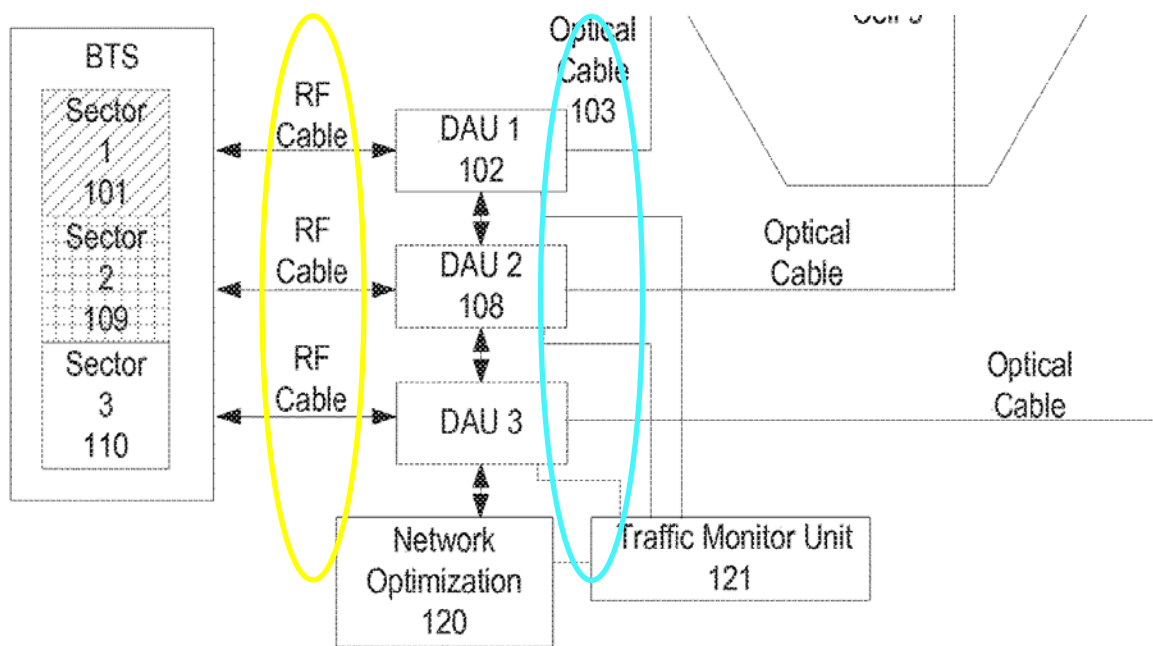


FIG. 1

EX-1001 FIG. 1; EX-1003 ¶122

- iv. *one or more Digital Remote Units (DRUs) connectable to the one or more DAUs and operable to transport signals between one or more of the one or more DRUs and the one or more DAUs;*

Leng discloses that RRH 26 (red) (*DRU*) is connectable to CMU 24 (blue) (*DAU*) and operable to transmit signals between one or more of the *DRUs* and *DAUs*:

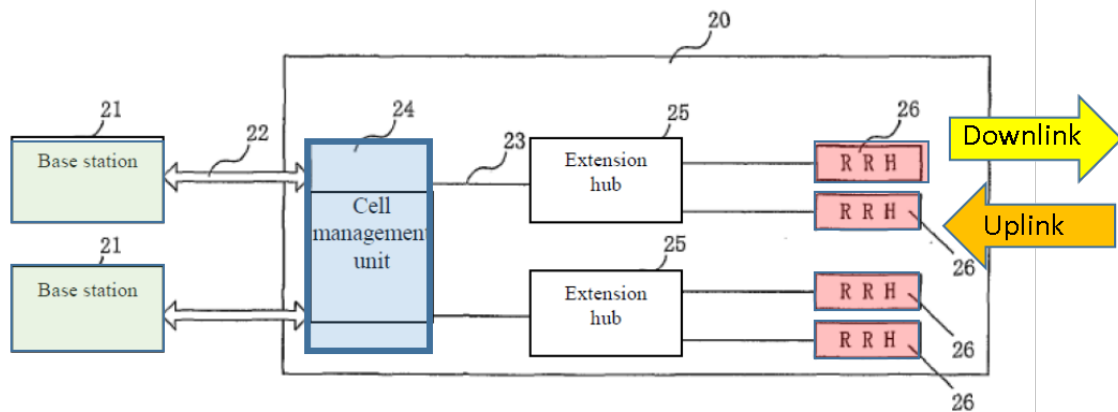
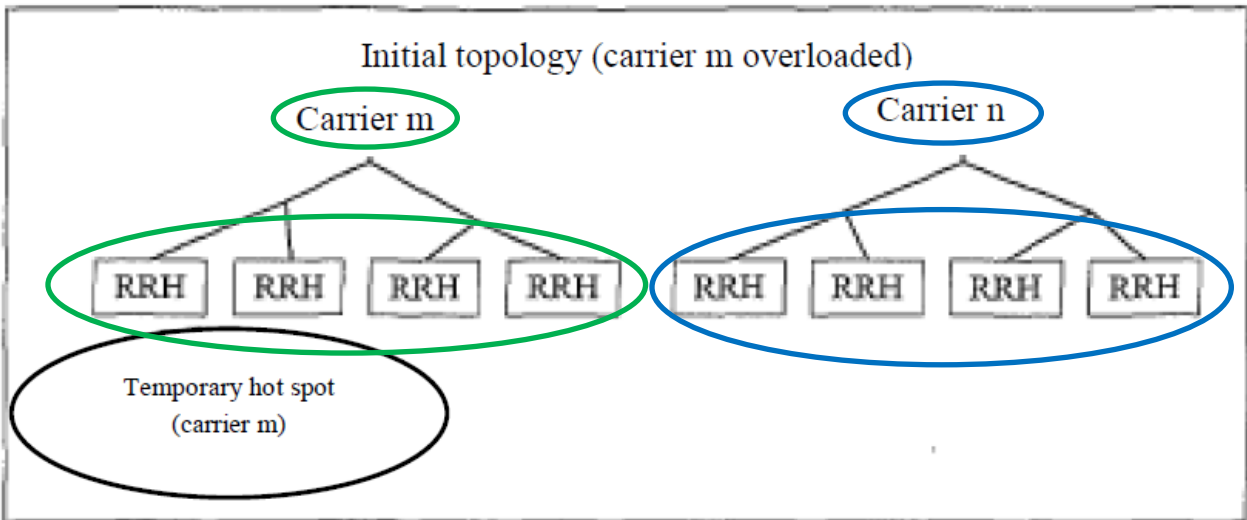


Fig. 2

EX-1005 FIG. 2; EX-1003 ¶123.

- v. *a plurality of radio resources formed from the one or more DRUs comprising a first radio resource and a second radio resource different from the first radio resource,*

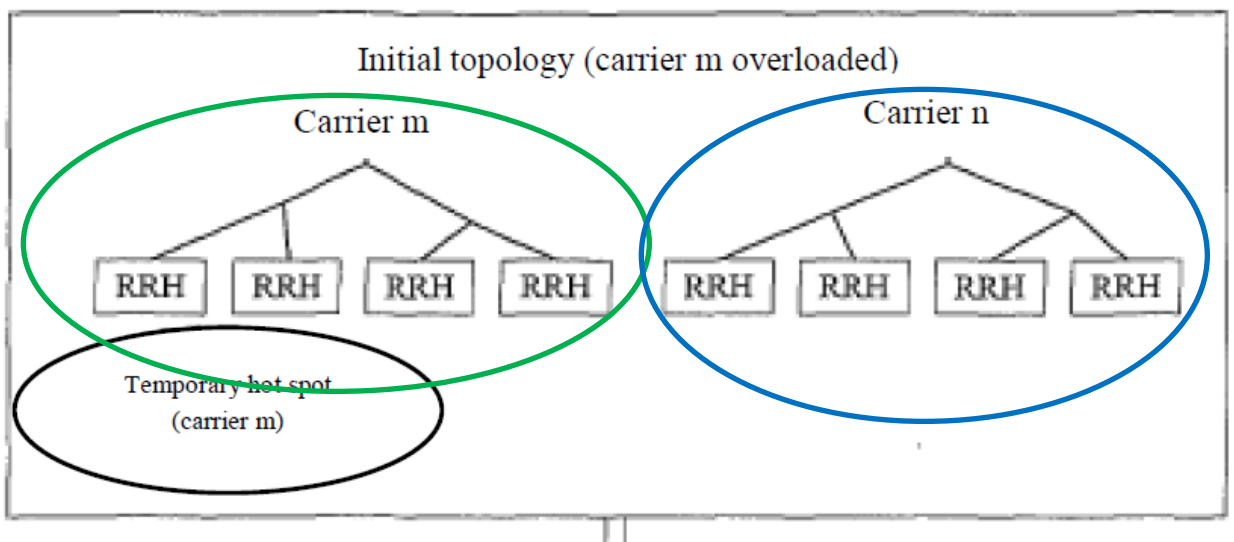
Leng discloses that carriers m and n (*a plurality of radio resources*) formed from one or more *RRHs* (*DRUs*) comprising carrier m (green) (*a first radio resource*) and carrier n (blue) (*a second radio resource different from the first radio resource*):



EX-1005 FIG 17; EX-1003 ¶124

vi. each radio resource comprising a subset of the plurality of DRUs; and

Leng discloses that each carrier (*each radio resource*) comprises a subset of the one or more RRHs (*DRUs*). For example, carrier m comprises a subset of RRHs circled in green and carrier n comprises a subset of RRHs circled in blue:



EX-1005 FIG 17; EX-1003 ¶125

vii. a traffic monitoring unit coupled to at least one of the DAUs;

Leng discloses a traffic monitoring unit in the form of load information detection module 210, a received power detection module 41, load information collection module 32, and reconfiguration module 33 (outlined in red). Each of these modules 210, 41, 32 and 33 is coupled to the CMU (DAU) (blue):

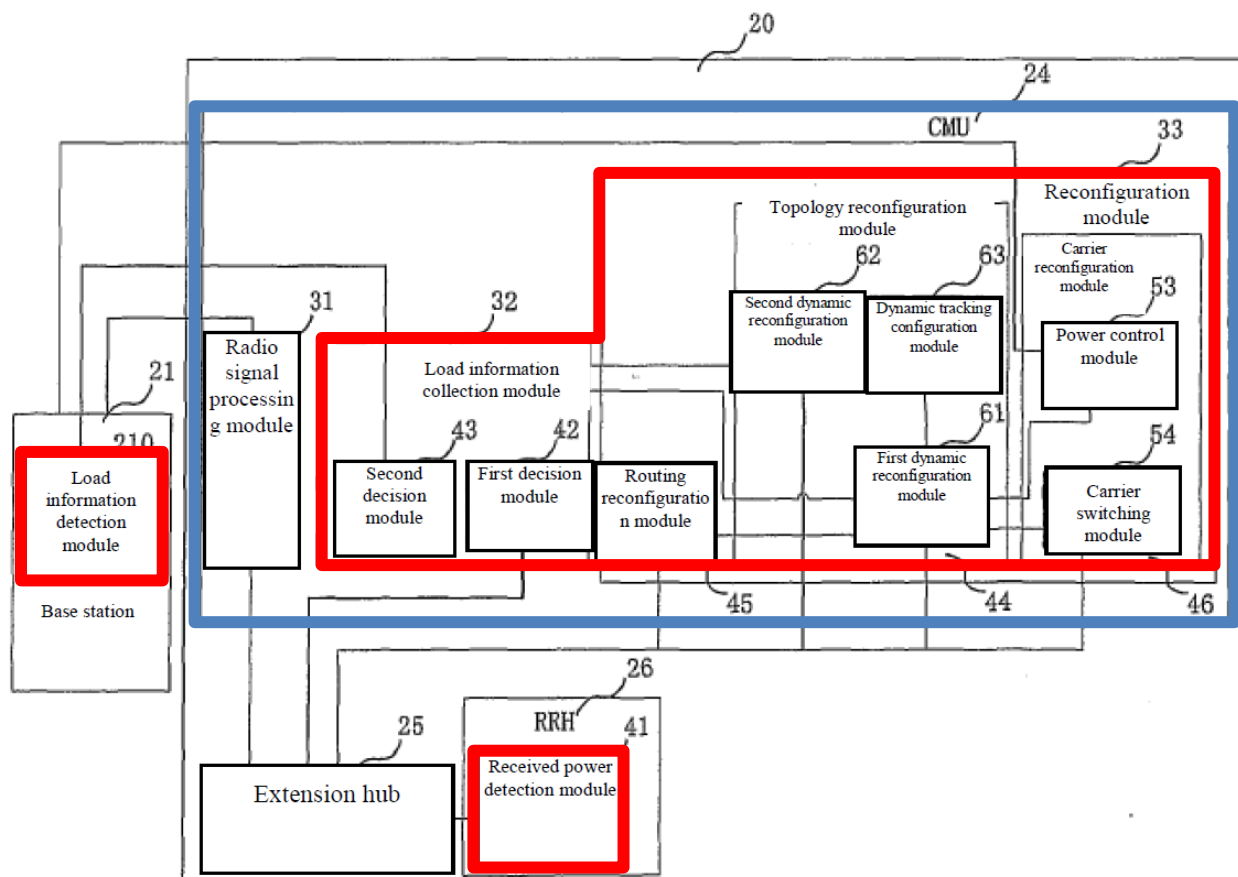


Fig. 15

EX-1005 FIG. 15; EX-1003 ¶126.

Because Claim 4 recites the traffic monitoring unit is “external” to the one or more DAUs, a POSA understood that the present limitation of a *traffic monitoring*

unit coupled to at least one of the DAUs is broad enough to encompass a traffic monitoring unit that is internal or external to the DAU. EX-1003 ¶127.

- (a) ***wherein the traffic monitoring unit is configured to: determine one or more of: one or more key performance indicators (KPIs) and/or a quality of service (QoS) of a network traffic for the one or more DAUs, wherein the QoS is a function of the one or more KPIs;***

Leng discloses that load information detection module 210 (component of the *traffic monitoring unit*) determines one or more of KPIs such as throughput, number of connections, number of registered users, QoS, etc.:

The load information detection module 210 is provided in each base station 21, and it is configured to collect various load information (for example, throughput, number of connections, number of registered users, etc.) and transmit the collected load information to the CMU through the OBSAI/CPRI interface or a local management interface.

EX-1005 6:1-5; EX-1003 ¶128.

However, if the CMU wants to know more detailed load information, such as the traffic load for different QoS, the number of users, etc., it must turn to the base station or the base station control center.

EX-1005 5:27-32; EX-1003 ¶128.

Leng also discloses that the RRHs comprise received power detection module 41 (component of the *traffic monitoring unit*) configured to detect the total

broadband power received by the RRHs and transmit the detected power value to module 32. EX-1005 5:13-15; EX-1003 ¶129.

Leng's disclosure that module 32 collects KPIs determined by module 210 and module 41 is consistent with the disclosure of the '382 Patent that network performance may be expressed by KPIs collected from different parts of the network. EX-1001 5:58-62; EX-1003 ¶130. For example, the '382 Patent describes that KPIs may comprise information such number of blocked calls, number of active calls, average power of uplink channels, average power of downlink ports, External Ports and PEER Ports, traffic on each sector, failed calls, number of satisfied users, number of unsatisfied users, number of users through a given DRU, and the like. EX-1001 10:37-45; EX-1003 ¶130.

(b) and reconfigure the plurality of radio resources based on one or more of the one or more KPIs and/or the QoS by allocating at least one DRU from the first radio resource to the second radio resource.

Leng discloses that reconfiguration module 33 (component of the *traffic monitoring unit*) reconfigures the carriers assigned to DRUs (*reconfigure the plurality of radio resources*) based on the load information collected by load information collection module 32 and/or the detected power value determined by received power detection module 41 (*based on one or more KPIs*):

... a reconfiguration module 33, configured to determine a new topology, reassign carriers among the corresponding remote radio heads, and reconfigure the routing of radio signals according to the load information collected by the load information collection module 32.

... and notify the reconfiguration module 33 to reconfigure the distributed antenna system according to the power value when the power value exceeds a threshold value.

EX-1005 4:11-17, 5:17-19; EX-1003 ¶131.

In one example, Leng reconfigures the plurality of resources by allocating a RRH from an area of high load to an area of low load to thereby reduce the load on the carrier in the high load area:

As shown in Fig. 17, in the initial topology of the distributed antenna system, the carrier m in the temporary hot spot determined according to the load information has a high load. In the intermediate topology state, after switching the carriers of half of the RRHs in the temporary hot spot to carrier n, the carrier m is still found to have a high load according to the load information. Therefore, half of the remaining RRHs with unswitched carriers in the temporary hot spot continue to be switched to carrier n, and load balance is achieved in this final topology state.

EX-1005 13:16-19; EX-1003 ¶132.

As illustrated in FIG. 17, Leng discloses allocating a RRH (*DRU*) (outlined in red) from the first carrier m (shaded in green) to the second carrier n (shaded in

blue) (*allocating at least one DRU from the first radio resource to the second radio resource*).

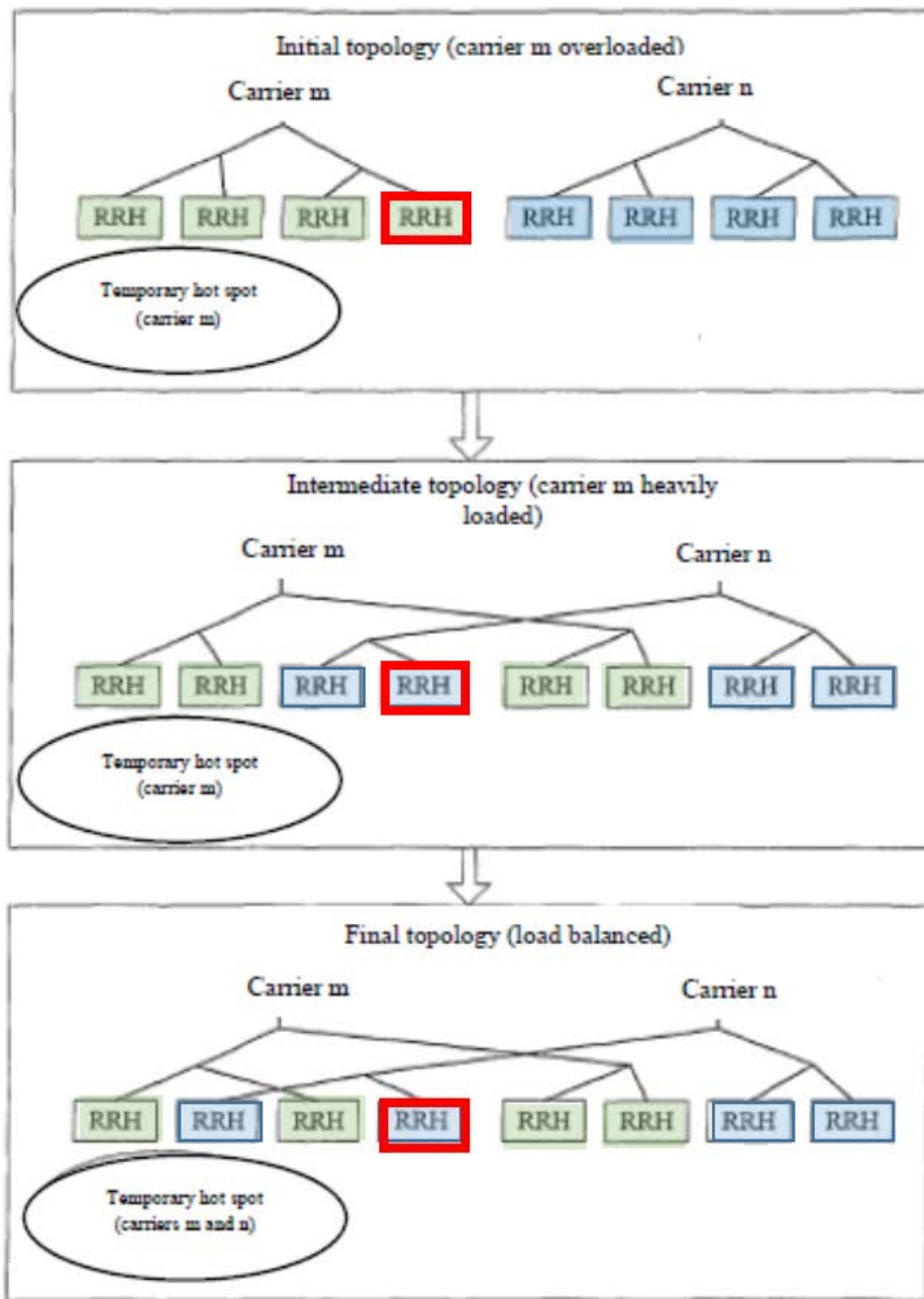


Fig. 17

EX-1005, FIG. 17, EX-1003 ¶133.

b. **Claim 2**

The system of claim 1, further comprising a one or more Base Transceiver Stations (BTSs) coupled to the one or more DAUs, wherein each BTS comprises the plurality of radio resources.

As described with respect to Claim 1, Leng discloses that base stations 21 are coupled to CMU 24 (DAU). Leng further discloses that the base stations transmit the carriers (*radio resources*) that are assigned to the RRHs. EX-1005 9:11-15; EX-1003 ¶134.

c. **Claim 3**

The system of claim 2, further comprising a network optimization goal comprising a percentage of users associated with each of the plurality of radio resources.

Leng discloses that one of the goals of its system is “balancing the load and improving the system efficiency in a timely manner.” EX-1005 2:15-16; EX-1003 ¶135. Leng provides an optimization goal based on a percentage of remote radio heads associated with the plurality of radio resources, *i.e.*, “exchanging the assigned carriers of a predetermined percentage of remote radio heads in the high-load areas with those of a corresponding number of remote radio heads in low-load areas to determine a new topology.” EX-1005 12:5-10; EX-1003 ¶135. While this example discusses an optimization goal of load balancing in terms of a predetermined number of remote radio heads associated with the radio resources, a POSA understood that Leng’s optimization goal could be based on a percentage of

users associated with the radio resources. EX-1003 ¶135. Leng expressly discloses that load information includes the number of users. EX-1005 5:30-32; EX-1003 ¶135. Leng expressly describes that prior art DAS cannot “be reassigned in time to effectively adapt to load changes when the communication traffic in an area varies greatly” (1:26-27), and a POSA understood that one way Leng’s teachings solved this problem was to measure load changes by monitoring the amount of users for each remote radio head, and load balancing based on the number of users. EX-1003 ¶135. Thus, a POSA understood that Leng discloses an optimization goal of load balancing based on a percentage of users associated with the radio resources. EX-1003 135.

d. Claim 4

The system of claim 1, wherein the traffic monitoring unit is external to the one or more DAUs.

Leng discloses this limitation for the same reasons as discussed with respect to Claim 1 because load information detection module 210 and received power detection module 41 (components of the *traffic monitoring unit*) are external to the CMU (*DAU*). EX-1003 ¶136

To the extent that PO argues that the traffic monitoring unit needs to be completely external to the DAU, Leng discloses this limitation for the same reasons as discussed with respect to Claim 10. EX-1003 ¶137.

e. **Claim 5**

The system of claim 1, wherein the traffic monitoring unit is provided as a component of each of the one or more DAUs.

For the same reasons as discussed with Claim 1, Leng discloses that load information collection module 32 and reconfiguration module 33 (components of the *traffic monitoring unit*) are a component of the CMU (*DAU*). EX-1003 ¶138.

f. **Claim 6**

The system of claim 1, wherein the traffic monitoring unit is external to the one or more DRUs.

For the same reasons as discussed with Claim 1, Leng discloses that load information detection module 210, load information collection module 32, and reconfiguration module 33 (components of the *traffic monitoring unit*) are external to one or more RRHs 26 (*DRUs*). EX-1003 ¶139.

g. **Claim 7**

The system of claim 1, wherein the traffic monitoring unit is provided as a component of each of the one or more DRUs.

As discussed with respect to Claim [1.vii], Leng discloses that load information in the form of received power is determined in received power detection module 41 (component of the *traffic monitoring unit*) in RRH 26 and sent to load information collection module 32. EX-1005 10:14-16; EX-1003 ¶140. This is consistent with the '382 Patent's disclosure that uplink power and downlink

power are KPIs. EX-1001 10:37-45; EX-1003 ¶140. Thus, as illustrated in FIG. 15 for Claim [1.vii], Leng discloses a traffic monitoring unit in the form of load information detection module 210, received power detection module 41, load information collection module 32, and reconfiguration module 33 (collectively highlighted in red), where received power detection module 41 is a component of RRH 26 (*DRU*). EX-1003 ¶140.

h. Claim 8

The system of claim 1, wherein the traffic monitoring unit is configured to analyze Key Performance Indicators (KPIs) of the DAS.

Leng discloses several examples of the traffic monitoring unit configured to analyze KPIs. In one example, Leng discloses that load information collection module 32 (component of the *traffic monitoring unit*) is configured to receive the load information (*KPIs*) and notify reconfiguration module 33 to reconfigure DAS 20 according to the load information when the load information meets the reconfiguration conditions (*analyze KPIs*). EX-1005 5:33-37; EX-1003 ¶141.

In another example, Leng discloses that module 32 (component of the *traffic monitoring unit*) is configured to receive the power value (*KPIs*) transmitted by received power detection module 41 and notify module 33 to reconfigure the DAS according to the power value when the power value exceeds a threshold value (*analyze KPIs*). EX-1005 5:16-19; EX-1003 ¶142.

i. **Claim 9**

The system of claim 1, wherein the traffic monitoring unit is configured to analyze Quality of Service (QoS) values of the DAS.

Leng discloses that QoS is load information, e.g., “traffic load for different QoS” that can be received from the base station and used by load information collection module 32 (component of the *traffic monitoring unit*) in order to decide whether to reconfigure the intelligent DAS (*analyze QoS values*). EX-1005 5:27-32; EX-1003 ¶143. A POSA understood that the QoS would change as a function of the traffic load and thus it would be useful to analyze the traffic load for different QoS in determining whether to reconfigure the radio resources of the DAS. EX-1003 ¶143.

j. **Claim 10**

Claim 10 is substantially similar to Claim 1 with the exception that the recited *traffic monitoring unit* is “external” to at least one of the DAUs. In Claim 1, there is no restriction on whether the *traffic monitoring unit* is “external” or “internal” to the DAU, only that it be coupled to the DAU. Thus, the analysis of Claim 1 illustrates four modules making up the *traffic monitoring unit*, two of which are internal to the CMU (DAU), e.g., load information collection module 32, and reconfiguration module 33, and two modules which are external to the CMU (DAU), e.g., load information detection module 210, received power detection

module 41. Thus, Claim 10 is obvious over Leng for the same reasons as discussed with respect to Claim 1 because the *traffic monitoring unit* includes two modules that are external to the CMU, *e.g.*, unit load information detection module 210, received power detection module 41. EX-1003 ¶144.

To the extent that PO argues that “external” means that the traffic monitoring unit uses a separate server from the DAU, a POSA understood that the various software modules of Leng identified as the traffic monitoring unit could be running on a server(s) separate from the processor/server in the CMU, as it was known to distribute hardware and software and Leng contemplates doing so. EX-1005 14:25-26; EX-1003 ¶145.

Further, to the extent that PO asserts that Claim 10 requires all components of the *traffic monitoring unit* to be external to the DAU, Petitioner provides an alternative analysis below where the DAU includes only certain portions of the CMU, radio signaling processing module 31. In addition, in this alternative analysis, the *traffic monitoring unit* comprises three modules, all external to radio signaling processing module 31 (*DAU*). Thus, under this alternative analysis, Claim 10 is obvious in view of Leng even if all components of the *traffic monitoring unit* are required to be completely external to the DAU. EX-1003 ¶146.

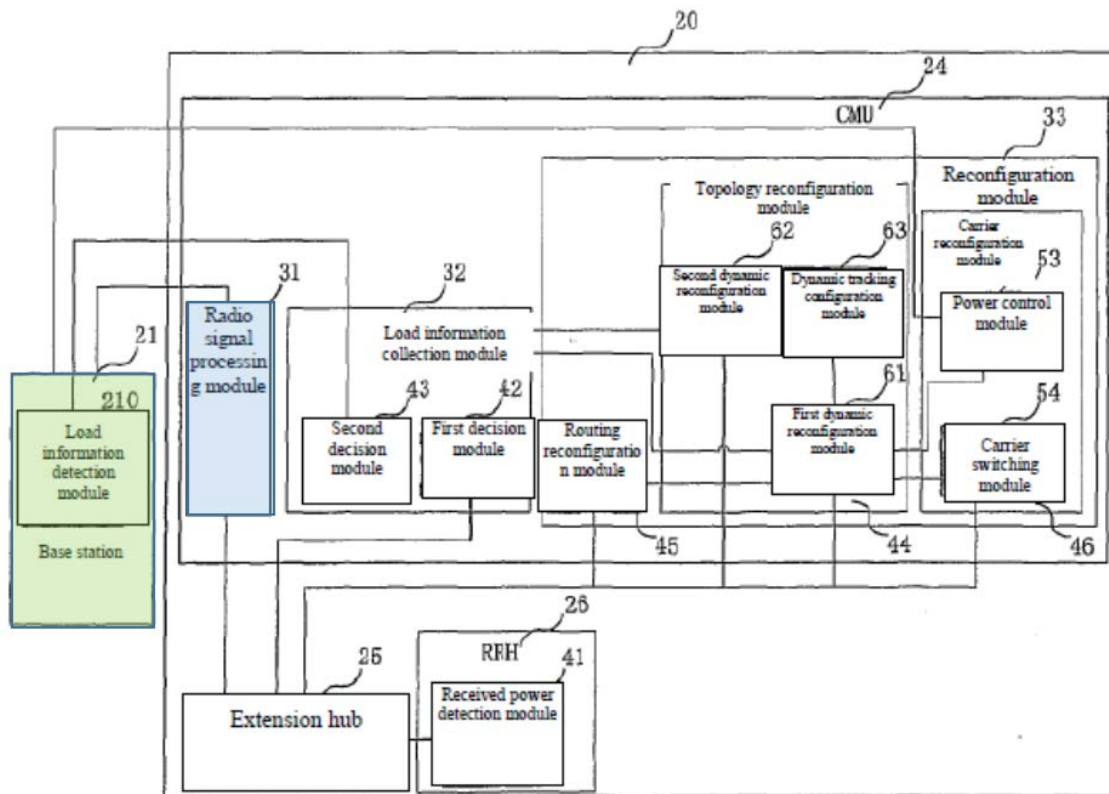
i. A system comprising:

See Claim [1.i]

- ii. ***one or more Digital Access Units (DAUs) operable to receive at least one signal from at least one of a first signal source and a second signal source from one or more of a plurality of signal sources,***

Leng discloses this limitation for the same reasons as recited with respect to Claim [1.ii].

In the alternative, Leng discloses a DAU in the form of radio signaling processing module 31. Leng describes that radio signaling processing module 31 (blue) is configured to distribute downlink signals from base stations 21 (green) (*at least one of a first signal source and a second signal source from one or more of a plurality of signal sources*) to RRHs 26, collect uplink radio signals and transmit them to the base stations. EX-1005 7:1-3. EX-1003 ¶148.



EX-1005 FIG. 15; EX-1003 ¶148.

- iii. each DAU of the one or more DAUs including an input port configured as an uplink/downlink port and an output port configured as an uplink/downlink port;*

Leng discloses this limitation for the same reasons as recited with respect to Claim [1.iii].

Alternatively, a POSA understood that an interface would be connected to an input port (yellow) on radio signal processing module 31 which is configured to receive downlink signals from base station 21, and configured to send uplink signals to base station 21 and that a transmission medium would be connected to

an output port (light blue) of module 31 which is configured to receive uplink signals from RRH 26, and configured to send downlink signals to RRH 26. EX-1003 ¶150

- iv. one or more Digital Remote Units (DRUs) couplable to the one or more DAUs and operable to transport signals between the one or more DRUs and the one or more DAUs;***

Leng discloses this limitation for the same reasons as recited with respect to Claim [1.iv].

Alternatively, as shown in FIG. 15 above, Leng discloses that RRH 26 (green) (*DRU*) is couplable to radio signal processing module 31 (blue) (*DAU*) and operable to transmit signals between one or more of the DRUs and DAUs. EX-1005 FIG. 15; EX-1003 ¶152.

- v. a plurality of radio resources formed from the one or more DRUs comprising a first radio resource and a second radio resource different from the first radio resource,***

Leng discloses this limitation for the same reasons as discussed with respect to Claim [1.v].

- vi. each radio resource comprising a subset of the one or more DRUs; and***

Leng discloses this limitation for the same reasons as discuss with respect to Claim [1.vi].

- (a) *wherein the traffic monitoring unit is configured to: determine one or more of one or more key performance indicators (KPIs) and/or a quality of service (QoS) of a network traffic for the one or more DAUs, wherein the QoS is a function of the one or more KPIs; and*

Leng discloses this limitation for the same reasons as recited with respect to Claim [1.vii(a)].

Alternatively, Leng discloses that the RRHs comprise received power detection module 41 (component of the *traffic monitoring unit*) configured to detect the total broadband power received by the RRHs and transmit the detected power value to module 32. EX-1005 5:13-15; EX-1003 ¶158.

Leng's disclosure that module 32 collects KPIs determined by module 41 is consistent with the disclosure of the '382 Patent that uplink power and downlink power are KPIs and that network performance may be expressed by KPIs collected from different parts of the network. EX-1001 5:58-62, 10:37-45; EX-1003 ¶159. For example, the '382 Patent describes that KPIs may comprise average power of uplink channels and average power of downlink ports. EX-1001 10:37-45; EX-1003 ¶159.

- (b) *reconfigure the plurality of radio resources based on one or more of the one or more KPIs and/or the QoS by allocating at least one DRU from the first radio resource to the second radio resource.*

Leng discloses this limitation for the same reasons as recited with respect to Claim [1.vii(b)].

Alternatively, in one embodiment, Leng discloses that reconfiguration module 33 (component of the *traffic monitoring unit*) reconfigures the carriers assigned to DRUs (*reconfigure the plurality of radio resources*) based on the detected power value determined by received power detection module 41 (*based on one or more KPIs*):

The load information collection module comprises a first decision module configured to receive the power value transmitted by the received power detection module and notify the reconfiguration module 33 to reconfigure the distributed antenna system according to the power value when the power value exceeds a threshold value.

EX-1005 4:11-17, 5:16-19; EX-1003 ¶161.

In one example, Leng reconfigures the plurality of resources by allocating a RRH from an area of high load to an area of low load to thereby reduce the load on the carrier in the high load area. EX-1005 13:16-19; EX-1003 ¶162.

k. **Claim 11**

The system of claim 10, wherein the traffic monitoring unit is external to one or more Base Transceiver Stations (BTSs) and coupled to each of the one or more BTSs.

Leng discloses an embodiment of the *traffic monitoring unit* in the form of load information collection module 32, reconfiguration module 33 and received power detection module 41 (outlined in red) and is completely external to and couplable to the BTS 21 (green).

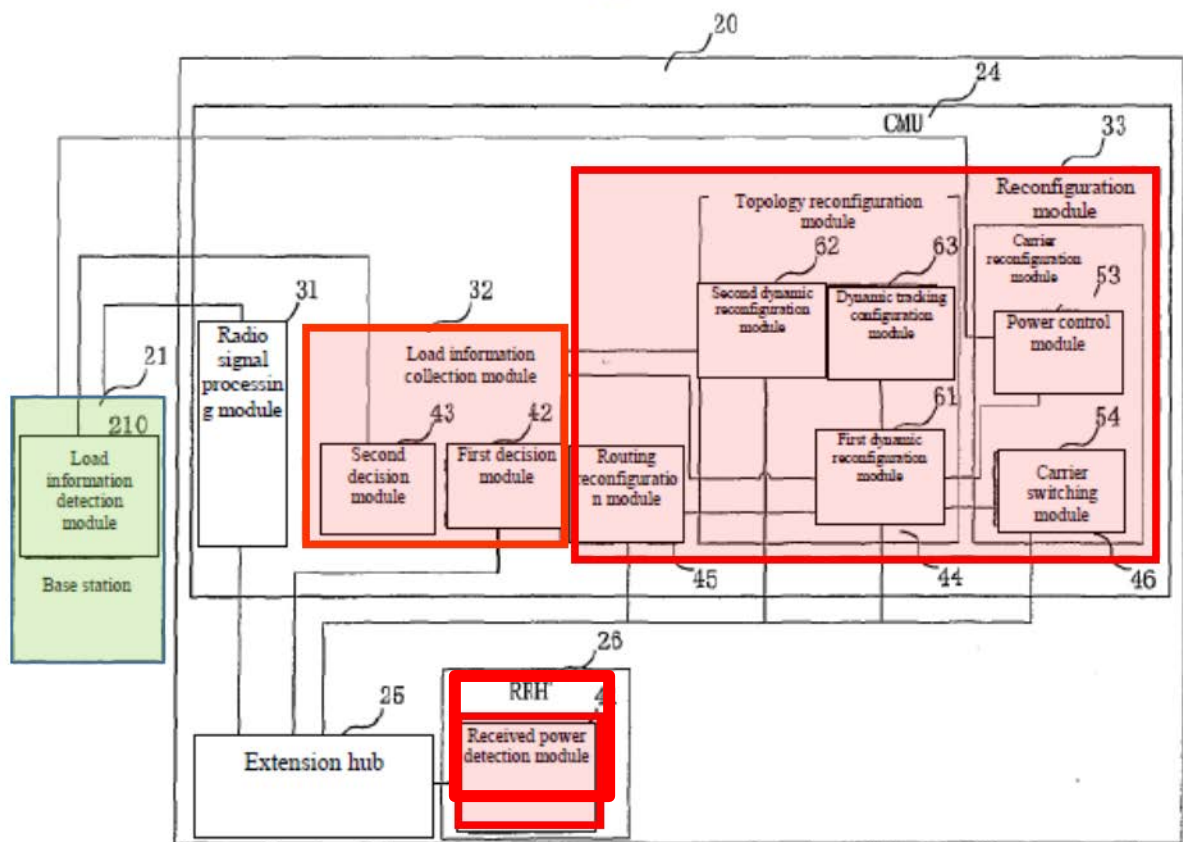


Fig. 15

EX-1005 FIG. 15; EX-1003 ¶163.

I. Claim 12

The system of claim 10, further comprising a network optimization processor coupled to the traffic monitoring unit.

Leng discloses network optimization as discussed with respect to Claim 3. With reference to FIG. 15, Leng discloses that the traffic monitoring unit comprises topology reconfiguration module 44 (*optimization processor*) which optimizes topology reconfiguration based on the load information to balance the load between the high and low load areas. EX-1005 11:1-16; EX-1003 ¶164.

m. Claims 13, 14 and 17

[13]. The system of claim 10, wherein the one or more DAUs are coupled via at least one of an ethernet cable, optical fiber, microwave line of sight link, wireless link, and/or satellite link.

[14]. The system of claim 10, wherein the one or more DAUs are coupled to the one or more DRUs via at least one of an ethernet cable, optical fiber, microwave line of sight link, wireless link, and/or satellite link.

[17] The system of Claim 10, wherein the one or more DAUs are connected to one or more BTSs via at least one of an ethernet cable, optical fiber, microwave line of sight link, wireless link and/or satellite link.

As discussed with respect to Claim [1.iii], Leng discloses that the transmission medium coupling the one of more DAUs to the BTS or between the one or more DRUs may be ethernet or optical fiber. EX-1005 3:31-38; EX-1003 ¶165. Leng discloses the use of the Open Base Station Architecture Initiative interface (OBSAI), or Common Public Radio Interface, each of which may use Ethernet cable or optical fiber. EX-1005 3:31-33; EX-1003 ¶165 A POSA also

understood DAUs as well as other components where known to be coupled via Ethernet or optical fiber. *See* State of the Art; EX-1003 ¶165

a. Claim 15

The system of claim 10, wherein the one or more DRUs are connected in a daisy chain configuration.

Leng discloses several functional schematic examples of multiple DRU's connected to a DAU, but does not provide details of the physical connections between one or more DRUs and the DAU. However, as discussed in the State of the Art section, a POSA understood that there were many different topology configurations used in DASs to connect DRU's including "point-to-point, multiple point-to-point, chain, star, tree, ring and combinations thereof" (EX-1011 0005), "daisy-chained" (EX-1013 0086), and "bus type, a star type or a hybrid type" (EX-1014 0033). EX-1003 ¶166. Leng does not disclose any preference or any restriction for any topology, and thus a POSA understood that Leng's teaching including using a daisy chain configuration. EX-1003 ¶166.

To the extent that PO argues that Leng does not expressly teach a daisy chain configuration, a POSA would be motivated to use a daisy chain as there is a finite number of choices, and a daisy chain is a well-known implementation. EX-1003 ¶167. Specifically, Leng explicitly references the CPRI specification as a suitable protocol for use with the DAS embodiments (EX-1005 6:11-15), and as discussed in the State of the Art section, the CPRI standard as well as prior art

DAS systems using CPRI have identified a daisy chain as a suitable topography. EX-1011 0005, FIG. 4; EX-1012 FIG. 5A; EX-1003 ¶167. A POSA understood that different topologies of remote antenna units provide different coverage areas and those topologies can provide the necessary or desired coverage for particular venues, such as stadiums and office buildings. EX-1003 ¶167. A POSA reasonably expected to succeed with the different topologies because the arrangement of the remote antenna units would provide predictable coverage areas for the particular venues or locations. EX-1003 ¶167. Thus, based on the advanced state of the art, implementing such topologies would have been routine, and would have led to predictable results. EX-1003 ¶167.

b. Claim 16

The system of claim 10, wherein the one or more DRUs are connected to the one or more DAUs in a star configuration.

This limitation is disclosed for the same reasons as with respect to Claim 15. Specifically, the use of a star configuration was well known in the art implementing such topologies would have been routine, and would have led to predictable results. EX-1011 [0005], FIG. 3; EX-1012 FIG. 5; EX-1014 [0033], EX-1003 ¶168.

c. Claim 18

The system of claim 10, wherein the one or more DRUs are connected in a loop to one or more of the one or more DAUs.

This limitation is disclosed for the same reasons as discussed with respect to Claim 15. Specifically, the use of a loop configuration was well known in the art implementing such topologies would have been routine, and would have led to predictable results. EX-1011 FIG. 6; EX-1012 FIG. 5C; EX-1003 ¶169.

d. Claim 19

The system of claim 10, wherein a single DAU port is connected to one or more BTSs.

This limitation is disclosed for the same reasons as discussed with respect to Claim [10.iii] because a single port of radio signal processing module 31 is connected to base station 21 as illustrated in FIG 15. EX-1003 ¶170.

VIII. THE BOARD SHOULD NOT EXERCISE ITS DISCRETION AND DENY INSTITUTION

A. The Board Should Not Deny Institution Under 35 U.S.C. § 325(d)

The '382 Patent has not been previously challenged in an IPR. Neither Leng nor Kummetz has been applied by the Office or the Board against the '382 Patent.⁴

⁴ The Kummetz publication US 2010/0278530 A1 included on the face of the '382 Patent includes a different specification, lists a different inventive entity and was filed three years prior to the Kummetz relied upon in Ground 1.

However, the '454 Patent, parent to the '382 Patent), was challenged in IPR 2021-00408 ("00408 IPR") where Kummertz was used as the primary reference. In the FWD for the 00408 IPR, the Board found that Kummertz did not disclose the "QoS" limitation which was recited in Claim 1:

determine one or more key performance indicators (KPIs) and a quality of service (QoS) of a network traffic for the one or more DAUs, wherein the QoS is a function of the one or more KPIs; and

reconfigure the plurality of sectors based on the one or more KPIs and QoS by allocating at least one DRU from the first sector to the second sector.

Specifically, while the Board found that Kummertz discloses determining KPI and reconfiguring based on KPI, the Board found that the petitioner in the 00408 IPR "has not established that [Kummertz] teaches the determination of a QoS of network traffic." 00408 IPR FWD, Paper 30 (July 19, 2022). However, with respect to the QoS limitation in the '382 Patent, QoS is recited in the independent claims in the alternative with KPIs:

determine one or more of : one or more key performance indicators (KPIs) and/or a quality of service (QoS) of a network traffic for the one or more DAUs, wherein the QoS is a function of the one or more KPIs; and

*reconfigure the plurality of radio resources based on one or more of the one or more KPIs **and/or the QoS** by allocating at least one DRU from the first radio resource to the second radio resource.*

Thus, the '382 Patent QoS claim limitations are broader than the '454 Patent and can be satisfied by Kummetz's disclosure of KPI alone.

Therefore the combination of art in the present grounds, and the arguments related thereto were not previously presented to the Office, thus following the precedential decision in *Advanced Bionics LLC*, Petitioner respectfully submits that the Board should not exercise its discretion under 35 U.S.C. § 325(d) to deny this Petition.

B. The Board Should Not Deny Institution Under 35 U.S.C. § 314(a)

The PTAB has discretion to deny institution under 35 U.S.C. § 314(a).

Related to the Director's June 2022 interim guidance regarding application of the *Finitv* factors⁵, (1) the Petition is particularly strong in the underlying merits, and (2) the Petitioner adopts the identical stipulation from *Sotera*, namely, that if the IPR is instituted, Petitioner will not pursue in the Related Litigation any ground

⁵ Interim Procedure For Discretionary Denials In AIA Post Grant Proceedings With Parallel District Court Litigation, PTO Director's Memorandum (June 21, 2022).

raised or that could have been reasonably raised in an IPR for the challenged patent. Thus, under the Interim Guidance, the Board should not deny institution.

Nevertheless, the Board's decision in *Sotera Wireless, Inc. v. Masimo Corp.*, IPR2020-01019, Paper 12 (Dec. 1, 2020) (precedential as to § II.A) and the Director's decision in *CommScope Techs. LLC v. Dali Wireless, Inc.*, IPR2022-01242, Paper 23 (Feb. 27, 2023) (precedential) instruct that a holistic view of the remaining *Fintiv* factors also weighs in favor of institution.

Factor 1 is neutral because no request for stay has been filed. *Sand Revolution II LLC v. Continental Intermodal Group – Trucking LLC*, IPR2019-01393, Paper 24 at 7 (June 16, 2020) (informative).

Under factor 2, the trial date has not been set. According to the most recent statistics on median time-to-trial for civil actions (https://www.uscourts.gov/sites/default/files/data_tables/fcms_na_distprofile0930.2022.pdf), the median time from filing to trial is 21 months in the Eastern District of Texas. The Related Litigation was filed on October 21, 2022 and thus would be expected to go to trial shortly after July 21, 2024 according to the median time to trial statistics. A Final Written Decision is expected in the present matter in September 2024. Considering the inherent uncertainties of litigation scheduling, particularly where multiple defendants are involved, this factor weighs against discretionary denial.

Factor 3 favors institution. The co-pending litigation is in its early stages, and the investment in it has been minimal. The initial scheduling conference is scheduled for April 24, 2023.

Under factor 4, in addition to the *Sotera* stipulation that Petitioner issued to PO, PO has only identified in the Complaint a subset of the claims that are being challenged in the present Petition. Thus, it is unlikely the district court will be addressing the validity of all of the claims challenged by this Petition.

Under factor 5, Petitioner is a defendant in the Related Litigation. While some cases favor institution where petitioner is not a defendant, nothing within *Fintiv* suggests that the same party between the proceedings weighs in favor of discretionary denial. See *HP Inc. v. Slingshot Printing LLC*, IPR2020-01084, Paper 13 at 9 (having the “same parties as parallel proceeding” makes factor 5 “neutral”).

Under factor 6, other circumstances weigh in favor of institution. Here, the merits of the Petition are particularly strong. For example, Leng and Kummetz provide independent grounds identifying nearly identical DAS systems as claimed by the '382 Patent. As discussed in the §325 Section, the QoS limitation that the Board found was missing in Kummetz during the IPR for the '454 Patent, was effectively removed from the claims of the '382 Patent demonstrating that the Petition is particularly strong in the underlying merits.

When viewed holistically, the timing of the present Petition is reasonable, there has been relatively limited investment in the related litigation, and there is minimal overlap between the present IPR and the Related Litigation. Further, coupling these *Fintiv* considerations with compelling evidence of unpatentability presented in the Petition, the efficiency and integrity of the IPR process is best served by instituting review.

IX. Mandatory Notices Under 37 C.F.R. §42.8

A. Real Party-in-Interest (37 C.F.R. § 42.8(b)(1))

The real party-in-interest in this Petition is Ericsson Inc. and corporate parent Telefonaktiebolaget LM Ericsson. No other parties have directed, funded, or controlled the filing of this IPR, and this IPR was not filed at the behest of any other party.

B. Related Matters (37 C.F.R. § 42.8(b)(2))

1. Judicial Matters

As of the filing date of this Petition and to the best knowledge of Petitioner, the '382 Patent is involved in the following litigations:

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

U.S.D.C. WDTX Case No. 6:22-cv- 01313-ADA.

2. Administrative Matters:

As of the filing date of this Petition and to the best knowledge of Petitioner, the '382 Patent was not subject to any administrative matters.

3. Related Patents

See EX-1016.

C. Lead/Back-up Counsel (37 C.F.R. § 42.8(b)(3)):

Lead Counsel:

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D. Notice of Service Information (37 C.F.R. § 42.8(b)(4)):

Please direct all correspondence to lead and back-up counsel at the above addresses. Petitioner consents to electronic service at the email addresses above.

X. CONCLUSION

For the reasons set forth above, Petitioner has established a reasonable likelihood of prevailing with respect to all Challenged Claims of the '382 Patent and requests the Board institute *inter partes* review and then cancel all claims as unpatentable.

Respectfully submitted,

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Dated: April 4, 2023

CERTIFICATION OF SERVICE ON PATENT OWNER

Pursuant to 37 C.F.R. §§ 42.6(e), 42.8(b)(4) and 42.105, the undersigned certifies that on the 4 of April, 2023, a complete and entire copy of this Petition for *Inter Partes* Review of U.S. Patent No. 10,750,382 and all supporting exhibits were served via Federal Express, postage prepaid, to Dali Wireless Inc. by serving the correspondence address of record for the '382 Patent:

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ATTORNEY FOR PETITIONER

CERTIFICATE OF COMPLIANCE

Pursuant to 37 C.F.R. § 42.24 *et seq.*, the undersigned certifies that this document complies with the type-volume limitations. This document contains 13,974 words as calculated by the “Word Count” feature of Microsoft Word 2010, the word processing program used to create it.

Dated: April 4, 2023

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