

I, Henry Houh, declare as follows:

I. INTRODUCTION

1. Pursuant to 35 U.S.C. §§311 *et seq.* I am over the age of eighteen (18) and 37 C.F.R. §§42.1 *et seq.*, otherwise competent to make this Declaration.

2. I have been retained by Ericsson, Inc. and Celco Partnership d/b/a Verizon Wireless (“Communications, Inc. (Petitioners”) petition) as an independent, technical expert consultant in this proceeding before the United States Patent and Trademark Office (USPTO). I am being compensated at my rate of \$820 per hour for an my services. No part of my compensation is dependent on my opinions or on the outcome of this proceeding. I have no financial interest in any of the parties to this proceeding.

3. This Declaration is in support of the Petition for *inter partes* review (“IPR”) of involving U.S. Patent No. 8,583,100 (“the ‘100 Patent”), (the “‘100 Patent” or “the Patent”) (EX-1001), entitled “Distributed Remote Base Station System” and listing Robert J. Koziy, Harold A. Roberts and Todd Schieffert as the inventors.

4. For the purposes of this *inter partes* review as I discuss later, I have been instructed to assume that the effective filing date of the Claims of the ‘100

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Patent challenged by the Petitioners submit that in this *inter partes* review is no earlier than January 25, 2007.

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5. I understand that, according to USPTO records, the '100 Patent is currently assigned to ADC Telecommunication, Inc. I have been instructed to assume for purposes of this proceeding that Procomm International Pte. Ltd is the patent owner.

6. The '100 Patent is generally directed to wireless communication systems employing Distributed Antenna Systems (DAS). I am familiar with the technology described in the '100 Patent as of the earliest possible priority date of January 25, 2007, the filing date of Application No. 11/627,255.

7. In preparing this Declaration, I have reviewed the '100 Patent (EX-1001) and its prosecution history (EX-1002), as well as the patents and documents cited herein, and I have considered these documents in light of the general knowledge in the art as of January 2007. In formulating my opinions, I have relied upon my experience in the relevant art. I have also considered the viewpoint of a person of ordinary skill in the art ("POSA") in the relevant field, as of January 2007, who I describe below (§ V.D). For convenience, the materials I considered in arriving at my opinions are listed in Appendix A.

8. I have been asked to provide my technical expertise, analysis, insights and opinions regarding the '100 Patent and relevant references that

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form the basis of the arguments set forth in the accompanying Petition for *inter partes* review of the '100 Patent. As described in detail below, I offer the following opinions in this Declaration:

9. A POSA would have found Claims 1-4, 6, 8-11, 14, 15, and 17-19 (the "Challenged Claims") of the '100 Patent ~~are unpatentable under 35 U.S.C. §103~~ to be obvious over Aarflot alone or in view of Laroia and Wiedeman and a POSA would have been motivated to combine the teachings of these references.

10. Unless otherwise indicated, the emphasis in quotations has been added.

II. QUALIFICATIONS

11. My qualifications for forming the opinions set forth in this declaration are summarized here and explained in more detail in my *curriculum vitae*, which is included as Appendix B. Appendix B also includes a list of my publications and patents.

12. I received a Ph.D. in Electrical Engineering and Computer Science from the Massachusetts Institute of Technology ("MIT") in 1998. I also received a Master of Science degree in Electrical Engineering and Computer Science in 1991, a Bachelor of Science degree in Electrical Engineering and Computer Science in 1989, and a Bachelor of Science Degree in Physics in 1990, all from MIT.

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13. For the last 15 years I have been self-employed as an independent technical consultant which specializes in, among other things, in Web Site Development, Data Networking, Optical Networking, Telecommunications, and Media Streaming. My clients include almost every major law firm in the country.

14. My Career in the area of telecommunications began 1987 when I worked at AT&T Bell Laboratories as part of a five-year dual degree program at MIT. Later, as part of my doctoral research at MIT from 19911998, I was a research assistant in the Telemedia Network Systems (TNS) group at the Laboratory for Computer Science. The TNS group built a high-speed gigabit network and created applications that ran over the network. Example applications included ones for remote video capture, processing, and display of video on computer terminals. In addition to working on the design of core network components, designing and building the high speed links, and designing and writing the device drivers for the interface cards, I also set up the group's web server. Furthermore, because our group focused on real-time software processing of live streamed data, some members of our group focused on research in software radios, which was thus commonly discussed in meetings and casual conversations. One of my labmates, Vanu Bose, went on to found Vanu, Inc., a software radio company focused on low cost base stations for rural

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cell carriers. Several members of our group joined Vanu's company and I continued to meet with Vanu and members of his company. Thus, I became aware of the architectures around software radios starting in the late 1990's.

15. I defended and submitted my Ph.D. thesis, titled "Designing Networks for Tomorrow's Traffic," in January 1998. As part of my thesis research, I analyzed local-area and wide-area flows to show a more efficient method for routing packets in a network, based on traffic patterns at the time.

16. From 1997 to 1999, I was a Senior Scientist and Engineer at NBX Corporation, a start-up that made business telephone systems for streaming packetized audio over data networks instead of using traditional telephone lines. NBX was later acquired by 3Com Corporation, and the phone system is still used today by numerous businesses. As part of my work at NBX, I designed the core audio reconstruction algorithms for the telephones, as well as the packet transmission algorithms. I also designed and validated the core packet transport protocol used by the phone system. The protocol was used for all signaling in the phone system. The NBX system also featured a computer interface for initiating phone calls, which could also initiate conference calls. The NBX system also supported TAPI, the Telephony Application Programming Interface, thus allowing other computer programs to integrate with our system telephony features. We obtained U.S. Patent No. 6,697,963, entitled "Telecommunication

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method for ensuring on-time delivery of packets containing time-sensitive data,” as a result of part of this work.

17. From 1999-2004, I was employed by Empirix or its predecessor company, Teradyne. Empirix was a leader in test tools for telecommunications protocols and systems, providing functional testing tools as well as load testing tools. From 2000-2001, I conceived and built a test platform for testing Voice-over-IP (VoIP). The first application on this new test platform was a cloud emulator for simulating the effects of transmitting VoIP over a busy network.

18. In 2006, as part of my role at BBN Technologies, I helped found PodZinger Inc., now known as RAMP Inc. PodZinger utilized BBN’s speech recognition algorithms to search through the spoken words in audio and video segments. While I was Vice President of Operations and Technology, PodZinger followed its initial prototype with a full streaming audio and video search solution.

19. Furthermore, I have served as expert witness in over 150 patent-related cases where I wrote expert reports and testified in over 100 depositions on topics such as network communications and telecommunications, including Internet protocols, streaming media, antenna design, and mobile wireless technologies. I have testified in Federal courts, the PTAB, and the ITC on behalf

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of leading companies such as Amazon, AT&T, Cisco Systems, Google, Microsoft, Comcast, Time Warner Cable, Samsung, Netflix, Disney, and Apple.

20. I have been awarded several United States patents, including the following examples:

<u>U.S. Pat. No.</u>	<u>Title</u>
<u>7,975,296</u>	<u>Automated security threat testing of web pages</u>
<u>7,877,736</u>	<u>Computer language interpretation and optimization for server testing</u>
<u>7,801,910</u>	<u>Method and apparatus for timed tagging of media content</u>
<u>7,590,542</u>	<u>Method of Generating Test Scripts Using a VoiceCapable Markup Language</u>
<u>7,860,999</u>	<u>Distributed computation in network devices</u>
<u>6,967,963</u>	<u>Telecommunication method for ensuring on-time delivery of packets containing time-sensitive data</u>
<u>7,359,993</u>	<u>Method and apparatus for interfacing external resources with a network element</u>

21. Based on my above-described over three decades of experience in network usage and resource allocation and the acceptance of my publications and professional recognition by societies in my field, I believe that I am qualified to be an expert in the field of wireless technology.

22. Based on my experience described above, and as indicated in my curriculum vitae, I am qualified to provide the following opinions with respect the patents in this case. Additionally, I am at least a person having ordinary skill

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in the art, as I have set forth in §IV.D below, as of the priority date of the '100 Patent.

III. RELEVANT LEGAL STANDARDS

23. I do not provide any legal opinions in this Declaration. I have been informed and understand that certain legal standards are to be applied by technical experts in forming opinions regarding the meaning and validity of patent claims. I have been asked to provide my opinions regarding whether the claims of the '100 Patent would have been obvious to a person having ordinary skill in the art at the time of the alleged invention, in light of the prior art references discussed herein. This Petition demonstrates by a preponderance of the

24. Further, I have been informed and understand that a patent claim is not patentable as obvious (a requirement I understand to be governed by a statute, 35 U.S.C. § 103) if the differences between the patent claim and the prior art are such that the claimed subject matter as a whole would have been obvious at the time the claimed invention was made to a person having ordinary skill in the relevant art. Obviousness, as I have been informed and understand, is based on the scope and content of the prior art, the differences between the prior art and the claim, the level of ordinary skill in the art, and, to the extent that they exist, certain objective indicia of non-obviousness.

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25. I understand that objective indicia can be important evidence regarding whether a patent is obvious or nonobvious, if it has an appropriate nexus to the claimed invention, i.e., is a result of the merits of a claimed invention (rather than the result of design needs or market pressure advertising or similar activities). Such indicia include: commercial success of products covered by the patent claims; a long-felt need for the invention; failed attempts by others to make the invention; copying of the invention by others in the field; unexpected results achieved by the invention as compared to the closest prior art; praise of the invention by the infringer or others in the field; the taking of licenses under the patent by others; expressions of surprise by experts and those skilled in the art at the making of the invention; the patentee proceeded contrary to the accepted wisdom of the prior art, and, the contemporaneous development of the subject matter claimed by others.

26. I have been informed that whether there ~~is~~ are any relevant differences between the prior art and the claimed invention is to be analyzed from the view of a person of ordinary skill in the relevant art at the time of the invention. As such, my opinions below as to a person of ordinary skill in the art are as of the time of the invention, even if not expressly stated as such; for example, even if stated in the present tense.

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27. In analyzing the relevance of the differences between the claimed invention and the prior art, I have been informed that I must consider the impact, if any, of such differences on the obviousness or nonobviousness of the invention as a whole, not merely some portion of it. The person of ordinary skill faced with a problem is able to apply his or her experience and ability to solve the problem and also look to any available prior art to help solve the problem.

28. I have been informed that a precise teaching in the prior art directed to the subject matter of the claimed invention is not needed. I have been informed that one may take into account the inferences and creative steps that a person of ordinary skill in the art would have employed in reviewing the prior art at the time of the invention. For example, if the claimed invention combined elements known in the prior art and the combination yielded results that were predictable to a person of ordinary skill in the art at the time of the invention, then this evidence would make it more likely that the claim was obvious. On the other hand, if the combination of known elements yielded unexpected or unpredictable results, or if the prior art teaches away from combining the known elements, then this evidence would make it more likely that the claim that successfully combined those elements was not obvious.

29. I have been informed and understand that there are recognized, exemplary, rationales for combining or modifying references to show

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obviousness of claimed subject matter. Some of the rationales include the following: combining prior art elements according to known methods to yield predictable results; simple substitution of one known element for another to yield predictable results; use of a known technique to improve a similar device (method or product) in the same way; applying a known technique to a known device (method or product) ready for improvement to yield predictable results; choosing from a finite number of identified, predictable solutions, with a reasonable likelihood that Petitioners will prevail with respect to at least one of these claims. Accordingly, it is respectfully requested that the Board institute an IPR of the '100 Patent pursuant to 37 C.F.R. §42.108 expectation of success; known work in one field of endeavor may prompt variations of it for use in either the same field or a different one based on design incentives or other market forces if the variations are predictable to one of ordinary skill in the art; and some teaching, suggestion, or motivation in the prior art that would have led one of ordinary skill to modify the prior art reference or to combine prior art teachings to arrive at the claimed invention.

IV. OVERVIEW

The Challenged Claims are unpatentable as obvious over the prior art. The claims are directed to prior art systems and combinations of conventional components of a distributed antenna system and base station

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system that distribute base station functions to a plurality of remote antenna units, all of which was ~~wellknown~~well-known in the art. For example, at the time that the '100 Patent was filed, the Aarflot reference disclosed the same structure and method including the distribution of base station functions into the remote antennas.

The '100 Patent discloses distributing base station functionality in a distributed antenna system (DAS). As illustrated in annotated Fig. 8, the system includes a host (purple) that provides RF sampled data in the downlink direction (yellow) to, and receives RF sampled data in the uplink direction (green) from, a first one (806) of several remote stations (blue) (806, 810, 810, 812). Each remote station (blue) includes an antenna so that it may function as the air interface to user equipment within range of its antenna via RF downlink signals (dashed yellow) and RF uplink signals (dashed green). The downlink RF data signals and uplink RF data signals are created and routed among the remote stations via the routers (red). ~~RF data signals are created and routed among the remote stations via the routers (red).~~

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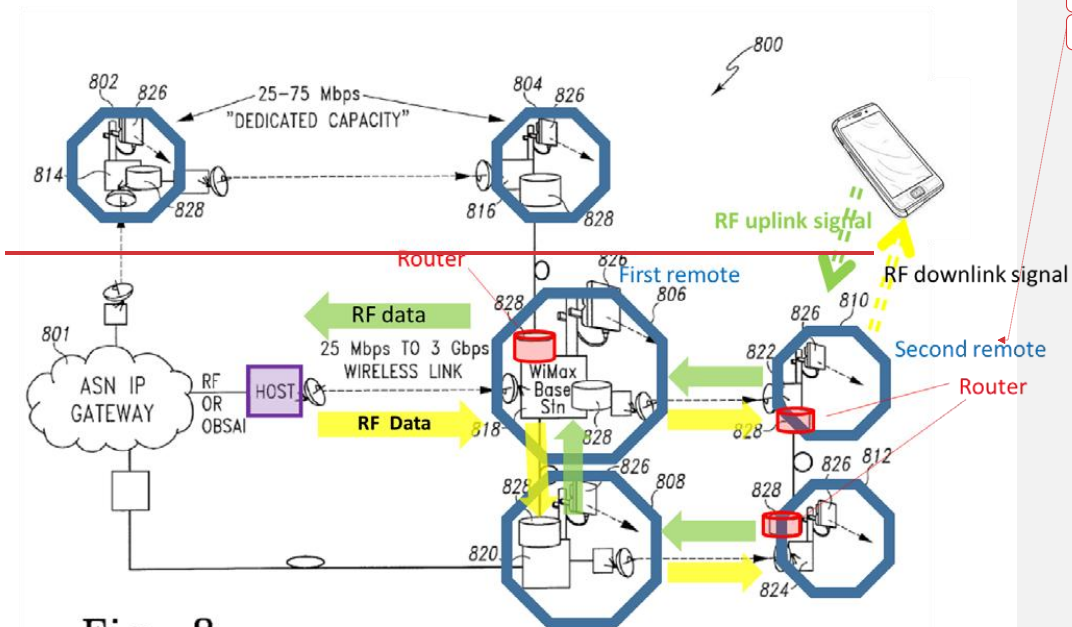


Fig. 8

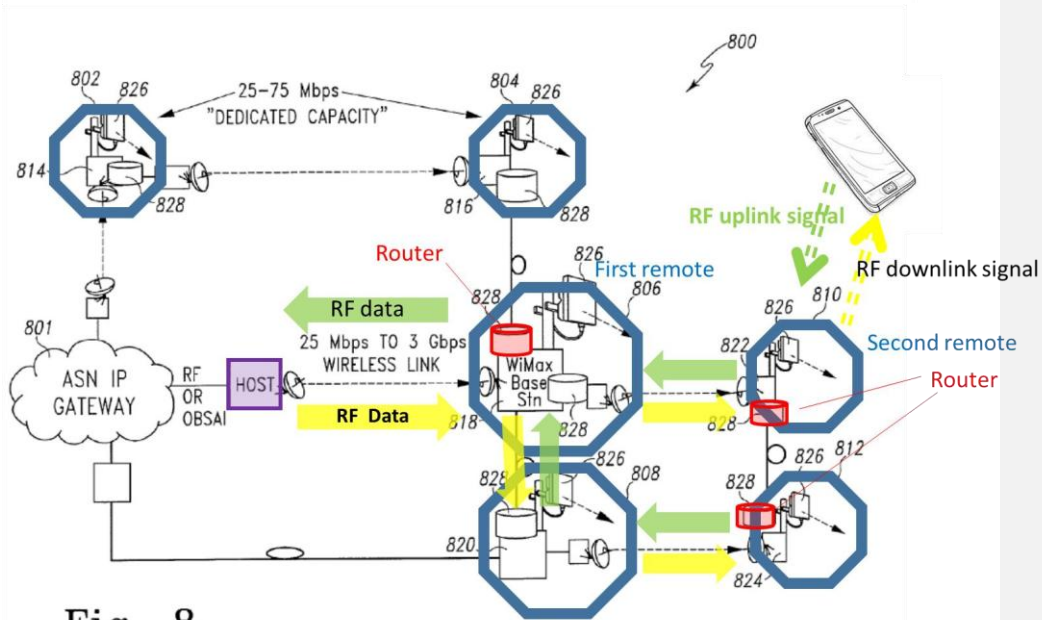


Fig. 8

EX-1001, FIG. 8¹; ~~EX-1003 ¶31~~.

30. The communications between the host and the first remote station (806), and between individual remote stations, can be in the common public radio interface (CPRI) format, in which RF sampled data (baseband) is transported to a first remote station and up converted into an RF signal. Where the RF signal is destined for a second remote station (810), the first remote station (806) includes base station functionality to process the RF signal and forward the RF sampled data to the second remote station (810). ~~EX-1003 ¶32~~.

Aarflot includes a parallel disclosure that includes the same architecture as the '100 Patent, but uses different terms. Below, the elements of distributing base station functionality in a DAS described in Aarflot are highlighted in the same colors corresponding to the common elements illustrated for the '100 Patent.

31. Aarflot discloses a system including a radio equipment control node (REC) [host] (purple) that provides RF sampled data in the downlink direction (yellow) to, and receives RF sampled data in the uplink direction (green) from, a first one (14a) of several remote radio equipment nodes (RE) [remote antenna units] (blue). Each remote antenna unit 14a-c includes an antenna (85a, 85b, 85c) so that it may function as the air interface to user

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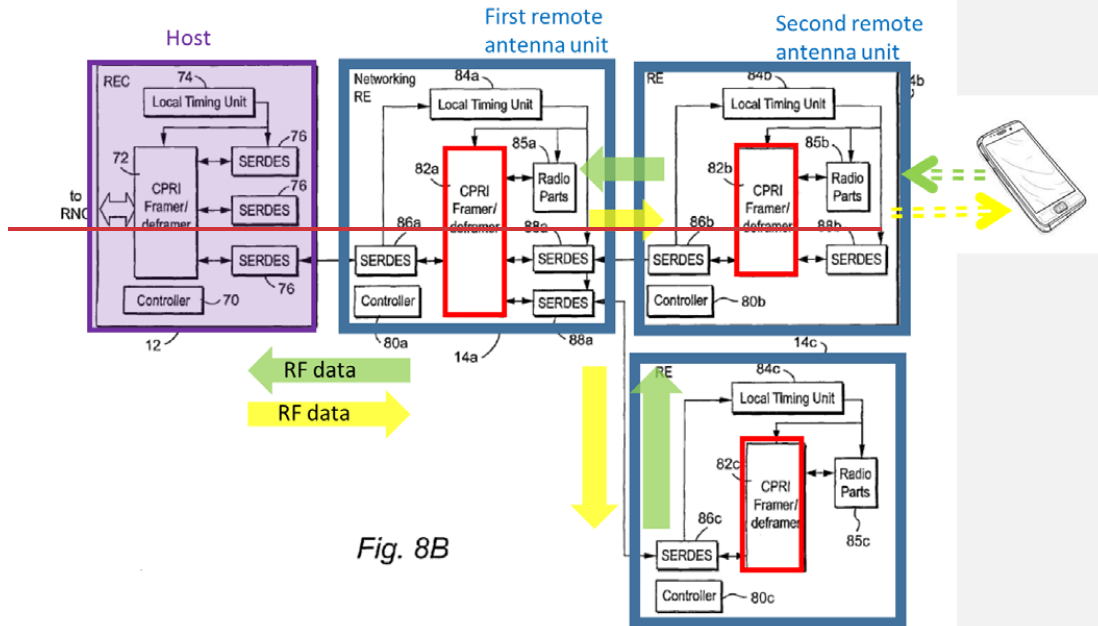
¹ All colored figures are annotated by Petitioners.

equipment within range of its antenna via RF downlink signals (**dashed yellow**) and RF uplink signals (**dashed green**). The downlink RF data signals and uplink RF data signals are created and routed among the radio antenna units (RE) via the routers [framer/deframer] (**red**). Aarflot

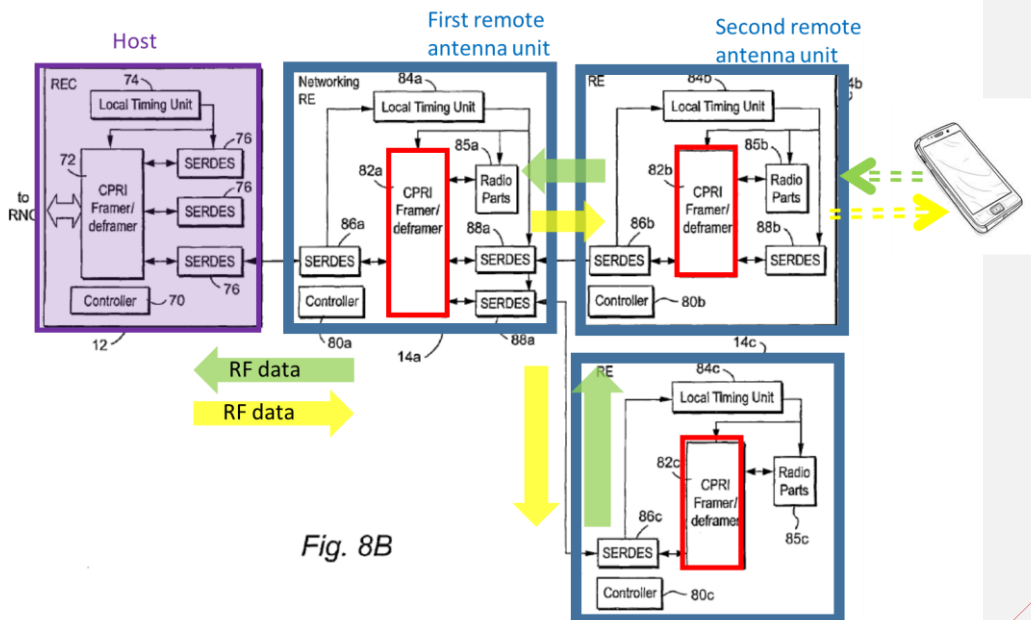
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Aarflot



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EX-1004, FIG. 8B; EX-1003 ¶33.

32. In Aarflot, the communications between the host [REC] and the first remote antenna unit (14a), and between remote antenna units (14a, 14b, 14c), can be in the CPRI format, in which, for RF signals destined to remote antenna units 14b or 14c, the first remote antenna unit 14a includes base station functionality to frame and route RF sampled data to the other antenna unit (14b, 14c). Likewise, uplink RF signals received at antenna unit 14b are framed and routed through first antenna unit 14a to the host [REC]. ~~EX-1003 ¶34.~~

33. Both Aarflot and the '100 Patent disclose distributing base station functionality to multiple, geographically separated antenna stations in a manner that increases bandwidth utilization and reduces latency, both desirable attributes in a network. EX-1001 9:39-57; EX-1004, 2:26-37; ~~EX-1003 ¶35.~~

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

~~Petitioners certify that the Patent for which review is sought is available for IPR and that Petitioners are not barred or estopped from requesting an IPR of the Challenged Claims on the grounds identified herein. This Petition is filed pursuant to 37 C.F.R. §42.106(a).~~

~~IV. REASONS FOR THE REQUESTED RELIEF~~

~~As explained in §§II and VI-VIII of this Petition and in the attached Declaration of Petitioners' Expert, Henry Houh ("Houh"), EX-1003, the distributed base station systems, as described and claimed in the '100~~

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~~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 ’100 Patent

34. The ’100 Patent is directed to systems and methods for a distributed base station. System 100 is a field-configurable distributed antenna system (DAS) that provides bidirectional transport of a fixed portion of RF spectrum from a gateway 101 to a remote antenna 108. ~~EX 1003 ¶36.~~

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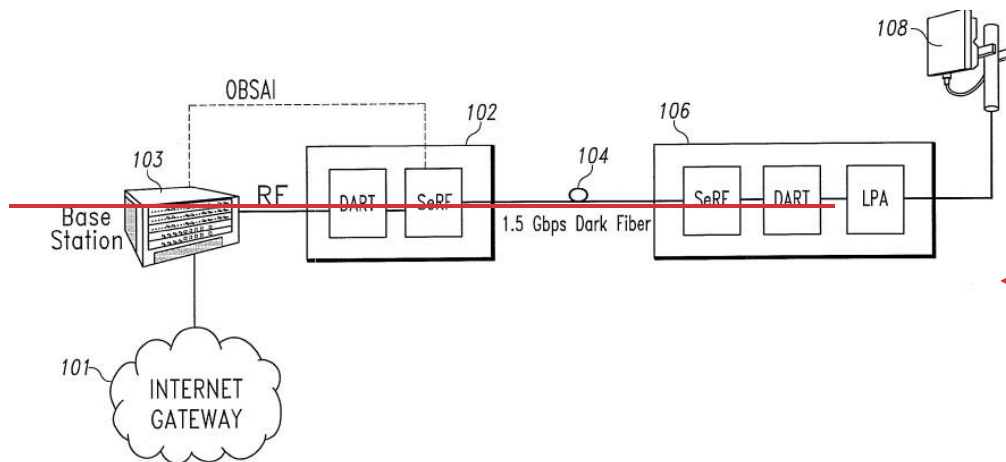


Fig. 1

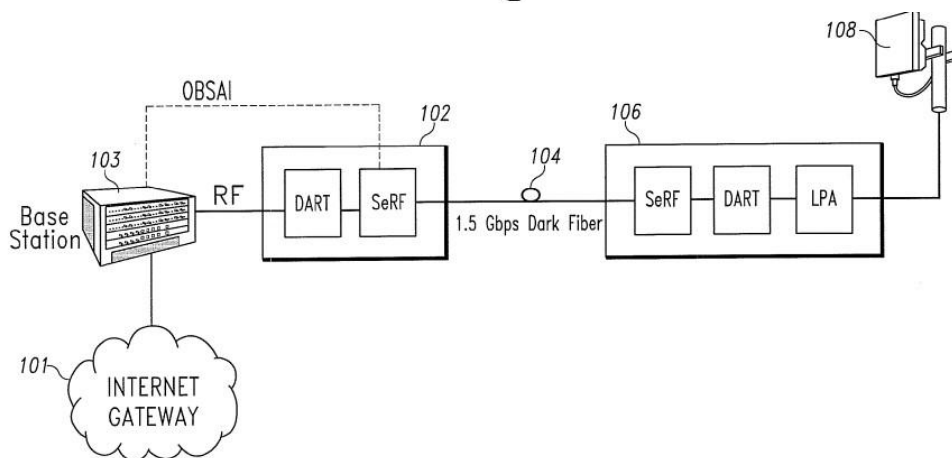


Fig. 1

35. Along with IP gateway 101 and remote antenna 108, system 100 includes base station 103, host unit 102, transport mechanism 104, and remote unit 106. The host unit 102, a modular host transceiver, and remote unit 106, a

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modular remote radio head, work together to transmit and receive data to/from remote antennas. EX-1001 2:63-3:13; ~~EX 1003 ¶37.~~

36. The base station 103 creates the protocol and modulation type for the channel. The base station 103 sends the RF signal to host unit 102. Host unit 102 has a serial radio frequency (SeRF) communicator that is coupled to a digital-~~to-analog~~to-analog radio frequency transceiver (DART) interface.

Remote unit 106 converts the received signal back into an RF signal and transmits the signal over antenna 108 to consumer mobile devices. EX-1001 3:23-34; ~~EX 1003 ¶38.~~

37. FIG. 7 illustrates a “configuration of a system 100 in which remote unit 106 performs the functionality of a base station”, a configuration that the patent states provides increased capacity to a network of antennas.

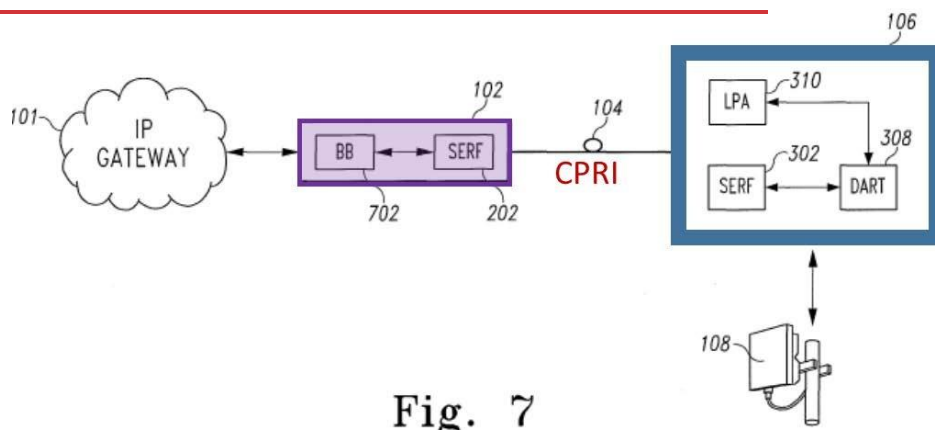


Fig. 7

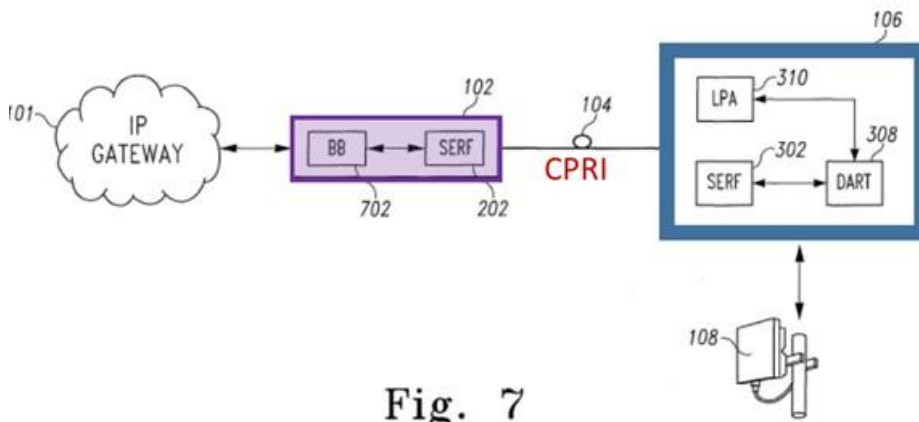


Fig. 7

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EX-1001 FIG. 7; 8:30-48, 7:62-66; ~~EX 1003 ¶39.~~

38. In this system 100 configuration, IP data is not processed by a base station before sending to remote unit 106. Instead, IP data is received at host unit 102, directly from IP gateway 101, and is converted into data conforming to a standardized protocol (*e.g.*, OBSAI, CPRI) within host unit 102. In this configuration, therefore, the signal does not travel through a DART module of host unit 102. Instead, the IP data is converted to CPRI (or OBSAI) data and transmitted over transport mechanism 104 to remote unit 106. Remote unit 106 receives the CPRI (or OBSAI) data at SeRF communicator 302, which converts the CPRI (or OBSAI) data into digital RF sampled data. *Id.*; *see also* FIG. 6, 7:~~62~~62-8:29 (describing “another configuration of a system 100 where base station functionality is performed at remote unit 106”); ~~EX 1003 ¶40.”).~~

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39. FIG. 8 illustrates one embodiment of a distributed base station system 800, including a central node 801 having an IP gateway and a plurality of remote wireless communication stations 802, 804, 806, 808, 810, 812 (blue). Each remote station 802, 804, 806, 808, 810, 812 includes a remote unit 814, 816, 818, 820, 822, 824 (with base station functionality), an antenna 826, and a router 828 (red). EX-1001 8:66-9:8; EX-1003 ¶41.

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40. In one embodiment, remote station 806 is equipped with base station functionality 818 which receives an RF signal via antenna 826 and processes the RF signal to form a second RF signal which is then routed toward the destination of the RF signal. EX-1001 9:19-32; ~~EX-1003 ¶42.~~ The '100 Patent describes that one advantage of having a remote station equipped with base station functionality (*e.g.*, configurations in FIGS. 6, 7 or 8) is that the remote station does not need to transmit signals back to central node 801 for base station processing, which simplifies and speeds up wireless signal processing. EX-1001 2:56-59, 7:24-27, 7:31-40, 9:19-23; ~~9:39-41.~~ Additionally, because each remote station is equipped with base station functionality with a dedicated amount of capacity, it provides increased capacity over a system where each remote station shares the capacity of a single central base station. EX-1001 9:47-57. ~~EX-1003 ¶42.~~

41. ~~During~~The '100 Patent further describes that, since each remote station includes a router, a best path can be found from the origination remote station to the destination remote station, thereby decreasing the latency of communication transmission, and reducing unnecessary network traffic. EX-1001 9:42-47.

42. I have been informed that during prosecution, the independent claims recited a distributed base station system including a plurality of remote

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stations, each coupled to a co-located, network layer router, transmitting/receiving an RF signal via antennas of the remote stations, and routing an RF signal from one remote station to another. ~~As discussed below in §V.B, the~~The examiner rejected the independent claims over the prior art, which the Applicant overcame by amending the independent claims to add the features of transporting a duplicate RF signal from a first remote station to a second remote station, and transmitting the duplicate RF signal from an antenna of the second remote station.

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43. The '100 Patent, however, does NOT disclose the details of duplicating an RF signal at a first remote station, transporting the duplicate RF signal from the first remote station to a second remote station, transmitting the RF signal from a first remote station antenna, and transmitting the duplicate RF signal from a second remote station antenna. In fact, the '100 Patent specification does not even use the term “duplicate” nor does it describe why or how such a practice would have been implemented. This lack of detail in the '100 Patent is not surprising, as a well-known feature of a DAS (including those with distributed base station functionality) was to transmit the same RF signals from multiple remote stations. For example, Laroia discloses a prior art DAS with distributed base station functionality that includes this feature. *See* §V.~~FE~~.3, §VII.A.2. Thus, the features that Applicant added to the independent

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claims to gain allowance were well-known in the art and were commonly used before the time of invention of the '100 Patent.

~~EX 1003 ¶45.~~

B. — Prosecution History

~~The examiner issued a Final Office Action rejecting all pending claims, except Claim 14, as anticipated by Sabat (EX 1007) or Weiniger (EX 1008), or rendered obvious over Sabat in view of Louberg, Weiniger in view of Louberg, or Weiniger in view of Borella. EX 1002, 44-56.~~

~~Claim 14 was objected to as containing allowable subject matter but dependent upon a rejected claim. EX 1002, 44-56. Claim 14, which depended from dependent Claim 13 and ultimately from independent Claim 9, recited “sending a duplicate of the fourth RF signal to a third remote wireless communication station; and transmitting the duplicate of the fourth RF signal from an antenna at the third remote wireless communication station”. EX 1002, 92. Following a pair of Examiner interviews, Applicant incorporated the limitations of Claims 13 and 14 into Claim 9, and each of the other independent claims, to obtain allowance EX 1002, 39. With respect to each of the prior art final rejections, Applicant argued that independent Claims 1, 9, 20 and 25 “have been amended based on allowable claim 14.” EX 1002, 38-39.~~

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Claim 1 is representative and was ultimately amended as follows:²

~~1. A distributed base station system for high speed data transmission comprising:~~
~~a host unit;~~
~~a plurality of remote antenna[[s]] units communicatively coupled to the host unit; wherein the host unit is configured to send downlink RF sampled data to the plurality of remote antenna[[s]] units and the plurality of remote antenna[[s]] units are configured to transmit an RF signal based on the downlink RF sampled data; wherein the plurality of remote antenna[[s]] units are configured to send uplink RF sampled data to the host unit based on RF signals received; wherein each of the plurality of remote antenna[[s]] units is coupled to a co-located, network layer router, and a first of the plurality of remote antenna[[s]] units is coupled to a colocated remote base station; wherein the plurality of remote antenna[[s]] units are coupled to each other and are arranged into a network, and wherein the network layer routers are~~

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²~~As explained by Applicant, Applicant added the identical language from Claim 14 into each independent claim which resulted in Claim 1 reciting "a fourth RF signal", even though Claim 1 does not recite a first, second, or third RF signal.~~

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configured to route data corresponding to RF signals transmitted and received at the plurality of remote antenna units, to and from the remote base station over the network; and wherein the first remote antenna unit is configured to: generate a fourth RF signal and a transport signal representing a duplicate of the fourth RF signal; transmit the fourth RF signal from the first remote antenna unit; and send the transport signal through the network such that the transport signal is routed to a second of the plurality of remote antenna units, wherein the duplicate of the fourth RF signal is transmitted from the second remote antenna unit.

EX 1002, 31-32.

Thus, each independent claim, as amended, requires, *inter alia*, a system or method of communicating wireless signals that include transmitting the same RF signal (original and duplicate) from two or more remote antenna units. For example, Claim 1 includes the limitations:

- 1) —“transmit the fourth RF signal” from the first remote antenna unit;
- 2) —“send the transport signal through the network” to a second remote antenna unit; and,
- 3) —“the fourth RF signal is transmitted from the second remote antenna unit.”

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In view of these amendments, the Office issued a Notice of Allowance granting all pending claims. EX 1002, 14 19.

C. Claim Construction

44. ~~Petitioners propose that~~ I have been informed to give each claim term in the Challenged Claims ~~be given~~ its plain and ordinary meaning in this proceeding, ~~and~~. It is my opinion that no specific construction of any claim term is required because the prior art I have relied ~~on in this Petition~~ upon meets each of the claim terms under any reasonable construction.

~~Petitioners additionally note that some language in the system claims includes terms that may be interpreted as an intended use, for example “such that the transport signal is routed to a second of the plurality of remote antenna units” (Claim 1) and “such that a duplicate of the first RF signal can be transmitted from the second of the remote units” (Claim 19); nonetheless, Petitioners demonstrate below how these limitations are also met.~~

D. C. Priority Date of the Challenged Claims

45. ~~The~~ I understand the application that issued as the '100 Patent was filed January 25, 2007 ~~and, therefore, Petitioners as~~ Application Serial No. 11/627,255 and I have been instructed to assume that the earliest priority date is January 25, 2007.

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ED. Person of Ordinary Skill in the Art

46. With respect to the '100 Patent, a POSA in the early 2007 timeframe would have been familiar with radio network communications, including radio interfaces, base stations, remote antennas, baseband units and communication links. A POSA would have a working knowledge of Radio Access Networks, base station operations, signal routing, and DAS systems.

~~EX-1003 ¶48.~~

47. 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 or related field and four years of experience; or by obtaining a Master's degree in electrical engineering or related field, but having only one to two years of experience; or by having no formal education but experience in radio communication networks of at least eight years. ~~EX-1003~~

~~¶49.~~

~~_____F~~

E. State of the Art

48. ~~The~~In the following section ~~describes~~I describe the state of the art for distributed base station systems as of early 2007.— 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, and

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provide additional motivation to modify or combine the references.

Accordingly, these references should be considered by the Board. ~~EX 1003 ¶50.~~

1. DAS

49. 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 (*e.g.*, at a facility controlled by a wireless service provider). The antenna nodes and related broadcasting and receiving equipment, located at a location that is remote from the host unit (*e.g.*, 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 (*e.g.*, 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, by its nature, an infrastructure within a community that can scatter remote units across a geographic area for providing wireless services across that

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area. EX-1005, [0017-0019] [0031]; EX-1006 Abstract, FIGS. 6-8; ~~EX-1003~~

~~¶51.~~

50. DAS configurations were known to include star, chain, tree and ring topologies, as well as combinations of the same, and the distributed antenna units may communicate across communication links using CPRI or other interfaces. The communication links in prior art DAS utilized electrical and/or optical transport. EX-1015 4, 9-10; ~~EX-1003 ¶52.~~

51. The benefits of DAS were also well known. A “significant increase in system capacity can be achieved by the use of spatial diversity (multiple antennas), and optimum combining” in DAS systems where an additional 2 to 3 antennas could double the capacity and 5 additional antennas could result in a 7-fold increase. EX-1012 Abstract; ~~EX-1003 ¶53.~~

2. Network Routing

52. Network routing was well-known in the art. Network routing, as known to a POSA, is the mechanism for transporting information across a network from node to node (*e.g.*, the transport of IP packets). For example, Sabat discloses using network layer routers co-located at each Radio Frequency (RF) Access Node (RAN) for routing information. EX-1007 FIG. 8, 10:6-11, 5:22-25; ~~§V.B, EX1003 ¶54.~~

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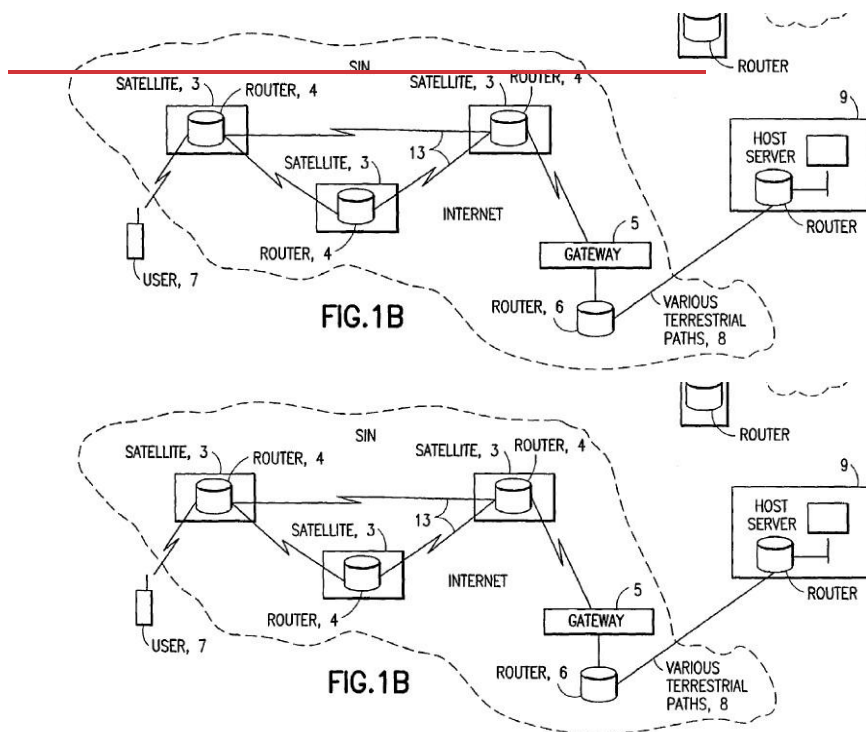
53. Similarly, Wiedeman discloses a satellite communication system that includes a plurality of satellites each with co-located routers. The satellite communication system is coupled to a terrestrial communication system to form a data communication system. Packets are “routed, using at least in part ~~satelliteresidentsatellite-resident~~ routers.” EX-1009 Abstract; EX 1003 ¶55.

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EX-1009 FIG. 1B; EX 1003 ¶55.

3. Macrodiversity and Simulcasting

54. Macrodiversity is a space diversity technique in wireless communication that uses multiple receiver or transmitter antennas to transmit

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the same signal (*i.e.*, simulcasting). The distance between the transmitters is much longer than the wavelength, and the antennas are typically located in different base station sites or access points. Transmitter macrodiversity may be in the form of simulcasting, where the same signal is sent from several nodes. Macrodiversity may be used to combat fading and to increase the received signal strength and signal quality in exposed positions in between the base stations. Macrodiversity may also facilitate efficient multicast services, where the same frequency channel can be used for all transmitters sending the same information. ~~EX-1011~~EX1011, Abstract; EX 1007 7:~~659~~65-9:13; ~~EX-1003 ¶56~~. As described in detail below, Laroia describes implementing macrodiversity in a wireless communication system as well as identifying the benefits derived therefrom. EX-1010 5:55-6:8; ~~EX-1003 ¶56~~.

55. Macrodiversity also is advantageous in handoffs when mobile devices leave the geographic area handled by one antenna unit into the area of another. A soft handoff₃ allows the mobile to receive the same RF signal from different antennas and select from the strongest signal. Thus, at the boundary where the geographic regions served by different antennas overlap, the mobile station receives and continues to rely upon a first signal received from the first antenna serving the geographic area the mobile is leaving, until a second signal from a second antenna serving the geographic area the mobile station is entering

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exceeds the first signal. In soft handoffs, the mobile device is able to receive the strongest signal and avoid drop outs during transitions between coverage areas. EX-1010 6:9-28928; EX-1016 1:28-50; EX-1003 ¶57.

56. Broadcasting, as well-known in the art, also offers similar advantages, but over multiple coverage areas and enabling the same signal to be received by multiple mobile devices. EX-1003 ¶58.

VI. IDENTIFICATION OF CHALLENGES

A. Challenged Claims

Claims 1-4, 6, 8-11, 14, 15 and 17-19 of the '100 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	1-4, 6, 8-11, 14, 15 and 17-19	§103	Aarflot, alone, or in view of Laroia and Wiedeman.

Aarflot

C. Prior Art Basis

I have been informed that U.S. Patent 8,908,650 (“Aarflot”) (EX-1004) is entitled “INTERFACE, APPARATUS, AND METHOD FOR COMMUNICATION BETWEEN A RADIO EQUIPMENT CONTROL

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~~NODE AND ONE OR MORE REMOTE RADIO EQUIPMENT NODES”;~~
~~and issued December 9, 2014 from a §371 application from~~
~~PCT/IB2005/003036 filed October 12, 2005 and claiming priority to~~
~~provisional application 60/617,084 filed October 12, 2004.³ Aarflot~~
~~qualifies as prior art under §102(e).~~

Laroia

⁴ ~~U.S. Patent 7,899,495 (“Laroia”) (EX-1010) is entitled~~
~~“METHODS AND APPARATUS FOR SUPPORTING MULTIPLE~~
~~CONNECTIONS”, and issued March 1, 2011 from an application filed July~~
~~14, 2006. Laroia qualifies as prior art under §102(e).~~

Wiedeman

57. and, U.S. Patent 9,985,454 (“Wiedeman”) (EX-1008) ~~is~~
~~entitled “ISP SYSTEM USING NON GEOSYNCHRONOUS ORBIT~~

³ ~~Aarflot also published as WO2006/040653 (EX-1017) on April 20, 2006 and~~
~~thus the disclosed subject matter further qualifies as prior art under §102(a).~~
~~Citations herein are limited to Aarflot (EX-1004).~~

⁴ Aarflot also published as WO2006/040653 (EX-1017) on April 20, 2006 and
thus the subject matter further qualifies as prior art under §102(a). Citations
herein are limited to Aarflot (EX-1004).

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~~SATELLITES”, and issued January 10, 2006 from an application filed June 16, 1999. Wiedeman qualifies as prior art under §102(a),(b) and (e). qualify as prior art under §102 for purposes of this IPR.~~

VII. IDENTIFICATION OF HOW THE CHALLENGED CLAIMS ARE UNPATENTABLE

A. — Challenge 1: Claims 1-4, 6, 8-11, 14, 15 and 17-19 are unpatentable over Aarflot, Alone or in view of Laroia and Wiedeman.

1. Aarflot

58. Aarflot discloses a distributed base station system which includes a host [radio equipment control (REC) node] (purple) that provides RF sampled data in the downlink direction (yellow) to, and receives RF sampled data in the uplink direction (green) from, a first one (14a) of several remote antenna units [radio equipment (RE) nodes] (blue). The remote antenna units 14a-c function as the air interface to the user equipment via RF downlink signals (dashed yellow) and uplink signals (dashed green). The downlink RF data signals and uplink RF data signals are created and routed via respective routers [framer/deframer] (red).

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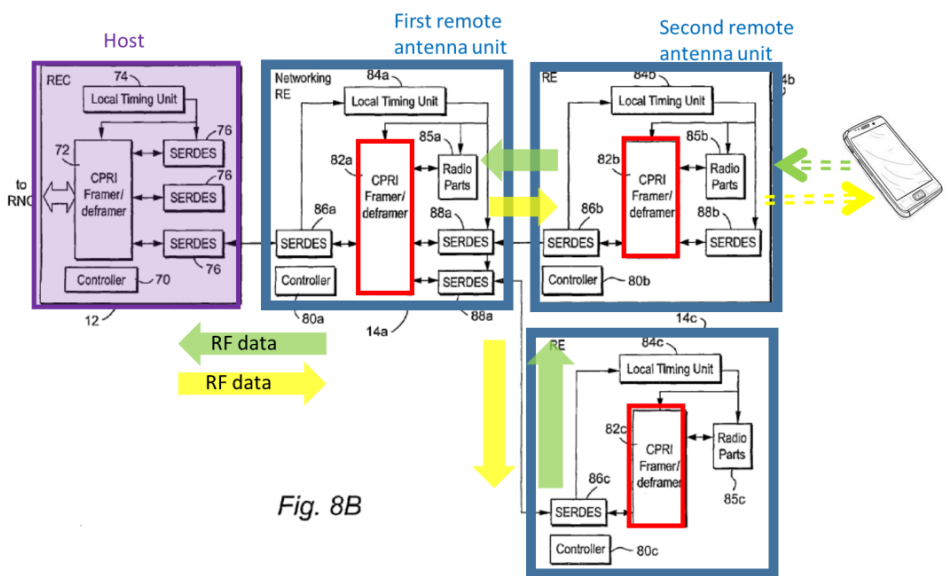
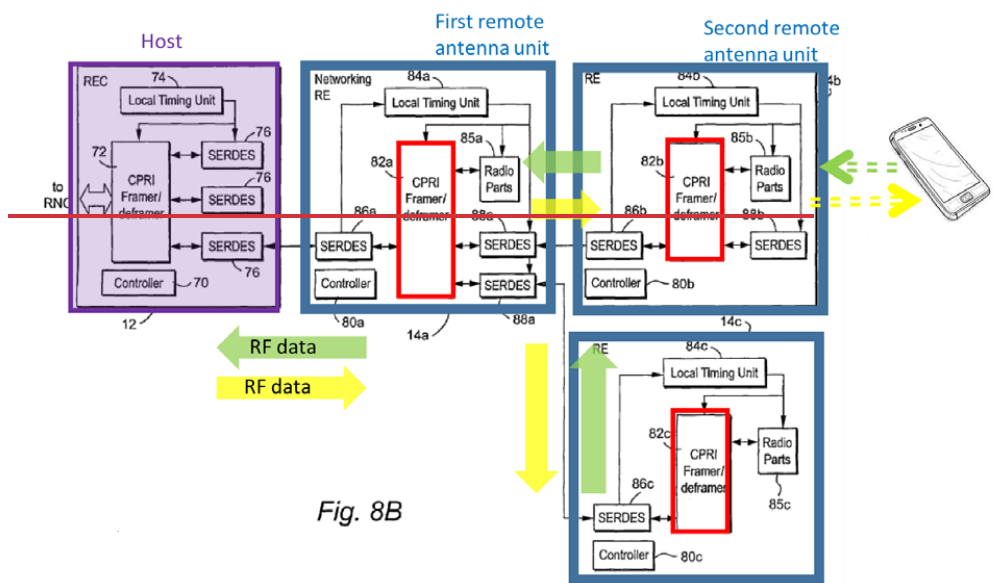
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EX-1004, FIG. 8B; EX-1003 ¶60.

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59. Aarflot discloses several network configurations of the distributed base station system. For example, FIG. 2D illustrates a daisy chain configuration;

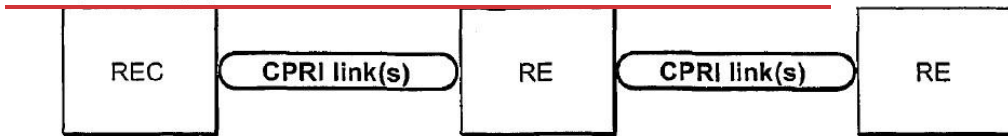


Fig. 2D

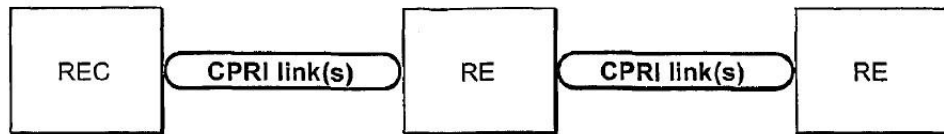


Fig. 2D

EX-1004, FIG. 2D; EX-1003 ¶61.

60. FIG 2E illustrates a tree configuration:

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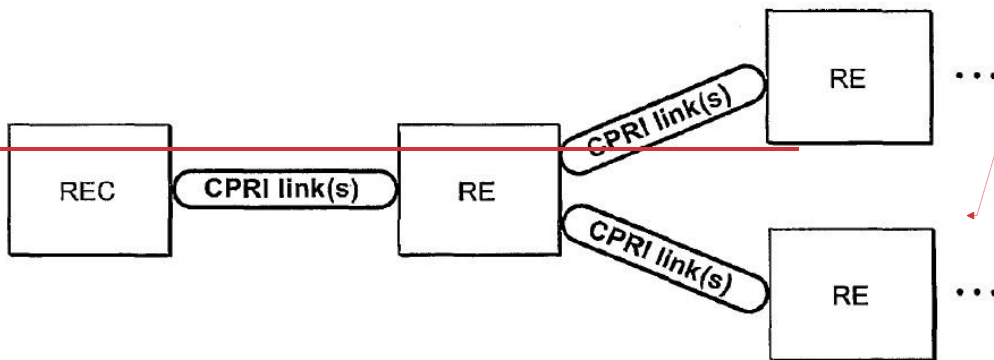


Fig. 2E

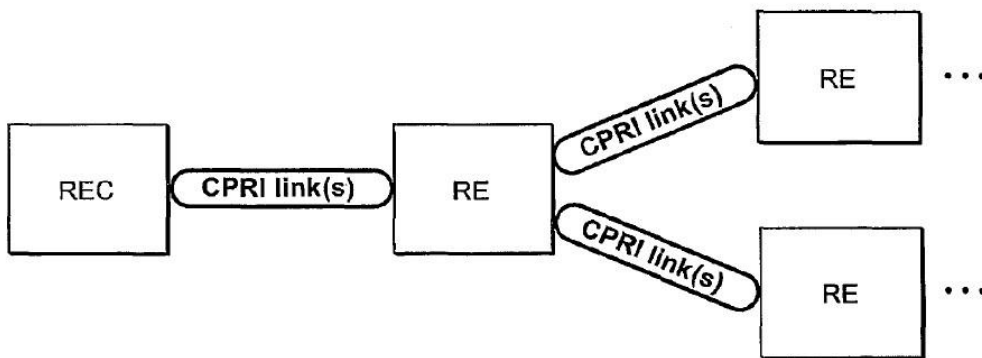


Fig. 2E

EX-1004, FIG. 2E; EX-1003 ¶62.

61. And FIG. 2F illustrates a ring arrangement.

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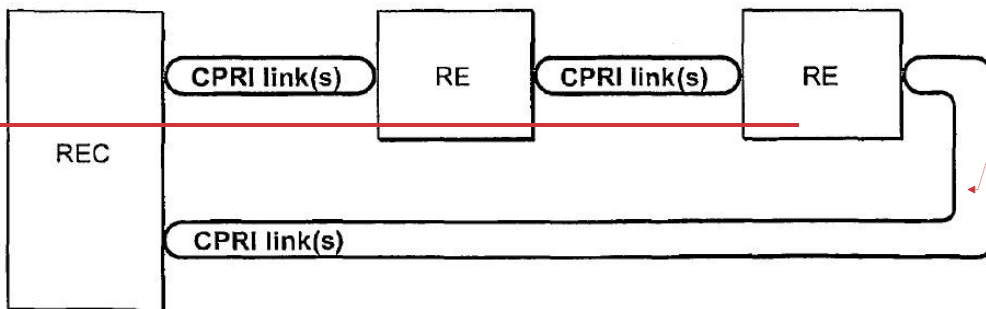


Fig. 2F

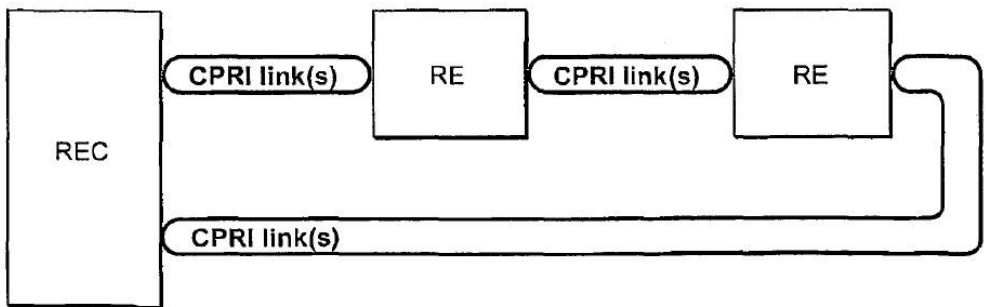


Fig. 2F

EX-1004, FIG. 2F; ~~EX-1003 ¶63.~~

62. Aarflot, as shown in FIG. 6 below, discloses the REC provides access to the Radio Network Controller via the Iub interface (lavender) in a UMTS radio access network, whereas each RE node serves as the air interface to the user equipment (pink) (in the UMTS network the air interface is called the Uu interface). ~~EX-1004~~EX-1004, 6:42-47; ~~EX-1003 ¶64.~~

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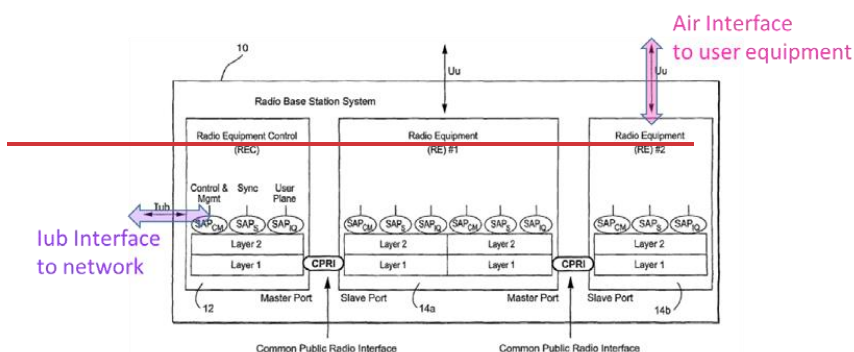


Fig. 6

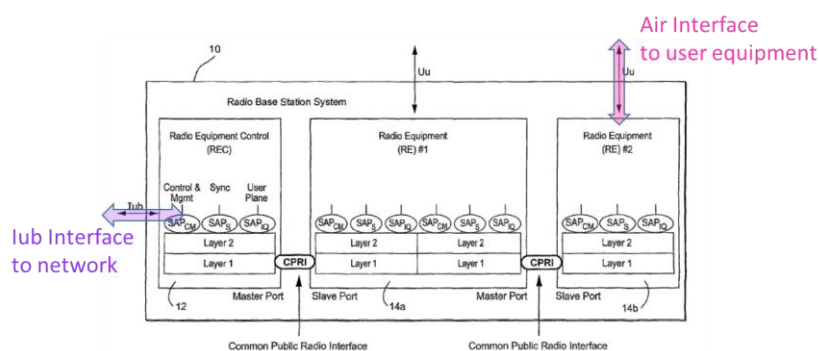


Fig. 6

EX-1004, FIG. 6; ~~EX-1003 ¶64.~~

2. Laroia

63. Laroia discloses a system that “facilitates supporting multiple connections” to a mobile device. EX-1010 Abstract. Laroia discloses the access points serve as routers using IP packets between the mobile device and the rest of the access network. EX-1010 4:45-52.

System 100 facilitates macrodiversity by allowing transmission to wireless terminal 106 from two or more base stations ~~102-~~

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~~104~~102~~104~~; such transmissions need not be simultaneous.

Wireless terminal 106 may include a connection establisher 108 and a connection notifier 110. Connection establisher 108 may establish a connection and/or terminate a connection with one or more base stations (e.g., base stations 102-104). According to an example, wireless terminal 106 may be connected to a first base station and connection establisher 108 may set up a connection with a second base station; however, the claimed subject matter is not so limited as it is contemplated that wireless terminal 106 may be connected to any number of base stations and any number of additional connections may be established and/or terminated by connection establisher 108.

EX-1010 5:55-6:8; ~~EX-1003 ¶65~~.

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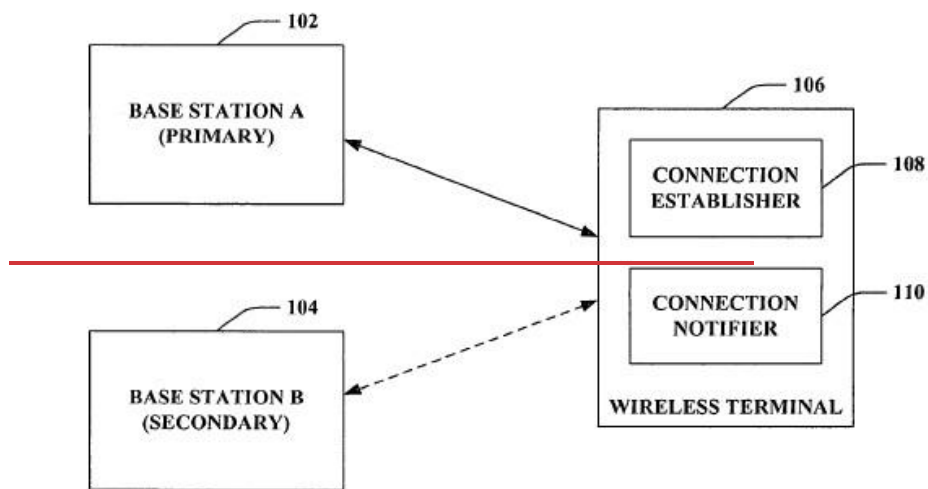


FIG. 1

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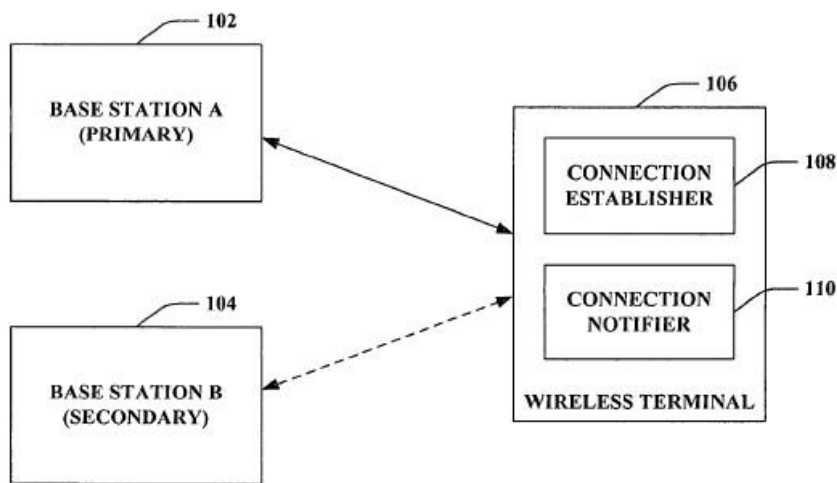


FIG. 1

EX-1010 FIG. 1; EX-1003 ¶65.

64. Laroia discloses that macrodiversity may be accomplished via “bicasting” where packets are transmitted from a first station as well as forwarded to a second base station for subsequent transmission, such that the same packets are transmitted from two base stations or access points:

According to another example, primary base station A102 may bicast the received packets. When bicasting the packets, primary base station A102 may retain a copy of packet(s) received from the core network for its queue, replicate the packet(s) and

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forward the replicated packet(s) to secondary base station

B104.

EX-1010 6:58-7:4, 12:60-13:15; ~~EX-1003 ¶66.~~

65. Laroia further discloses the base stations may act as a router between the user equipment and the access network. EX-1010 4:45-53, 9:16-27; ~~EX-1003 ¶67.~~

The base station may act as a router between the wireless terminal and the rest of the access network, which may include an IP network, by converting received air-interface frames to IP packets. The base station also coordinates management of attributes for the air interface.

EX-1010 4:45-53; ~~EX-1003 ¶67.~~

3. Wiedeman

66. Wiedeman discloses a satellite communication system that includes a plurality of satellites, each satellite with a co-located network layer router. The satellite communication system is coupled to a terrestrial communication system to form a data communication system. EX-1009 Abstract, FIGS. 4A, 4B, 5A and 5B; ~~EX-1003 ¶68.~~ In Wiedeman, packets are “routed, using at a least in part satelliteresidentsatellite-resident routers.” EX-1009 Abstract; ~~EX-1003 ¶68.~~

In satellites 3, each having a satellite router 4, for exchanging 20

TCP/IP information. TCP/IP is connection-oriented protocol. The

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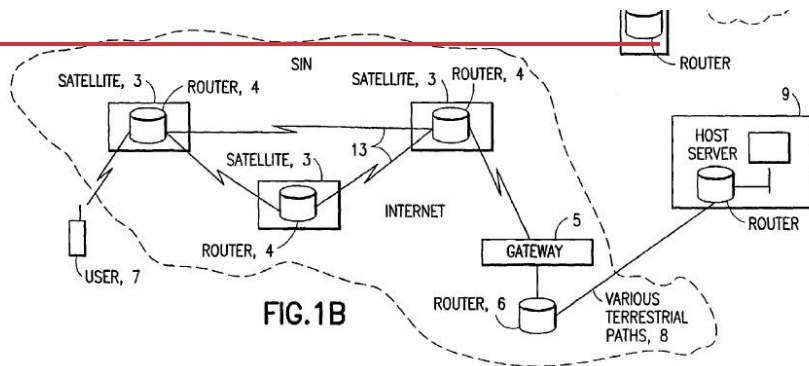
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packets of TCP/IP information are routed over a Satellite Internet Network (SIN) through inter-satellite links (cross-links) 13 to a ground service introduction point (GSIP), such as a gateway S, which includes a gateway router 6. The packets of TCP/IP information are then introduced into the Terrestrial Internet Network (TIN) 8 and flow therein in a normal manner. ~~EX-1009~~

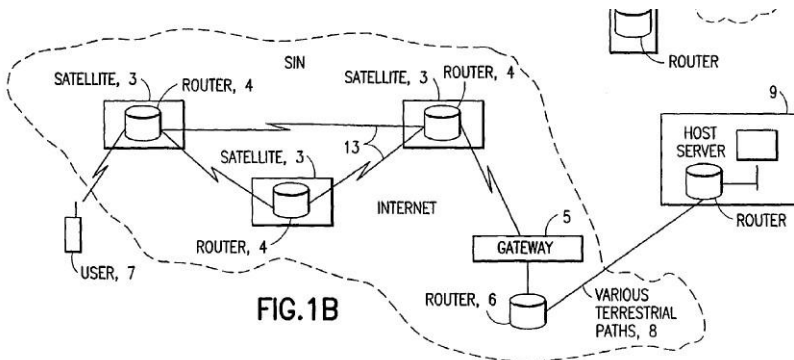
~~9:19-28; EX-1003 ¶68.~~

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EX-1009 9:19-28.



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EX-1009 FIG. 1B; ~~EX-1003 ¶68.~~

4. Motivation to Combine

67. As discussed above, Aarflot, Laroia and Wiedeman are each generally directed to establishing and maintaining wireless communication with a wireless device, and connecting the device to a network. Aarflot employs a distributed base station system in which signals may be routed via a network of REC and RE nodes and ultimately transmitted from an RE to the mobile device. Laroia describes a network of base stations that route a signal and bicast the signal to the mobile device from two base stations to establish macrodiversity. Wiedeman discloses a terrestrial and satellite communication network that routes packet across a satellite network between a gateway and a wireless device. ~~EX-1003 ¶69.~~

68. A POSA understood the beneficial aspects of macrodiversity as described by Laroia would also be applicable to Aarflot's system. A POSA would be motivated to modify the teachings of Aarflot to transmit the signal from two sources (two antenna locations) as taught by Laroia in order to achieve macrodiversity and the benefits associated therewith as discussed in §V.FE.3 above. ~~EX-1003 ¶70.~~

69. In view of this section (and discussed further below in the claims analysis), Petitioners have demonstrated at least:

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i. Aarflot and Laroia themselves provided teaching, suggestion, or motivation that would have led a POSA to modify Aarflot's teaching of either routing or transmitting a received RF signal at the RE, to routing or transmitting or both, such that the RF signal would be transmitted from two sources, and macrodiversity could be practiced (EX 1003 ¶71); ii.;

ii. The beneficial aspects of macrodiversity, as described in Laroia, in Aarflot's system with predictable results (EX 1003 ¶71); and iii.—

iii. A POSA would also be confident the modification would have a high likelihood of success given the predictable nature of long practiced techniques of multicasting and broadcasting to a wireless device (EX 1003 ¶71);.

70. A POSA also understood the use of co-located routers, as described by Wiedeman, would also be applicable to the system of Aarflot. A POSA would be motivated to implement the system of Aarflot with the network routers of Wiedeman to route the RF signals between the REC and RE nodes. EX 1003 ¶72.

71. In view of this section (and discussed further below in the claims analysis) Petitioners have demonstrated at least:

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i. Aarflot and Wiedeman themselves provided teaching, suggestion, or motivation that would have led a POSA to modify Aarflot's teaching by selecting IP routing and routers as taught by Wiedeman for routing RF signals

~~(EX-1003 ¶73);~~

ii. A simple substitution of one known packetizing and routing method for another to obtain predictable results, *i.e.* substituting in IP protocol for routing digitized RF signals for the protocol used by Aarflot's framer/deframer to route the same digitized RF signals, would lead to predictable results (the reliable transport of the digitized RF signals over

Aarflot's network) ~~(EX-1003 ¶73);~~ and

iii. Choosing from a finite number of identified, predictable solutions, with a reasonable expectation of success, *i.e.*, networks including Aarflot's distributed base station TDMA network may route digitized RF signals using a limited number of methodologies, among them being IP or similar routing techniques via associated routers co-located at network nodes, and using the known solutions would yield predicable results ~~(EX-1003 ¶73);~~

5. Detailed Application of Aarflot Alone, or in view of Laroia and Wiedeman, to the Challenged Claims

Claim 1

[1.0] A distributed base station system for high speed data transmission comprising:

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72. To the extent the preamble is limiting, Aarflot discloses a distributed radio base station [*distributed base station system*] for data transmission:

The present invention is directed to **distributed radio base stations** where a base station includes a main baseband processing unit coupled to one or more remote radio units where RF processing occurs, and in particular, to the radio interface between the main baseband processing unit and the one or more remote radio units.

EX-1004, 1:24-29; ~~EX 1003 ¶74.~~

[1.1] a host unit;

Aarflot discloses a main baseband processing unit/Radio Equipment

73. Controller (REC) (**purple**) [*host unit*]:

[A] main baseband processing unit coupled to one or more remote radio units where RF processing occurs, and in particular, to the radio interface between the main baseband processing unit and the one or more remote radio units.

EX-1004, 1:25-29.

[A]n interface, apparatus, and method are described for communication between a radio control (REC) node and first and second radio equipment (RE) nodes in a radio base station.

EX-1004, 2:37-40; EX 1003 ¶75. See also EX 1004, 2:37-40.

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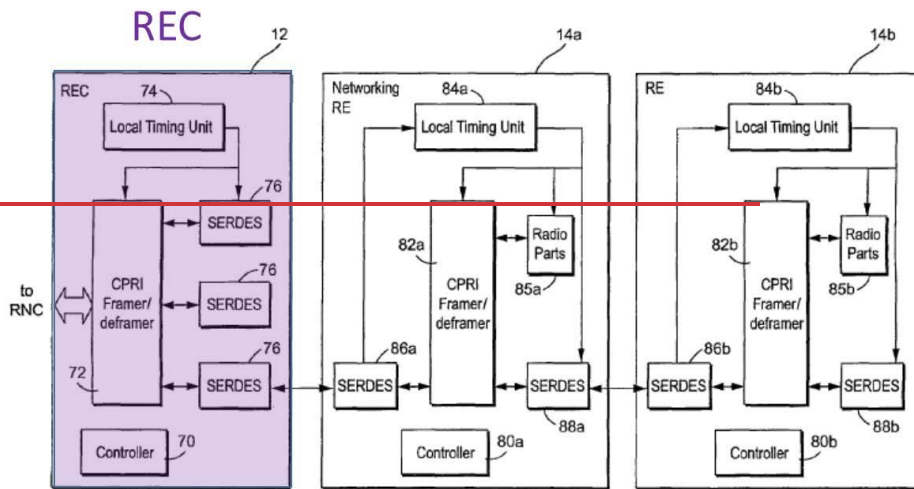


Fig. 8A

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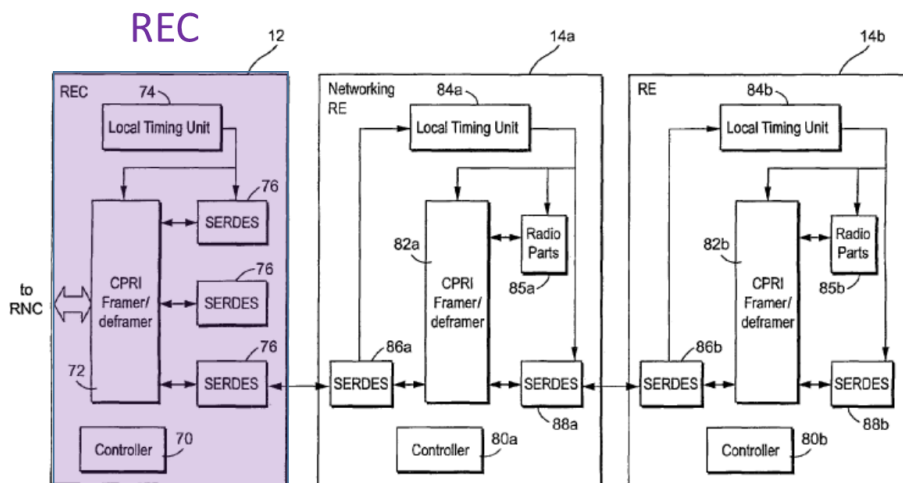


Fig. 8A

EX-1004, FIG. 8A; EX-1003 ¶75.

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[1.2] a plurality of remote antenna units communicatively coupled to the host unit;

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74. Aarflot discloses two or more radio equipment nodes (RE) [plurality of remote antenna units] (blue) which are communicatively coupled to the REC [host unit]. Each of the REs includes an antenna.

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An interface, apparatus, and method are described for communication between a radio control (REC) node and first and second radio equipment (RE) nodes in a radio base station that transceives information over radio interface using multiple antenna carriers. The REC node is separate from and coupled to the first RE node by a first transmission link, and the second RE node coupled to the first RE by a second transmission link. Both control information and user information intended for communication between the REC node and the first RE node and the REC and the second RE node are conveyed over the first transmission link. The first RE node also conveys information between the REC and second RE node.

EX-1004, Abstract; ~~EX-1003 ¶76.~~

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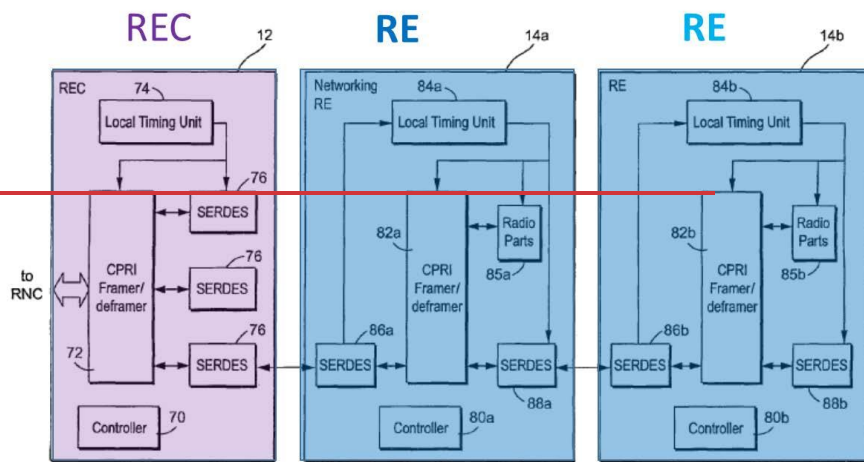


Fig. 8A

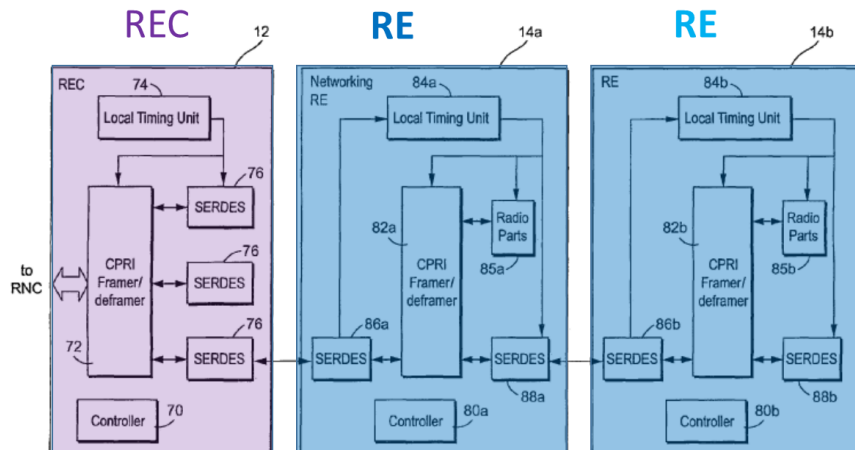


Fig. 8A

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EX-1004, FIG. 8A; EX 1003 ¶76.

[1.3] wherein the host unit is configured to send downlink RF sampled data to the plurality of remote antenna units and the plurality of remote antenna units are configured to

transmit an RF signal based on the downlink RF sampled data;

75. Aarflot discloses the REC [*host unit*] transmits digital downlink data(~~I/Q data, user plane data~~) [*RF sampled data*] to each of the REs [*plurality of remote antenna units*] and further the REs transmit an RF signal to the user based upon the digital downlink data.~~The digital downlink data sent from the REC undergoes D/A conversion and up conversion for transmission to the user at the RE's. EX 1004, 2:37-41, 2:58-60, 6:60-7:23, 7:24-27, 7:46-48, 7:49-53, 8:1-7; EX 1003 ¶77.~~ [*RF sampled data*]:

The single hop configuration in FIG. 4 shows a single link between the REC and the RE. The downlink direction is from the REC to the RE, and the uplink direction is from the RE to the REC. The REC includes a master port, and the RE includes a slave port.

EX-1004, 8:1-7;~~EX 1003 ¶77.~~

In addition to the user plane data (IQ data), control and management (C&M) control signals as well as synchronization control signals are exchanged between the REC and each RE.

EX-1004, 7:24-27;~~EX 1003 ¶77.~~

The user plane includes user data that must be transferred from the radio network station to the user equipment and vice versa.

EX-1004, 7:46-48;~~EX 1003 ¶77.~~

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~~The user data are transferred in the form of complex data, referred to herein as IQ data, where “I” corresponds to the real or In-phase component of the complex signal and “Q” corresponds to the imaginary or Quadrature component of the complex signal.~~

~~EX 1004, 7:49-53; EX 1003 ¶77.~~

These features and others are achieved by an interface, apparatus, and method for communication between a radio equipment control (REC) node and a radio equipment (RE) node in a radio base station that transceives information over the radio interface using multiple antenna-carriers.

~~EX-1004, 2:37-41; EX 1003 ¶77.~~

Each antenna carrier has a corresponding time slot in the frame so that the data samples for each antenna carrier are inserted in the antenna carrier's corresponding time slot.

~~EX-1004, 2:58-60; EX 1003 ¶77.~~

[1.4] _____ wherein the plurality of remote antenna units are configured to send uplink RF sampled data to the host unit based on RF signals received;

76. Aarflot discloses the REs [plurality of remote antenna units] transmit uplink data [~~uplink~~-RF sampled data] to the REC [host unit] where the uplink data [RF sampled data] is based upon uplink signals [RF signals] received at the REs' antennas from the user. ~~The digital uplink data [uplink RF~~

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~~sampled data]~~ is down converted and A/D converted and sent to the REC. EX-

1004, ~~6:60-7:23~~, 7:24-27, 7:46-48, 8:1-7:2.

In addition to the user plane data (IQ data), control and management (C&M) control signals as well as synchronization control signals are exchanged between the REC and each RE.

EX-~~1003 ¶78~~1004, 7:24-27.

The user plane includes user data that must be transferred from the radio network station to the user equipment and vice versa.

EX-1004, 7:46-48.

[1.5] wherein each of the plurality of remote antenna units is coupled to a co-located, network layer router, and a first of the plurality of remote antenna units is coupled to a co-located remote base station;

77. Aarflot discloses the REs [*plurality of remote antenna units*] are each coupled to processing circuitry/CPRI Framer/deframer [*network layer router*], and that functionality within the networking RE (14a), and within the REC, [*coupled to and co-located*] is that of a distributed radio base station [*remote base station*]:

A first radio equipment (RE) for use in a distributed radio base station that also includes a second RE and a radio equipment controller (REC) coupled to the first RE by a

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first communications link and coupled to the second RE by a second communications link,

EX-1004, 23:58-62; ~~EX-1003 ¶79.~~

processing circuitry configured to format the control information and user information from the radio transceiving circuitry into multiple frames

EX-1004, 24:13-16; ~~EX-1003 ¶79.~~

wherein the processing circuitry is configured to route some of the received frames to the radio transceiving circuitry for transmission over a radio interface and **to route others of the received frames to the first interface circuitry for transmission to the second RE** over the second communications link.

EX-1004, 24:33-38; §V.A (discussing EX-1001 FIGS. 6-8); ~~EX-1003 ¶79.~~

78. Aarflot discloses the use of layer 3 protocols:

The L1 signaling transfers a Service Access Point (SAP) Defect Indicator (SDI) bit or the like. The SDI bit (when not set) indicates that higher protocol layers (**L3 and above up to the application layer**) are available and operational on the C&M logical connection, synchronization logical connection, and IQ data logical connection.

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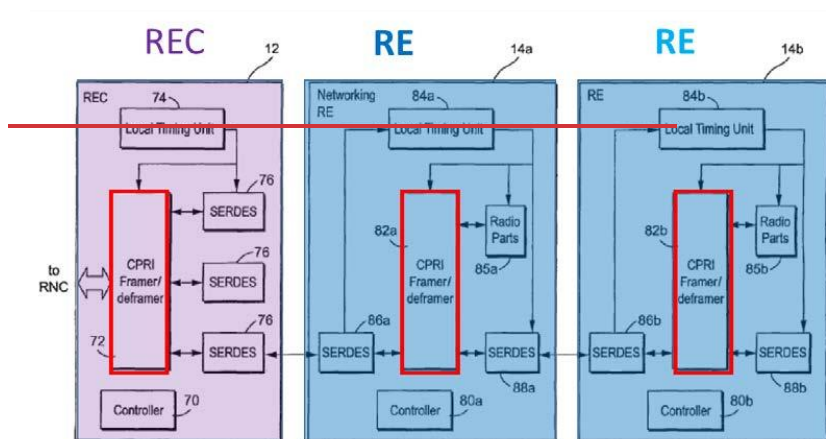
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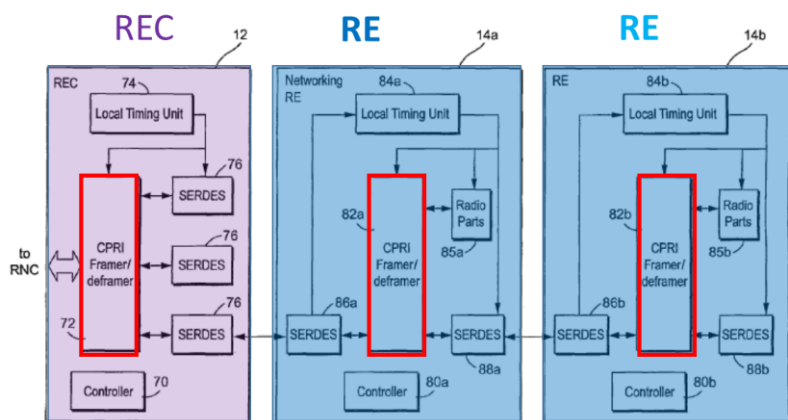
EX-1004, 13:29-34; ~~EX-1003 ¶80.~~

79. A POSA understood L3 to be the network layer and thus the framer/deframers routed on the network layers would be understood to be network layer routers. ~~EX-1003 ¶81.~~



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EX-1004, FIG. 8A; ~~EX-1003 ¶81.~~

80. To the extent the PO argues the framer/deframers are not network layer routers, Wiedeman, which is analogous art, discloses the use of network layer routers to route digital RF signals [*transport signals*] via Internet Protocol over a network.

The demodulated signal data output bit stream is then applied to the on-board computer which, using the stored algorithms, operates to send the packets of user data to the router 4. In the manner discussed above, the router 4 determines the destination path for the packet to be routed to. This path may be to the user transmit antenna 302, or to a specified other satellite or satellites via the cross-link antenna(s) 305.

EX-1009, 14:60-15:17; ~~EX-1003 ¶82.~~

81. Wiedeman describes TCP/IP as the transport protocol and a POSA understood that an IP router is a L3 network layer router. EX-1009 9:19-28; ~~EX-1003 ¶83.~~ Thus, a POSA would have been motivated to use IP protocols in the framer/deframer of Aarflot for routing the RF signals in IP packets as described in Wiedeman because that was the common router transport mechanism as described in the State of the Art section (*see* §V.~~FE~~.2 above (EX-1007 FIG. 8, 10:6-11)). A POSA would be motivated to implement the network

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layer routers of Wiedeman in the system of Aarflot given 1) the ubiquitous, well-known and accepted use of IP routers and IP packets, and 2) the ability to interface with external IP based networks and devices utilizing the same protocol. ~~EX-1003 ¶83.~~

82. Additionally, such a modification would be merely:

3) a simple substitution of one known packetizing and routing method for another to obtain predictable results, *i.e.* substituting an IP protocol for routing digitized RF signals for the protocol used by Aarflot's framer/deframer to route the same digitized RF signals would lead to predictable results (the reliable transport of the digitized RF signals over Aarflot's network); and

4) choosing from a finite number of identified, predictable solutions, with a reasonable expectation of success; *i.e.*, networks including Aarflot's distributed base station TDMA network may route digitized RF signals using a limited number of methodologies, among them being IP or similar routing techniques via associated routers co-located at network nodes, and using the known solutions would yield predictable results. ~~EX-1003 ¶84.~~

83. A POSA would also be confident of the success because the proposed modification would not result in rearrangement of the network

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devices, network topology, nor a deviation from their common and intended operation/uses. Using IP protocols and associated network routers for transporting digitized RF signals over a network was a well-understood and predictable endeavor. ~~EX-1003 ¶85.~~

84. Aarflot discloses that base station functionality is distributed to both the REC and the networking RE 14a. Aarflot also discloses that the REC and the networking RE 14a may be co-located, meaning the remote base station is within the networking RE 14a, within the co-located REC, or formed by the networking RE 14a and the co-located REC [*coupled to and co-located*].

A distributed radio base station includes the radio equipment control (REC) and the radio equipment (RE). Both parts may be physically separated, (i.e., the RE may be close to the antenna, whereas the REC is located in a conveniently accessible site), or both may be co-located as in a conventional radio base station design.

~~EX-1004, 1:58-67; §V.A (discussing EX-1001 FIGS. 6-8); EX-1003 ¶86.)~~

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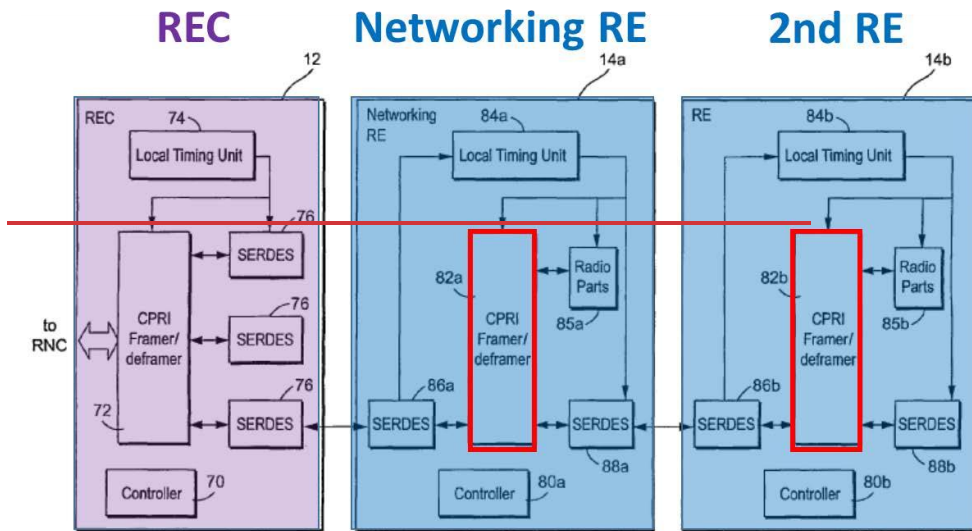


Fig. 8A

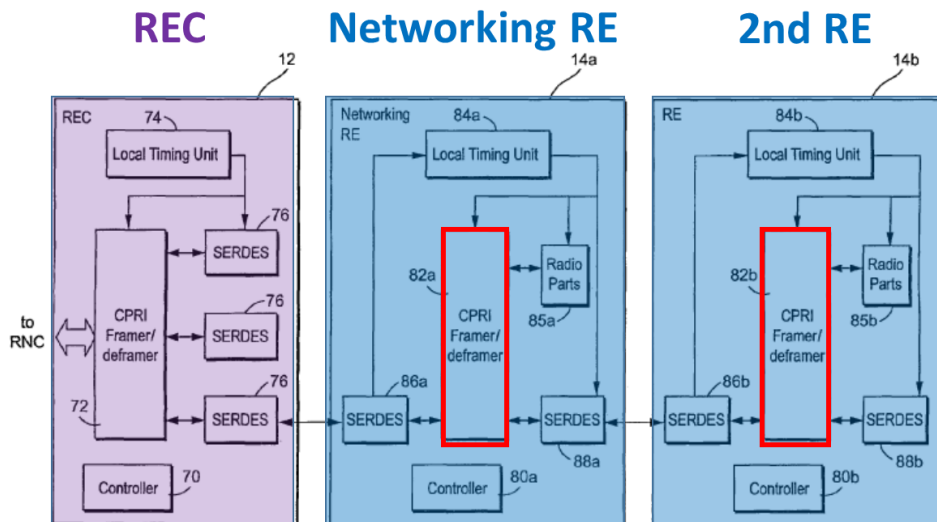


Fig. 8A

EX-1004, Fig. 8A; EX-1003 ¶86;

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[1.6] _____ wherein the plurality of remote antenna units are coupled to each other and are arranged into a network,

85. Aarflot discloses the REs [*plurality of remote antenna units*] are coupled to each other and are arranged into a network by a plurality of communication links.

A first radio equipment (RE) for use in a distributed radio base station that also includes a second RE and a radio equipment controller (REC) coupled to the first RE by a first communications link and coupled to the second RE by a second communications link.

EX-1004, 23:58-62; ~~EX-1003 ¶87.~~

86. Aarflot discloses the REs are linked together to form one of many types of networks:

FIG. 2A shows a point-to-point CPRI link between one REC and one RE. FIG. 2B illustrates multiple, point-to-point CPRI links between one REC and RE, and FIG. 2C illustrates multiple, point-to-point CPRI links between one REC and several REs (sometimes referred to as a “star” topology). FIG. 2D shows a chain or cascade network topology with an intervening “networking” RE coupling the REC and the end RE. FIG. 2E shows a tree network topology, and FIG. 2F shows a ring network topology. Other

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topologies could be used, e.g., a combination of a ring and a tree topology.

EX-1004, 6:32-41; ~~EX 1003 ¶88.~~

[1.7] and wherein the network layer routers are configured to route data corresponding to RF signals transmitted and received at the plurality of remote antenna units, to and from the remote base station over the network; and

87. Aarflot, alone or as modified by Wiedeman, discloses the processing circuitry/CPRI framer deframer [network layer routers] route data corresponding to the uplink and downlink RF signals received or transmitted at the REs, to and from the base station functionality located in, or co-located at, the networking RE *[remote base station]*. EX-1004, 24:33-38, FIGS. 3, 8A, 8B; element [1.5]; ~~EX 1003 ¶89.~~

the processing circuitry is configured to route some of the received frames to the radio transceiving circuitry for transmission over a radio interface and to route others of the received frames to the first interface circuitry for transmission to the second RE over the second communications link.

EX-1004, 24:33-38; ~~EX 1003 ¶89.~~

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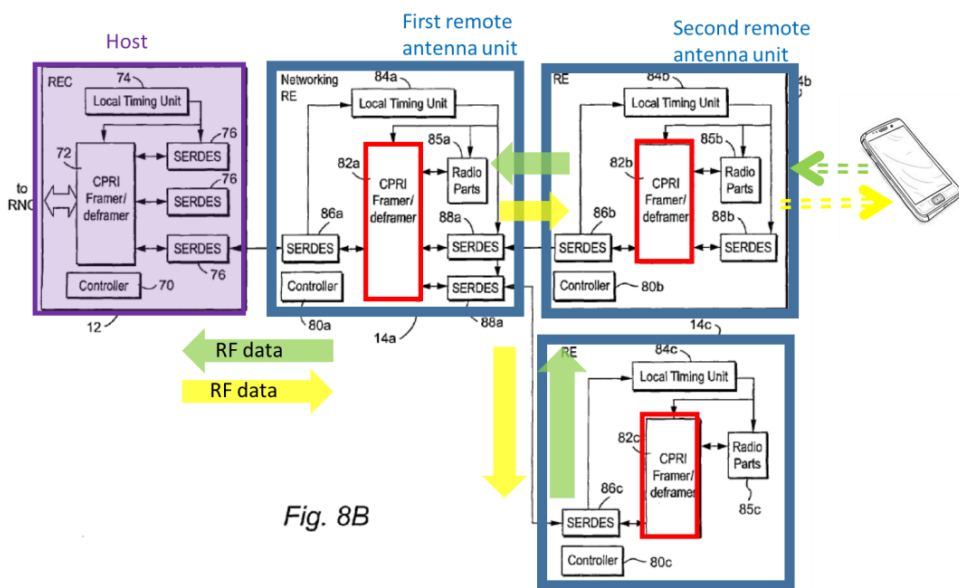
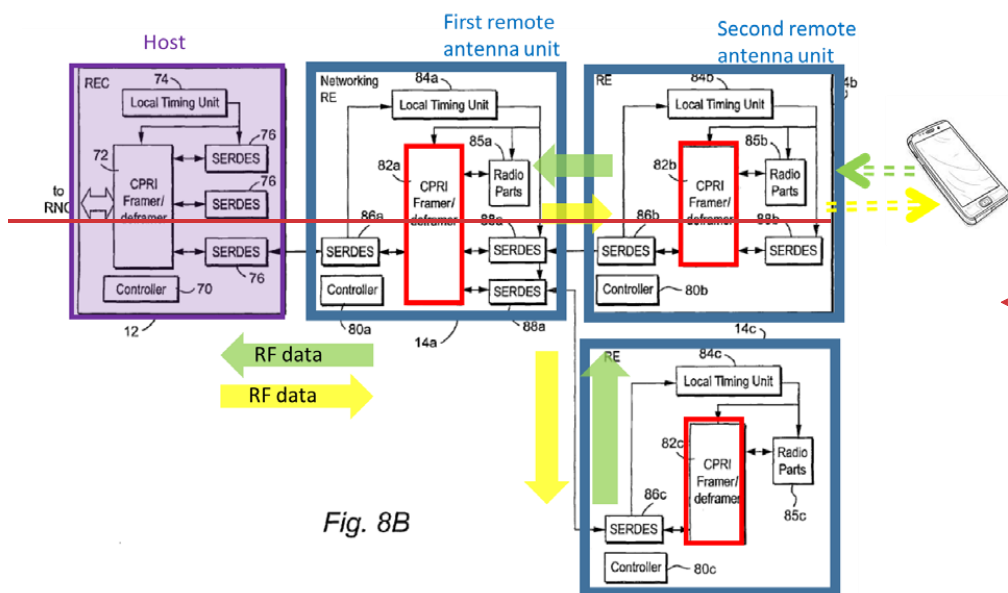
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EX-1004, FIGS. 8A, 8B; 10:23-11:6, EX-1003 ¶89.

[1.8] wherein the first remote antenna unit is configured to:

[1.8] wherein the first remote antenna unit is configured to:

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i. ~~generate a fourth RF signal and a transport signal representing a duplicate of the fourth RF signal;~~

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88. Aarflot discloses the networking RE (14a) [first remote antenna unit] is configured to convert between baseband and radio frequencies

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[generate a fourth RF signal] of a signal received from the REC.

~~RF signal] of a signal received from the REC.~~

The radio equipment control (REC) performs baseband signal processing, and each radio equipment (RE) converts between baseband and radio frequencies and transmits and receives signals over one or more antennas. Each RE serves a certain geographic area, sector, or cell. Separate, dedicated optical and/or electrical links connect the radio equipment control (REC) to each of the plural remote radio equipment (RE). However, the term link as used hereafter refers to a logical link and is not limited to any particular physical medium. Each link carries digital information downlink from the REC to the RE and digital information uplink from the RE to the REC.

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EX-1004, 1:67-2:11; ~~EX-1003 ¶90.~~

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89. Aarflot discloses generating a RF signal at each of the remote antenna units which is transmitted wirelessly from the RE to the user. EX-1004, 1:67-2:11; ~~EX-1003 ¶91.~~

90. Aarflot also discloses the networking RE (14a) frames and serializes a signal representative of the RF signals [*generates a transport signal*].

the processing circuitry is configured to route some of the received frames to the radio transceiving circuitry for transmission over a radio interface and to **route others of the received frames to the first interface circuitry for transmission to the second RE over the second communications link.**

EX-1004, Claim 33(~~emphasis added~~); ~~EX-1003 ¶92.~~

The framer/deframer 82a **transmits on its master port via SERDES 88a the information intended for the next RE 14b.**

The RE 14b receives that information on its slave port via its SERDES 86 b and passes that information onto its local timing unit 84b and to its framer/deframer 82b to perform similar operations that the networking RE 14a performs for information received intended for its own RE.

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EX-1004 10:44-50(emphasis added); EX-1003 ¶92.

A POSA understood that Aarflot’s disclosure of routing some of the received frames to the networking RE’s (14a) antenna and some of the received frames to the second RE (14b) would include the routing the same signals

[transporting a signal representing a duplicate of the fourth RF signal] when Aarflot intends to simulcast the signals from the networking RE (14a) and second RE (14b) to a user, as this was a common method of communicating using a DAS as described in §V.FE.1 and 3 above.

Aarflot’s disclosure is consistent with the’100 Patent’s disclosure, which also does not describe the details of how or why the signal at the first remote radio is duplicated and sent to the second remote radio, thus evidencing that these features are well-known to a POSA. See §V.A above;

EX-1003 ¶93.

91. . See also “Fourth RF Signal” and “Duplicate of Fourth RF Signal” below.

ii. *transmit the fourth RF signal from the first remote antenna unit; and*

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92. Aarflot discloses each RE, including networking RE (14a) [*first remote antenna unit*], is configured to transmit an RF signal “from one or more antennas.” EX-1004, 1:67-2:11, 10:33-35; ~~EX 1003 ¶94.~~

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the processing circuitry is configured to route some of the received frames to the radio transceiving circuitry for transmission over a radio interface and to route others of the received frames to the first interface circuitry for transmission to the second RE over the second communications link.

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EX-1004, 24:30-38(~~emphasis added~~); ~~EX 1003 ¶94.~~

See also “Fourth RF Signal” and “Duplicate of Fourth RF Signal” below.

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iii. send the transport signal through the network such that the transport signal is routed to a second of the plurality of remote antenna units, 95.

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93. Aarflot discloses the networking RE (14a) is configured to route frames [*transport signal*] representing a copy of the RF signal over a second communications link [*through the network*] to a second RE (14b-~~f~~)[*a second of the plurality of remote antenna units*].

~~the processing circuitry is configured to route some of the received frames to the radio transceiving circuitry for transmission over a radio interface and to route others of the~~

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~~received frames to the first interface circuitry for transmission to the second RE over the second communications link.~~

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~~EX-1004, 24:33-38(emphasis added); EX-1003 ¶95:the processing circuitry is configured to route some of the received frames to the radio transceiving circuitry for transmission over a radio interface and to route others of the received frames to the first interface circuitry for transmission to the second RE over the second communications link.~~

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EX-1004, 24:33-38.

transmitting the frames over the second transmission link between the first and second RE.

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EX-1004, 19:1-2; ~~EX-1003 ¶95.~~

Control information and user information are provided for transmission over the first transmission link from the REC node to the first RE node, and that **information intended for the second RE is forwarded over the second transmission link from the first RE node to the second RE node.**

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EX-1004, 4:8-13(~~emphasis added~~); ~~EX-1003 ¶95.~~

The framer/deframer 82a **transmits on its master port via SERDES 88a the information intended for the next RE 14b.** The RE 14b receives that information on its slave port via its SERDES 86 b and passes that information onto its local

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timing unit 84b and to its framer/deframer 82b to perform similar operations that the networking RE 14a performs for information received intended for its own RE.

EX-1004 10:44-50 (~~emphasis added~~); EX 1003 ¶95.

See also “Fourth RF Signal” and “Duplicate of Fourth RF Signal” below.

[1.9] wherein the duplicate of the fourth RF signal is transmitted from the second remote antenna unit.

94. Aarflot discloses the second RE (14b) is configured to receive the transport signal from the networking RE (14a) and transmit RF signals [duplicate of the fourth RF signal] over an antenna of the second RE (14b) [second remote antenna unit]”

the processing circuitry is configured to route some of the received frames to the radio transceiving circuitry for transmission over a radio interface and to route others of the received frames to the first interface circuitry for transmission to the second RE over the second communications link.

EX-1004, 24:33-38 (~~emphasis added~~); EX 1003 ¶96.

The radio equipment control (REC) performs baseband signal processing, and each radio equipment (RE) converts between baseband and radio frequencies and **transmits and receives signals over one or more antennas.**

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EX-1004, 1:67-2:11 (~~emphasis added~~); ~~EX-1003 ¶96~~.

See also “Fourth RF signal” and “Duplicate of fourth RF Signal” below.

“Fourth RF signal” and “Duplicate of fourth RF signal” with respect to Limitations [1.8.i-iii] and [1.9]

95. To the extent that PO asserts that Aarflot does not explicitly state that the framed and forwarded signal [*transport signal*] represents a duplicate of the RF signal [*fourth RF signal*] transmitted⁵ from the networking RE (14a) [*first remote antenna unit*], and then transmitted from the second RE (14b) [*second remote antenna unit*], a POSA would be motivated to modify the teachings of Aarflot with Laroia’s teaching of transmission of the same signal from multiple remote antenna units. ~~EX-1003 ¶97~~.

96. It would have been obvious to a POSA to modify the method of Aarflot to send, via the fourth transport signal, a duplicate of the fourth RF signal to, and transmit from the antenna of, RE 14b [*second remote antenna unit*] as taught by Laroia for the reasons discussed in the Motivation to Combine section. ~~EX-1003 ¶98...~~

⁵ As in transmitted over the air interface Uu.

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97. A POSA understood, as described above, Aarflot discloses: 1) generating/transmitting a RF signal from the networking RE (14a); 2) generating/sending a transport signal containing a representation of a RF signal to the second RE (14b); and 3) transmitting the RF signal represented in the transport signal from the second RE (14b). ~~EX 1003 ¶99.~~

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98. A POSA also understood, that among others, Laroia taught at least two practical reasons the same signal would be transmitted from two different remote antenna units (Networking RE (14a) and second RE (14b)). Macrodiversity and broadcasting.

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99. As discussed in §V.FE.3 above, handoffs are required when a mobile device leaves the geographic area handled by one antenna unit into another. As described in Aarflot, “each RE serves a certain geographic area, sector, or cell,” thus when traversing the geographic area, the mobile may require a different RE. A soft handoff allows the mobile to receive the same RF signal from different REs and select from the strongest signal. Additionally, simulcasting or broadcasting over multiple coverage areas was well-known in the art as described in §V.FE.3. ~~EX 1003 ¶101.~~

100. Therefore, it would have been obvious to a POSA to send a duplicate RF signal (*i.e.* duplicate of the RF signal transmitted by the

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networking RE (14a)) to the second RE (14b) [*second remote antenna unit*] for transmission from the second RE (14b) in the method of Aarflot as taught by Laroia. A POSA would have been motivated to make the modification to allow a soft handoff as a mobile device travels between the respective areas of the networking RE and the second RE, as well as allowing Aarflot's network to broadcast over the areas covered by the networking RE and the second RE.

Such a modifications enables:

- 1) Seamless overlapping coverage with the network during mobile device movement across the respective geographic boundaries (soft handoff);
- 2) Seamless communications between the network and mobile devices operating in areas with multiple interfering obstacles;
- 3) — Delivery of the same information over multiple geographic areas to mobile devices within those areas covered by the networking RE and the second

3) RE; and,

- 4) Querying/polling of a device to determine whether the device is within the geographic areas served by the second RE and networking RE. ~~EX-1003 ¶102.~~

101. In addition, such a modification would be merely:

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5) Combining prior art elements according to known methods to yield predictable results, *i.e.* the elements of sending a duplicate of the RF signal to, and transmitting from, the second RE are known methods that predicatively result in macrodiversity and a simulcast signal;

6) Use of known techniques to improve similar methods in the same way;

6) *i.e.* macrodiversity enabled by the sending and transmission of the duplicate RF signal would improve the wireless communications within Aarflot's distributed base station network in the same way it improves other conventional base station systems;

7) Choosing from a finite number of identified, predictable solutions, with a reasonable expectation of success; *i.e.*, conventional RF TDMA communications systems, including Aarflot's distributed base station TDMA network, may operate using a limited number of methodologies, macrodiversity and simulcast among them. Using the known solutions, the macrodiversity and/or simulcast would have predictable results. ~~EX 1003 ¶103.~~

102. A POSA would also be confident of the success because the proposed modification would not result in *rearrangement* of the network devices, network topology, nor a deviation from their common and intended operation/uses. Offering wireless communications by transmitting duplicate

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RF signals from multiple antenna units was a well-understood and predictable endeavor. ~~EX-1003 ¶104.~~

Claim 2

The distributed base station system of claim 1, wherein the plurality of remote antenna units are arranged in a tree configuration.

103. Aarflot discloses the REs may be arranged in a tree configuration, (“FIG. 2E shows a tree network topology.”); EX-1004, 6:38; ~~EX-1003 ¶105.~~

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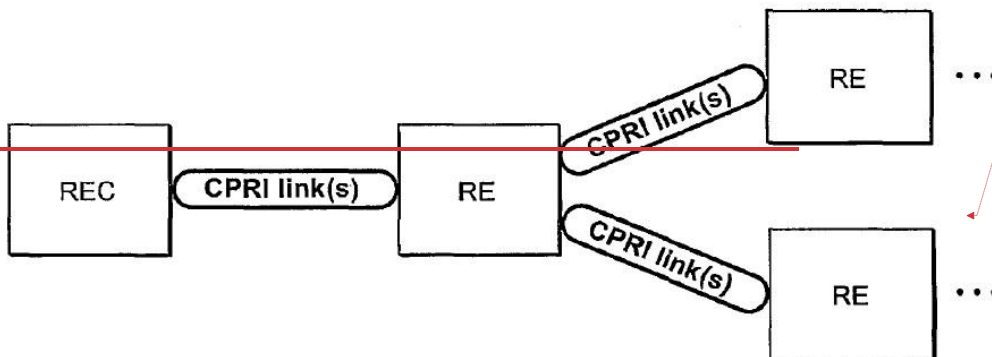


Fig. 2E

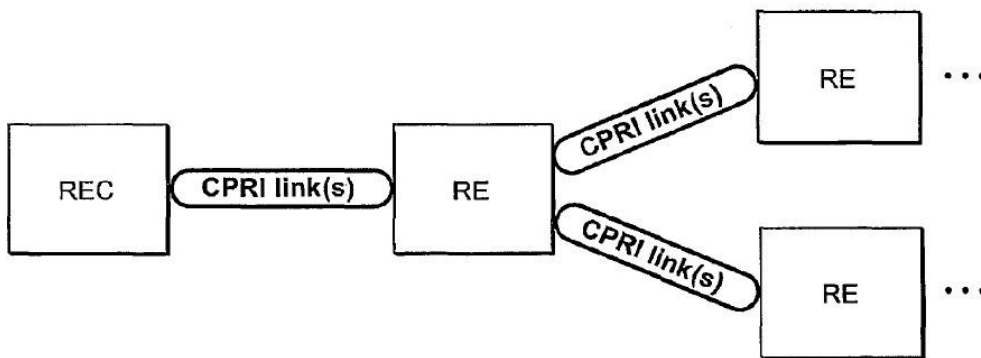


Fig. 2E

EX-1004, FIG. 2E; EX 1003 ¶105.

Claim 3.

The distributed base station system of claim 1, wherein the plurality of remote antenna units are arranged in a ring configuration.

104. Aarflot discloses the REs may be arranged in a ring configuration, (“FIG. 2F shows a ring network topology. Other topologies could be used, e.g.,

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a combination of a ring and a tree topology.”); ~~EX 1004~~EX1004, 6:38-40; ~~EX 1003 ¶106~~.

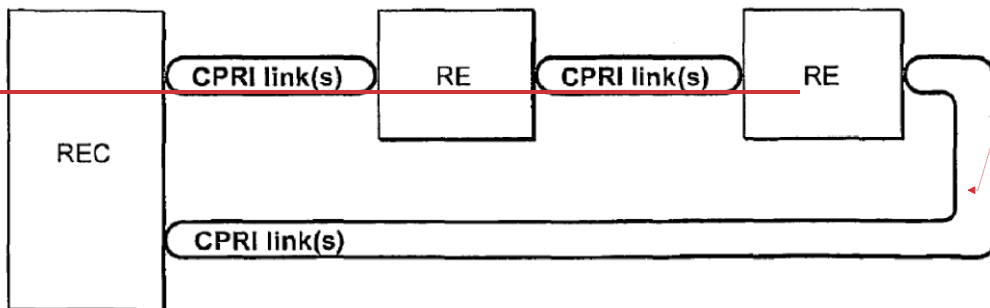


Fig. 2F

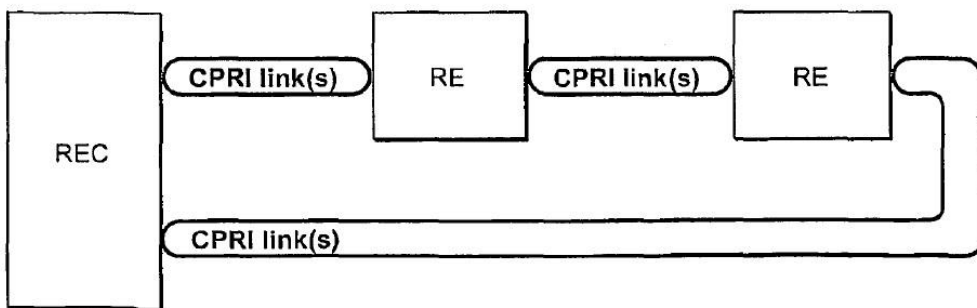


Fig. 2F

EX-1004, FIG. 2F; ~~EX 1003 ¶106~~.

Claim 4

The distributed base station system of claim 1, wherein each of the plurality of remote antenna units is coupled to a remote base station.

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105. Aarflot discloses each of the REs are coupled to a remote base station. As discussed in [1.5] above, functionality within the networking RE (14a), and within the co-located REC, is that of a distributed radio base station [remote base station]:

A distributed radio base station includes the radio equipment control (REC) and the radio equipment (RE). Both parts may be physically separated, (i.e., the RE may be close to the antenna, whereas the REC is located in a conveniently accessible site), or both may be co-located as in a conventional radio base station design.

EX-1004, 1:61-67; EX 1003 ¶107.

TABLE 1

Functions of REC		Functions of RE	
Downlink	Uplink	Downlink	Uplink
Radio base station control & management		RRC Channel Filtering	
Iub transport		D/A conversion	A/D conversion
Iub Frame protocols		Up Conversion	Down Conversion

TABLE 1

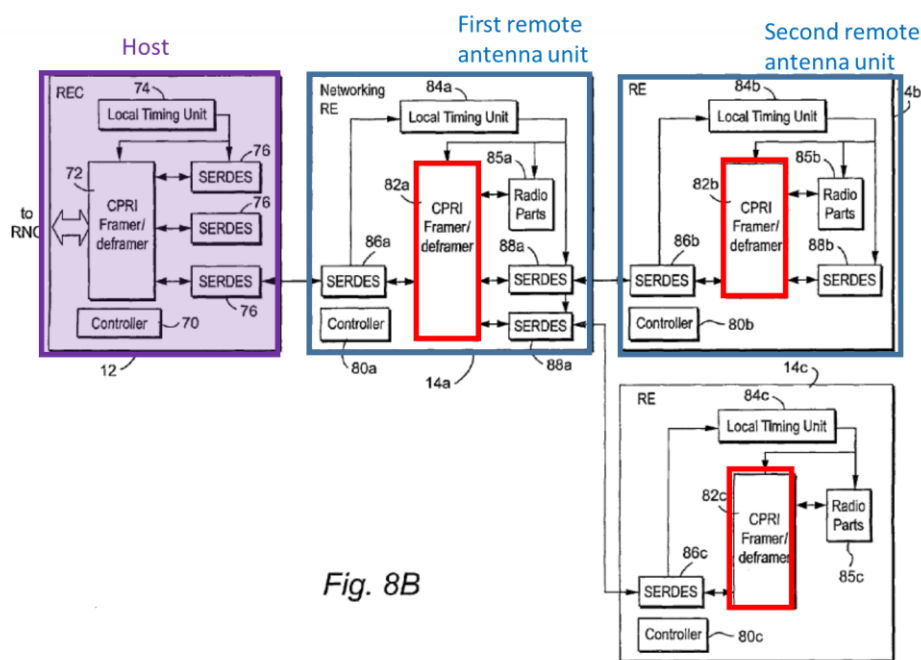
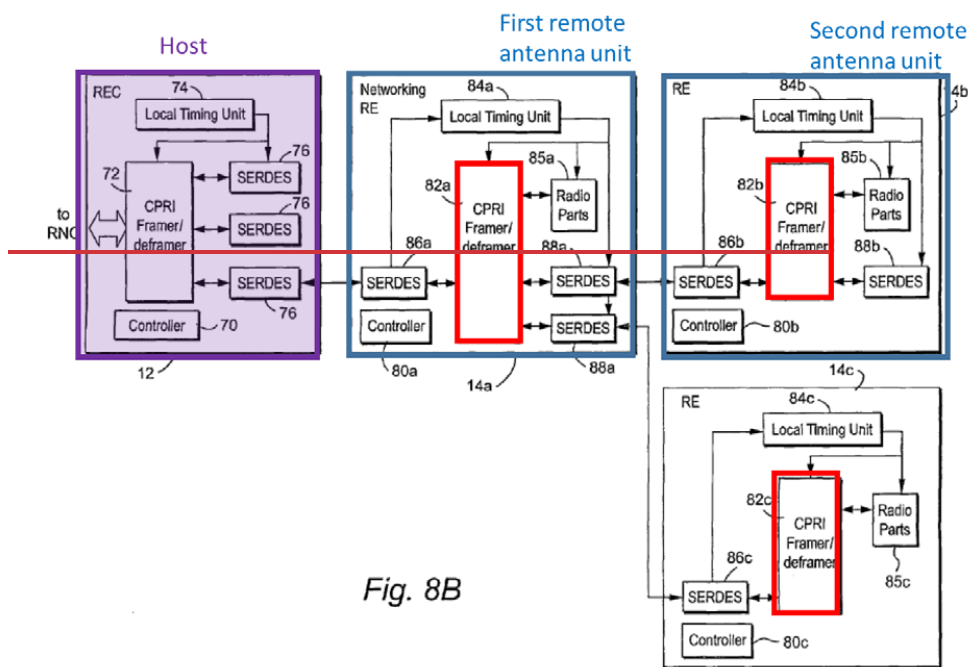
Functions of REC		Functions of RE	
Downlink	Uplink	Downlink	Uplink
Radio base station control & management		RRC Channel Filtering	
Iub transport		D/A conversion	A/D conversion
Iub Frame protocols		Up Conversion	Down Conversion

EX-1004, Table 1; ~~EX 1003 ¶107.~~_____

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EX-1004, FIG 8B; §V.A (discussing EX-1001 FIGS. 6-8);

~~EX 1003 ¶107.~~

Claim 6

The distributed base station system of claim 1, further comprising: a fiber optic transport mechanism between two of the plurality of remote antenna units.

106. Aarflot discloses CPRI protocols between the REs [*two of the plurality of remote antenna units*] utilize optical transport, which a POSA understood as disclosing a fiber optic transport mechanism. ~~EX 1004, 9:18-22, Fig. 7; EX 1003 ¶108.~~

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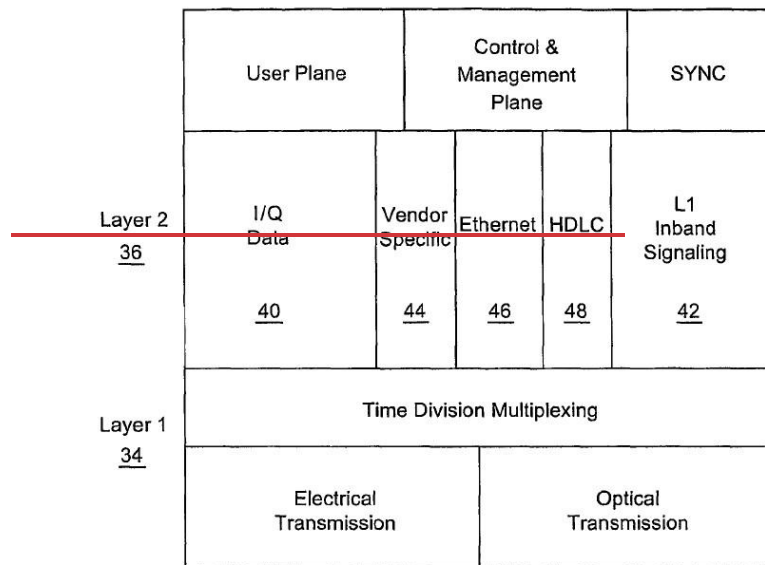


Fig. 7

FIG.

7 illustrates an overview of the CPRI protocol for the physical layer 34 (layer 1) and the data link layer 36 (layer 2). Layer 1 defines, e.g., electrical characteristics, optical characteristics, time division multiplexing of the different data flows, and low level signaling.

EX-1004, 9:18-22.

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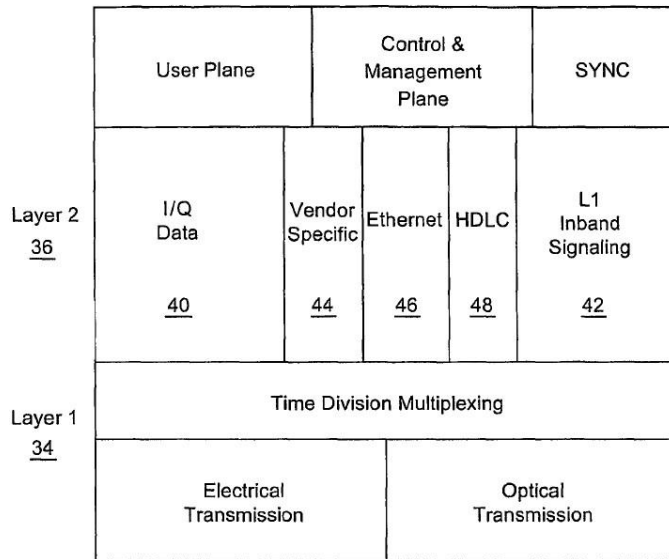


Fig. 7

FIG. 7; EX-1003 ¶1081004, FIG. 7.

Claim 8

[8.0] A method of transmitting a wireless communication signal comprising:

107. To the extent that the preamble is limiting, Aarflot discloses a method for transmission of user information across an air interface [*wireless data transmission*] between an RE and user equipment [*transmitting a wireless communication signal*],

The radio equipment control (REC) node provides access to the Radio Network Controller via the Iub interface in a UMTS radio

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access network, **whereas each radio equipment (RE) node serves as the air interface to the user equipment** (in the UMTS network the air interface is called the Uu interface). The REC performs the radio functions of the digital baseband domain, whereas each RE performs the analog radio frequency (RF) functions.

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EX-1004, 6:42-48(~~emphasis added~~); ~~EX 1003 ¶109.~~

The user information includes multiple data flows. Each data flow corresponds to data associated with one antenna per one radio carrier.

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EX-1004, 2:46-48; ~~EX 1003 ¶109.~~

[8.1] _____receiving a first RF signal at a first remote wireless communication station;

108. Aarflot discloses a first RE (14b) (blue) [first remote wireless communication station] receives an uplink signal (green) [first RF signal] from a user.

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The radio equipment control (REC) node provides access to the Radio Network Controller via the Iub interface in a UMTS radio access network, **whereas each radio equipment (RE) node serves as the air interface to the user equipment** (in the UMTS network the air interface is called the Uu interface).

EX-1004, 6:42-47(~~emphasis added~~); ~~EX 1003 ¶110.~~

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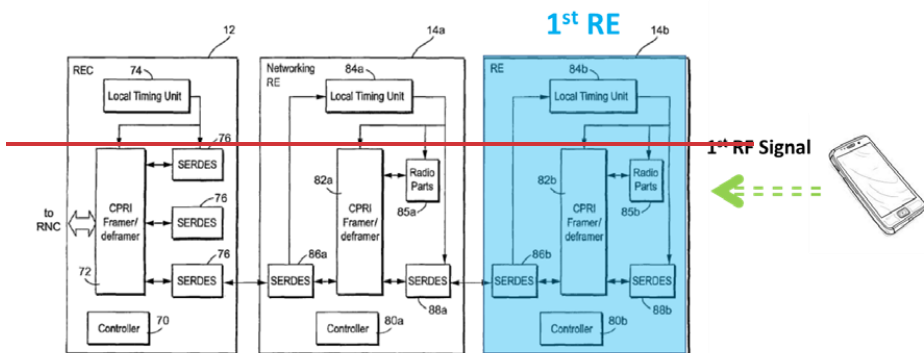


Fig. 8A

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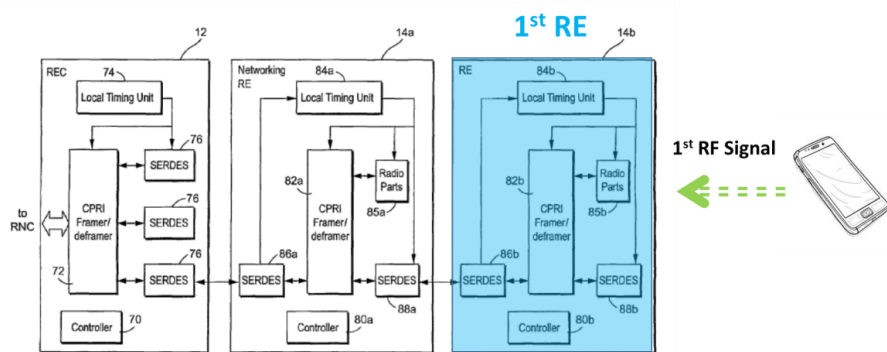


Fig. 8A

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EX-1004, FIG. 8A; EX-1003 ¶110.

[8.2] routing a first transport signal based on the first RF signal to a second remote wireless communication station via a network layer router co-located with the first remote wireless communication station;

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109. Aarflot discloses, via the processing circuitry/CPRI framer deframer (red) [network layer router] located in each of the REs, routing frames including data corresponding to the uplink RF signals received [first

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transport signal based on the first RF signal] to RE 14a (dark blue) [*second remote wireless communication station*]:

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the processing circuitry is configured to route some of the received frames to the radio transceiving circuitry for transmission over a radio interface and to route others of the received frames to the first interface circuitry for transmission to the second RE over the second communications link.

EX-1004, 24:33-38; ~~EX-1003 ¶111.~~

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The RE 84b sends user and control information including antenna carrier data from its radio parts 85b and C&M information from the controller 80b to the framer/deframer 82b. The framer/deframer 82b multiplexes and frames that information and forwards those frames via the SERDES 86b to the networking RE 14a over the second communications link. The networking RE 14a receives those frames from the end RE 14b in the master port for processing by SERDES 88a. The framer/deframer 82a processes the parallel formatted information from the SERDES 88a and includes it with its own uplink frames for delivery to the REC 12 via SERDES 86a and the first transmission link.

EX-1004, 10:52-64; ~~EX-1003 ¶111.~~

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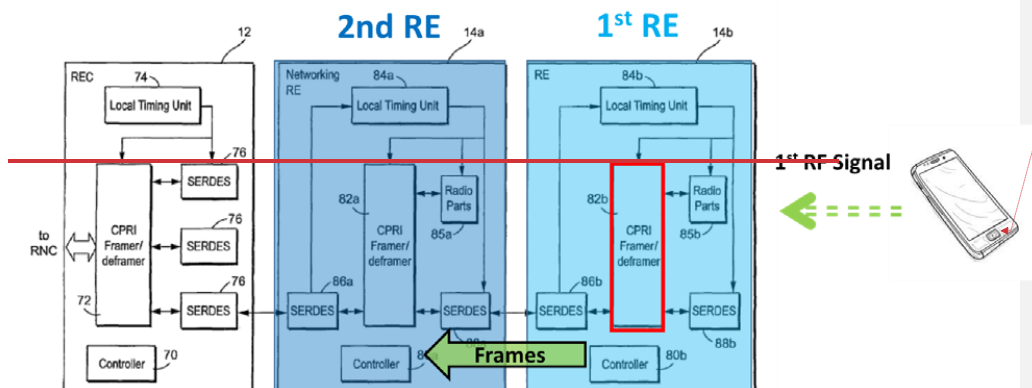


Fig. 8A

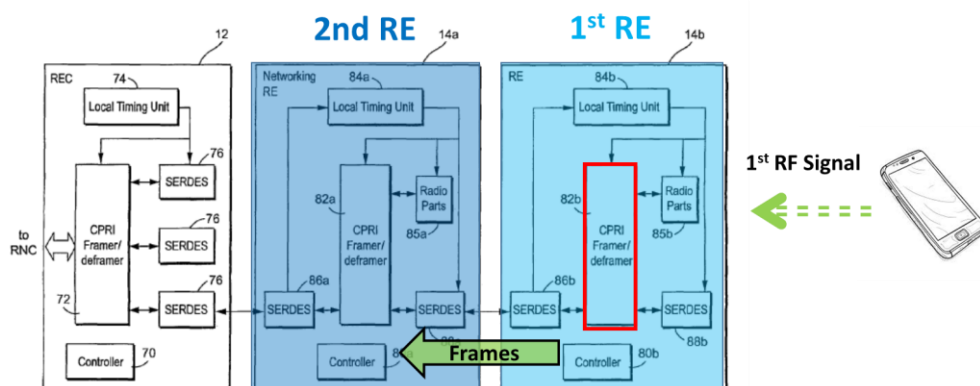


Fig. 8A

EX-1004, FIG. 8A; EX-1003 ¶111.

110. Thus, a POSA understood that Aarflot discloses a network layer router for the same reasons discussed regarding limitation [1.5]. To the extent the PO argues the framer/deframers are not network layer routers, Wiedeman, which is analogous art, **discloses** the use of network layer routers to route digital RF signals via network layer router over a network, and a POSA would

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be motivated to modify the teaching of Aarflot to include a router as taught by Wiedeman for the same reasons discussed regarding limitation [1.5] above. ~~EX-1003 ¶112.~~

[8.3] receiving the first transport signal at a co-located, network layer router at the second remote wireless communication station;

111. Aarflot discloses the processing circuitry/CPRI framer deframer of the second RE (14a) [co-located network layer router] receives the frames [first transport signal] from the first RE (14b).

transmitting the frames over the second transmission link between the first and second RE,

EX-1004, 19:1-2; ~~EX-1003 ¶113.~~

The networking RE 14a receives those frames from the end RE 14b in the master port for processing by SERDES 88a. The framer/deframer 82a processes the parallel formatted information from the SERDES 88a and includes it with its own uplink frames for delivery to the REC 12 via SERDES 86a and the first transmission link.

EX-1004, 10:52-64; ~~EX-1003 ¶113.~~

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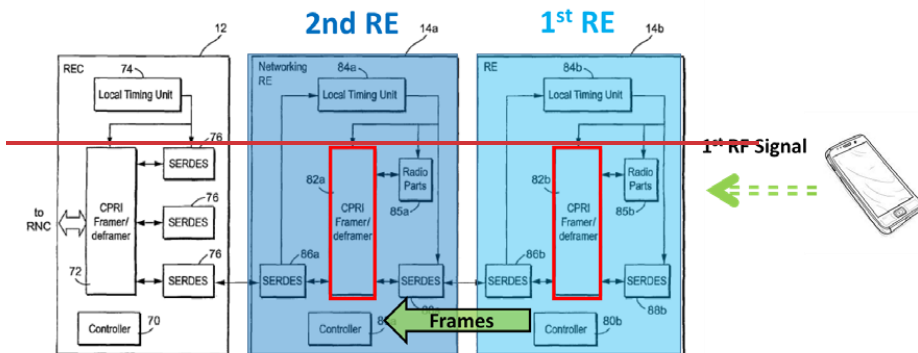


Fig. 8A

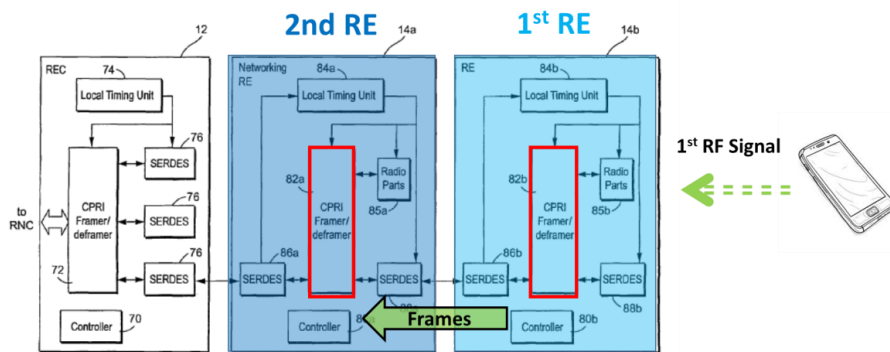


Fig. 8A

EX-1004, FIG. 8A; EX-1003 ¶113.

112. A POSA understood that Aarflot, alone or in combination with Wiedeman, discloses a *co-located, network layer router at the second remote wireless communication station* for the same reasons discussed regarding limitation [8.2]. EX-1003 ¶114.

[8.4] processing the first transport signal by a base station at the second remote wireless communication station;

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113. Aarflot discloses functionality within the networking RE (14a), and within the co-located REC, [*base station*] that processes the received frames [*first transport signal*]. ~~EX 1003 ¶115.~~

114. Aarflot discloses the second RE (14a) serializes, ~~de-serializes~~deserializes, de-frames and frames the frames received from the first RE 14b, and the REC perform numerous additional functions (purple) upon the received frames including De-coding, ~~Deinterleaving~~De-interleaving, De-spreading; ~~De-serambling~~Descrambling etc.

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TABLE 1-continued

Functions of REC		Functions of RE	
Downlink	Uplink	Downlink	Uplink
Channel Coding Interleaving	Channel De-coding De-Interleaving	ON/OFF control to each carrier Carrier Multi-plexing	Automatic Gain Control Carrier De-multiplexing
Spreading	De-spreading	Power amplification and limiting	Low Noise Amplification
Scrambling	De-scrambling	Antenna supervision	
Adding of physical channels	Signal distribution to signal processing units	RF filtering	RF filtering
Transmit Power Control of each physical channel	Transmit Power Control & Feedback Information detection	Measurements	
Frame and slot signal generation (including clock stabilization)			
Measurements			

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TABLE 1-continued

Functions of REC		Functions of RE	
Downlink	Uplink	Downlink	Uplink
Channel Coding Interleaving	Channel De-coding De-Interleaving	ON/OFF control to each carrier Carrier Multiplexing	Automatic Gain Control Carrier De-multiplexing
Spreading	De-spreading	Power amplification and limiting	Low Noise Amplification
Scrambling	De-scrambling	Antenna supervision	
Adding of physical channels	Signal distribution to signal processing units	RF filtering	RF filtering
Transmit Power Control of each physical channel	Transmit Power Control & Feedback Information detection	Measurements	
Frame and slot signal generation (including clock stabilization)			
Measurements			

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EX-1004, Table 1; ~~EX-1003 ¶116.~~

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115. As discussed in [1.5] above, Aarflot discloses functionality within the networking RE (14a), and within the co-located REC, is that of a distributed base station and performs the functions of a base station:

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A distributed radio base station includes the radio equipment control (REC) and the radio equipment (RE). Both parts may be physically separated, (i.e., the RE may be close to the antenna, whereas the REC is located in a conveniently

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accessible site), or both may be co-located as in a conventional radio base station design.

EX-1004, 1:61-66;~~EX 1003 ¶117.~~

TABLE 1			
Functions of REC		Functions of RE	
Downlink	Uplink	Downlink	Uplink
Radio base station control & management		RRC Channel Filtering	
	Iub transport	D/A conversion	A/D conversion
	Iub Frame protocols	Up Conversion	Down Conversion

TABLE 1			
Functions of REC		Functions of RE	
Downlink	Uplink	Downlink	Uplink
Radio base station control & management		RRC Channel Filtering	
	Iub transport	D/A conversion	A/D conversion
	Iub Frame protocols	Up Conversion	Down Conversion

EX-1004, Table 1;~~EX 1003 ¶117.~~

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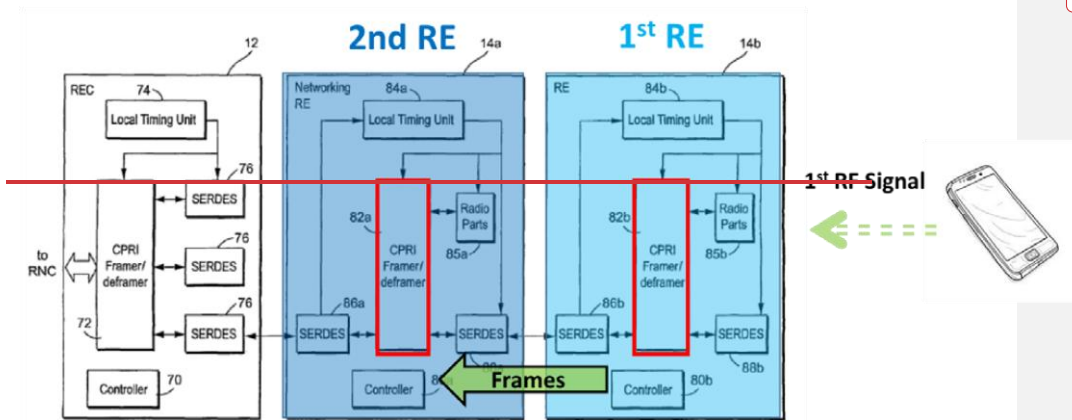


Fig. 8A

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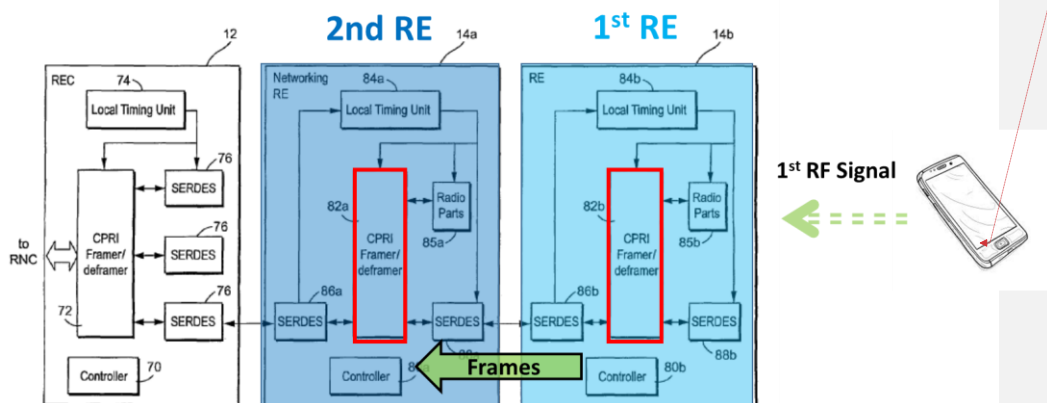


Fig. 8A

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EX-1004, FIG. 8A; §V.A (discussing EX-1001 FIGS. 6-8); ~~EX 1003 ¶117.~~

[8.5] ___receiving a second RF signal at the first remote wireless communication station;

116. A POSA understood Aarflot discloses a first RE (14b) (blue) [first remote wireless communication station] may receive multiple uplink signals which would include a second uplink signal (dark green) [second RF signal]

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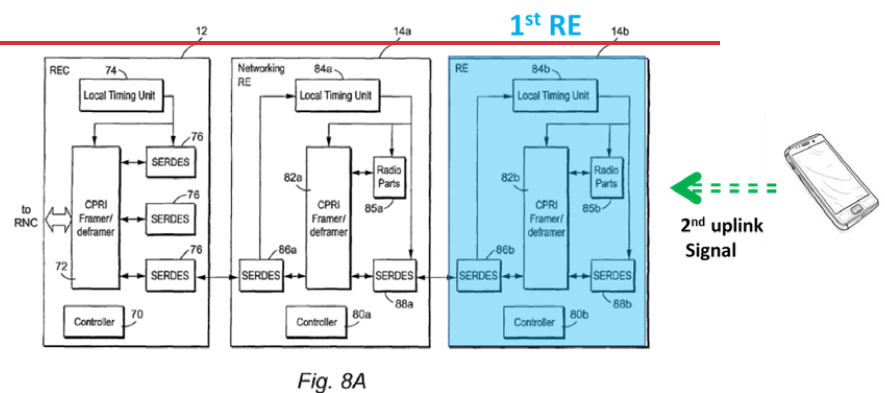
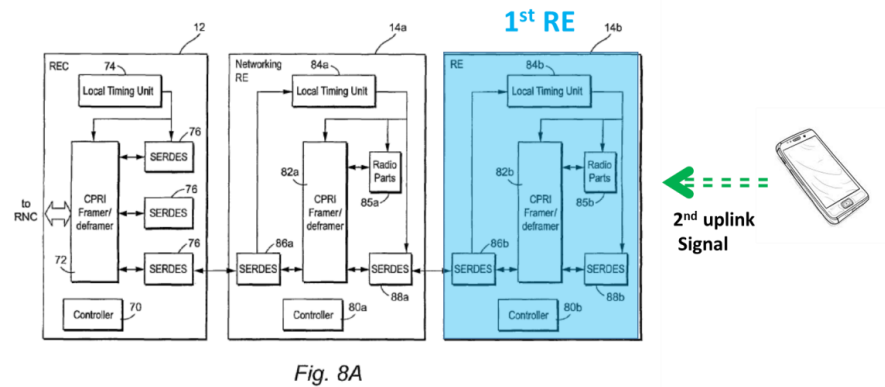
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from a user.



EX-1004, FIG. 8A; EX-1003 ¶118.

[8.6] sending a second transport signal to a host unit based on the second RF signal

Aarflot discloses a main baseband processing unit/Radio Equipment

117. Controller (REC) (purple) [host unit]:

a main baseband processing unit coupled to one or more remote radio units where RF processing occurs, and in particular, to the

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radio interface between the main baseband processing unit and the one or more remote radio units.

EX-1004, 1:24-29; ~~EX 1003 ¶119.~~

An interface, apparatus, and method are described for communication between a radio control (REC) node and first and second radio equipment (RE) nodes in a radio base station.

EX-1004, Abstract; ~~EX 1003 ¶119.~~

Aarflot discloses frames representing the uplink signals [*second transport signal based on the second RF signal*] are sent via the 2nd RE (14a) to the REC [*host unit*]. Aarflot discloses the REs send uplink signal frames to the REC via an intervening networking RE (14a). EX-1004 2:37-41, 7:24-27, 7:46-48, 8:8-16; ~~EX~~

118. ~~1003 ¶120.~~

A networked topology includes at least one intervening RE node. FIG. 5 shows examples of several defined terms useful 10 in describing features or aspects of a networked topology, where the simplest networked topology includes an REC coupled to at least two REs with at least one of the REs being connected between the REC and the other RE. FIG. 5 shows such a simple networked topology with RE#1 being the networking RE.

EX-1004, 8:8-16; ~~EX 1003 ¶120.~~

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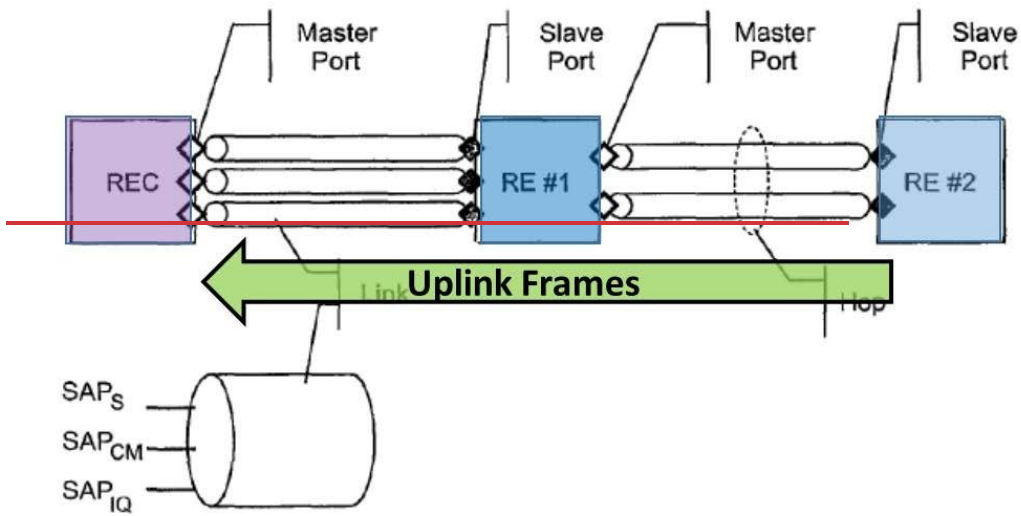


Fig. 5

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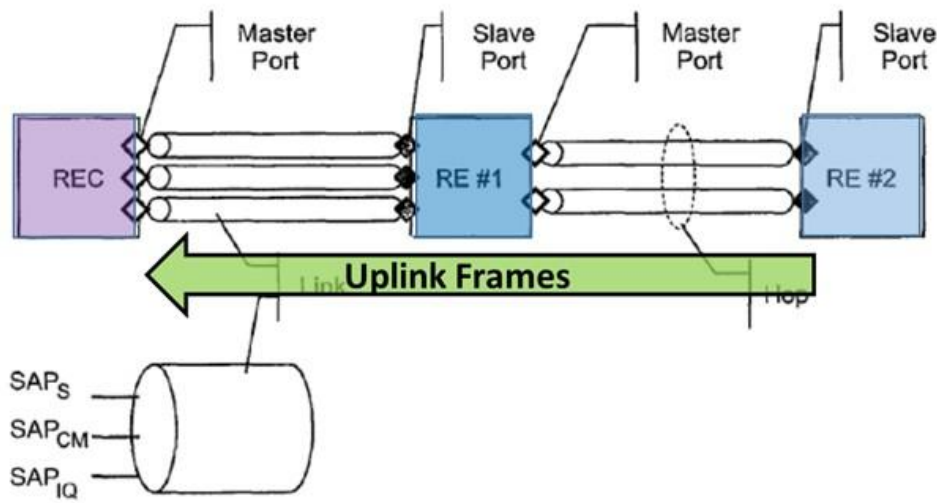


Fig. 5

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EX-1004, FIG. 5;~~EX 1003 ¶120.~~

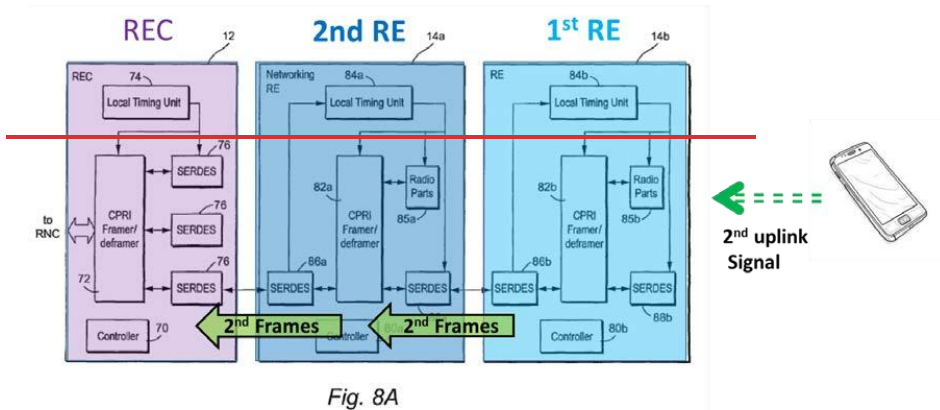


Fig. 8A

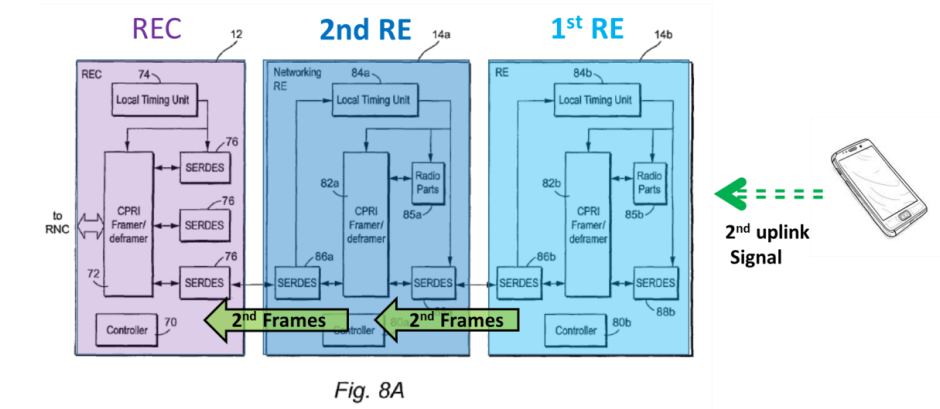


Fig. 8A

EX-1004, FIG. 8A;~~EX 1003 ¶120.~~

[8.7] generating a fourth RF signal at the base station of the second remote wireless communication station;

As discussed regarding [1.8.i], Aarflot discloses generating a downlink RF signal [fourth RF signal] from the I/Q signal received from the REC at the second

119. RE (14a-).

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The single hop configuration in FIG. 4 shows a single link between the REC and the RE. The downlink direction is from the REC to the RE, and the uplink direction is from the RE to the REC. The REC includes a master port, and the RE includes a slave port.

EX-1004, 8 1-7; *see* [8.4] above (base station); ~~EX 1003 ¶121.~~

120. Aarflot discloses the networking RE 14a [*second remote wireless communications station*] deframes/de-serializes and converts between baseband and radio frequencies [*generating a fourth RF signal*] from the signal received from the REC.

The radio equipment control (REC) performs baseband signal processing, and each radio equipment (RE) converts between baseband and radio frequencies and transmits and receives signals over one or more antennas. Each RE serves a certain geographic area, sector, or cell. Separate, dedicated optical and/or electrical links connect the radio equipment control (REC) to each of the plural remote radio equipment (RE). However, the term link as used hereafter refers to a logical link and is not limited to any particular physical medium. Each link carries digital information downlink from the REC to the RE and digital information uplink from the RE to the REC. ≈

EX-1004, 1:67-2:11; ~~EX 1003 ¶122.~~

The framer/deframer 82a extracts control and management data and layer 1 maintenance data received from the REC 12 by way of the serializer/deserializer 86a for the networking

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RE 14a and provides it to the controller 80 over a control link not shown. The framer/ deframer 82a extracts antenna carrier user data intended for the networking RE and forwards it to its radio parts 85a.

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EX-1004, 10:29-35; ~~EX 1003 ¶122.~~

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[8.8] transmitting the fourth RF signal from an antenna of the second remote wireless communication station;

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121. As discussed regarding [1.8.ii], Aarflot discloses each RE, including RE 14a, is *configured* to transmit an RF signal [*fourth RF signal*] from its antenna based upon received digital downlink data.

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The radio equipment control (REC) performs baseband signal processing, and each radio equipment (RE) converts between baseband and radio frequencies and **transmits and receives signals over one or more antennas**. Each RE serves a certain geographic area, sector, or cell.

EX-1004, 1:67-2:4; ~~EX 1003 ¶123.~~

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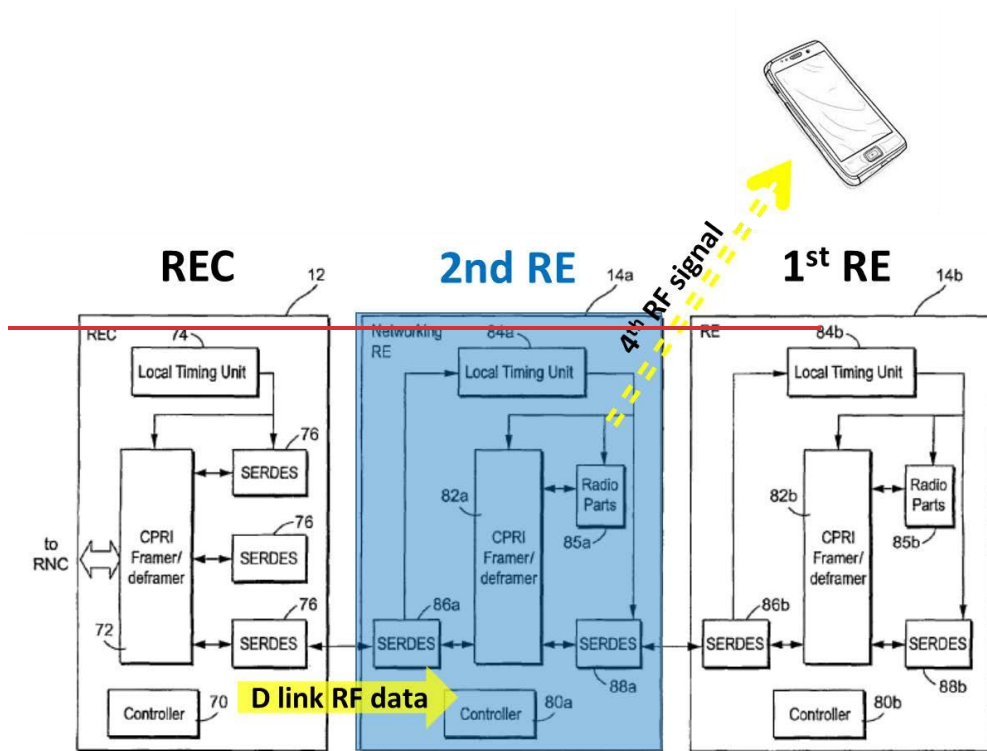


Fig. 8A

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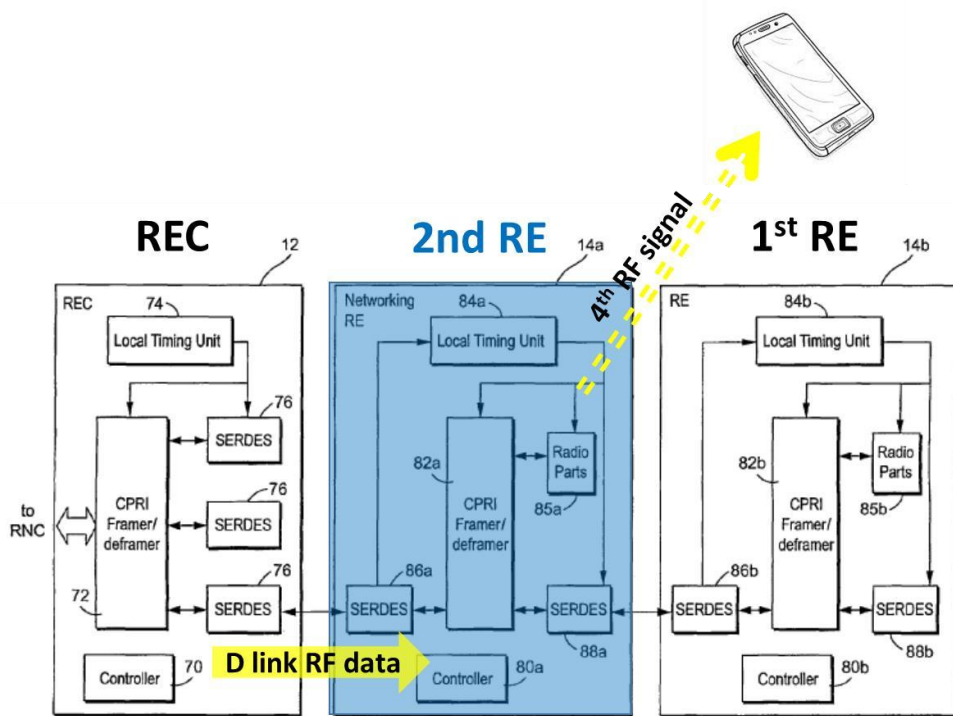


Fig. 8A

EX-1004, FIG. 8A; EX-1003 ¶123.

[8.9] generating a fourth transport signal representing a duplicate of the fourth RF signal;

Aarflot discloses this limitation for the same reasons discussed regarding *limitations* [1.8.i] and [1.9]. Aarflot discloses the networking RE (14a) (dark blue) receives, de-serializes and deframes a downlink signal from the REC and then ~~reframes~~re-frames and re-serializes a signal representative of a downlink signal [generating a fourth transport signal] to send over a second communications link to RE 14b

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122. *[first remote wireless communication station]*.

the processing circuitry is configured to route some of the received frames to the radio transceiving circuitry for transmission over a radio interface and to **route others of the received frames to the first interface circuitry for transmission to the second RE over the second communications link.** ~

EX-1004, 24:33-38; ~~EX-1003 ¶124.~~

The framer/deframer 82 a **transmits on its master port via SERDES 88a the information intended for the next RE 14b.** The RE 14b receives that information on its slave port via its SERDES 86 b and passes that information onto its local timing unit 84b and to its framer/deframer 82b to perform similar operations that the networking RE 14a performs for information received intended for its own RE.

EX-1004 10:44-50; ~~EX-1003 ¶124.~~

[8.10] sending the fourth transport signal to the first remote wireless communication station; and

123. As discussed regarding [1.8.iii], Aarflot discloses the networking RE (14a) *[second remote wireless communication station]* sends the frames *[fourth transport signal]* over a second communications link to RE 14b *[first remote wireless communication station]*. EX-1004, 10:44-50, 24:33-38; ~~EX-1003 ¶125.~~

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[8.11] transmitting a duplicate of the fourth RF signal from an antenna at the first remote wireless communication station.

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124. As discussed regarding [1.9], Aarflot discloses transmitting, by an antenna of the RE 14b [*first remote wireless communication station*], an RF signal represented in the frames received from the networking RE (14a) [*second remote wireless communication station*]:

~~the processing circuitry is configured to route some of the received frames to the radio transceiving circuitry for transmission over a radio interface and to route others of the received frames to the first interface circuitry for transmission to the second RE over the second communications link.~~

~~EX 1004, 24:33-38 the processing circuitry is configured to route some of the received frames to the radio transceiving circuitry for transmission over a radio interface and to route others of the received frames to the first interface circuitry for transmission to the second RE over the second communications link.~~

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~~EX-1003 ¶ 126~~ EX 1004, 24:33-38.

The radio equipment control (REC) performs baseband signal processing, and **each radio equipment (RE) converts between baseband and radio frequencies and transmits and receives signals over one or more antennas. Each RE**

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serves a certain geographic area, sector, or cell. Separate, dedicated optical and/or electrical links connect the radio equipment control (REC) to each of the plural remote radio equipment (RE). However, the term link as used hereafter refers to a logical link and is not limited to any particular physical medium. Each link carries digital information downlink from the REC to the RE and digital information uplink from the RE to the REC. ≈

EX-1004, 1:67-2:11 (~~emphasis added~~); EX 1003 ¶126.

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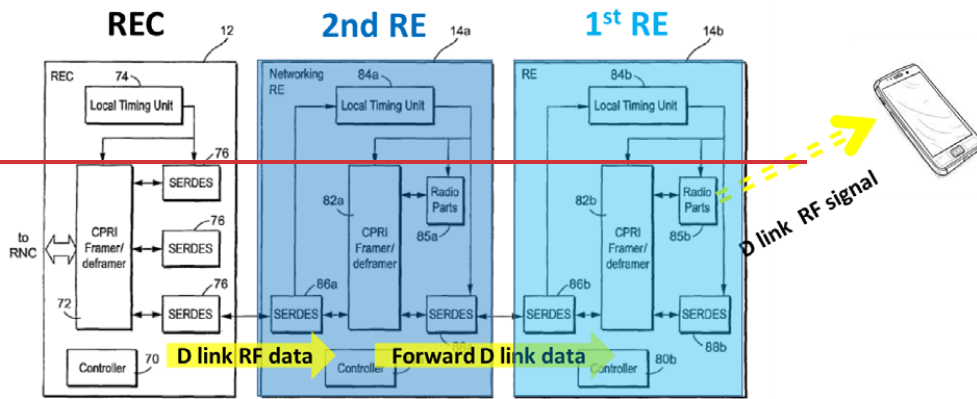


Fig. 8A

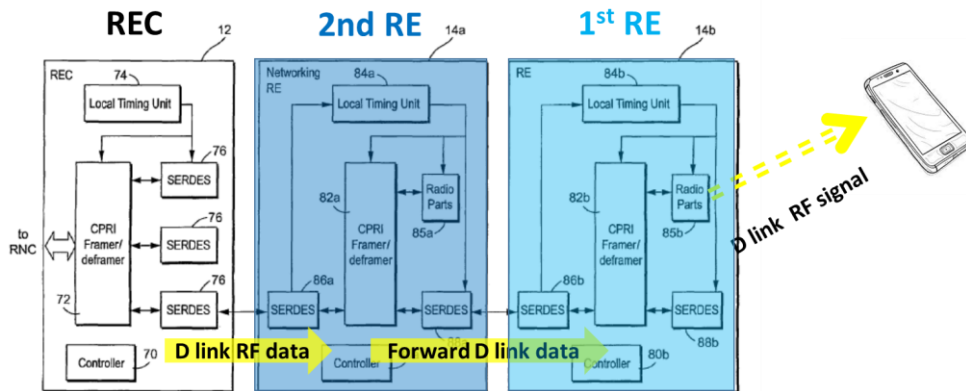


Fig. 8A

EX-1004, FIG. 8A; EX-1003 ¶126.

“Fourth RF signal” and “Duplicate of fourth RF signal” with respect to Limitations [8.8-8.11]

125. To the extent PO asserts that Aarflot does not explicitly disclose the framed and forwarded signal [*transport signal*] represents a duplicate of the RF signal [*fourth RF signal*] transmitted from the networking RE (14a) [*second remote wireless transmission station*], and then transmitted from the

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RE 14b [*first remote wireless communication station*], a POSA would be motivated to modify the teachings of Aarflot with Laroia's teaching of transmitting the same signal from multiple remote antenna units. ~~EX-1003 ¶127.~~

126. It would have been obvious to a POSA to modify the method of Aarflot to send to, via the fourth transport signal, and transmit a duplicate of the fourth RF signal from, the RE 14b for the same reasons discussed above regarding "fourth RF signal" and "duplicate of fourth RF signal" in limitations [1.8]-[1.9]. ~~EX-1003 ¶128.~~

Claim 9

—The method of claim 8, further comprising:

sending a third transport signal from the host unit to the first remote wireless communication system; and

transmitting a third RF signal from the remote wireless communication station based on the third transport signal.

127. Aarflot discloses the REC [*host unit*] transmits digital downlink data (yellow) [*third transport signal*] to RE 14b [*first remote wireless communication system*], and RE 14b transmits an RF signal [*third RF signal*] to a user based upon the digital downlink data [*third transport signal*]. EX-1004, 2:37-41, 2:58-60, 7:24-27, 7:46-48, 8 1-7; ~~EX-1003 ¶129.~~

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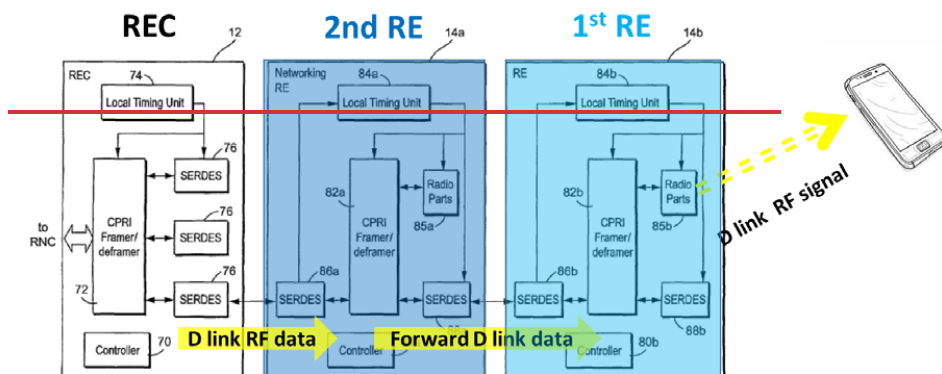


Fig. 8A

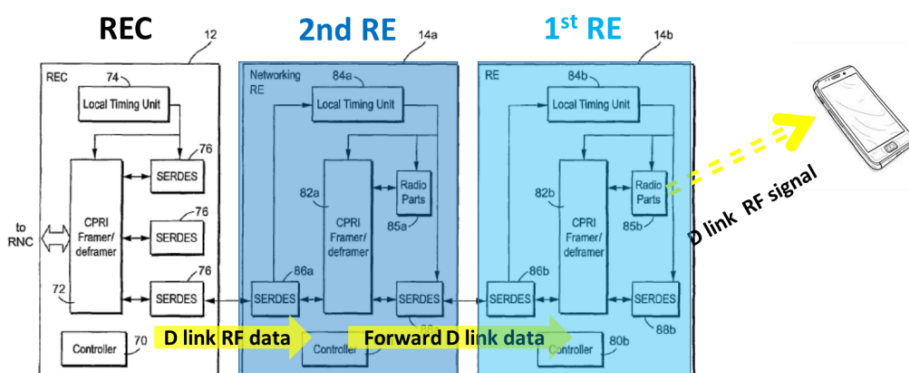


Fig. 8A

EX-1004, FIG. 8A; EX 1003 ¶129.

Claim 10

The method of claim 8, wherein receiving the first RF signal receives the first RF signal via an antenna at the first remote wireless communication station.

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128. Aarflot *discloses* RE 14b (blue) [*first remote wireless communication station*] receives an uplink signal (green) [*first RF signal*] from a user via an associated antenna. *See* limitation [8.1].

The radio equipment control (REC) node provides access to the Radio Network Controller via the Iub interface in a UMTS radio access network, whereas each radio equipment (RE) node serves as the air interface to the user equipment (in the UMTS network the air interface is called the Uu interface).

EX-1004, 6:42-47.

a radio equipment (RE) node in a radio base station that transceives information over the radio interface using multiple antenna-carriers.

EX-1004, 2:39-41, ~~6:42-47~~; EX-1003 ~~¶130~~.

Claim 11

The method of claim 8, wherein transmitting further comprises: transmitting the fourth RF signal to a mobile device.

129. Aarflot discloses wireless communication with a user

[mobile device].

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The user equipment units 35 (UEs) can be **mobile stations** such as mobile telephones ("cellular" telephones) and laptops with mobile termination, and thus can be, for example, portable, pocket, hand-held, computer- included, or car-mounted **mobile devices** which communicate voice and/or data with radio access network. Alter natively, the wireless user equipment units can be fixed wireless devices, e.g., fixed cellular devices/terminals which are part of a wireless local loop or the like.

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EX-1004 1:35-43; see limitations [8.8], [8.11]; ~~EX-1003 ¶131.~~

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Claim 14

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The method of claim 8, wherein routing the first transport signal further comprises: routing the first transport signal through a third wireless communication station and then to the second remote wireless communication station.

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130. Aarflot discloses several network configurations of the distributed base stations. For example, FIG. 2D illustrates a daisy chain configuration in which "the internal interface within the radio base station which links the REC to one or more REs is referred to herein as the common public radio interface (CPRI)." ~~EX-1004~~EX-1004, 6:23-26; ~~EX-1003 ¶132.~~ Aarflot also discloses the network.

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A networked topology includes “at least one intervening RERE node.”. FIG. 5 shows examples of several defined terms useful 10 in describing features or aspects of a networked topology, where the simplest networked topology includes an REC coupled to at least two REs with at least one of the REs being connected between the REC and the other RE.

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EX-1004, 8:8-14; ~~EX 1003 ¶132.~~

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131. A POSA understood Aarflot’s teachings to include multiple REs including an intervening third RE (dark green) by which, as discussed regarding limitation [8.2], the first RE [*first remote wireless communication station*] forwards the frames [*first transport signal*] to the networking RE [*second remote wireless communication station*], with this intervening third RE shown below in annotated FIG. 2D.

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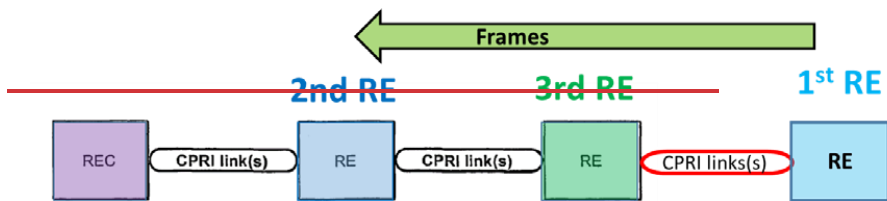


Fig. 2D

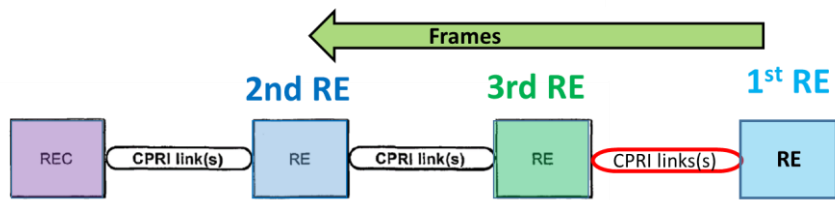


Fig. 2D

EX-1004, FIG. 2D; ~~EX 1003 ¶133.~~

Claim 15

[15.0] A method of transmitting a wireless communication signal comprising:

132. See [8.0] above.

[15.1] ___receiving a first RF signal at an antenna of a first remote wireless communication station;

133. Aarflot discloses networking RE (14a) (blue) [first remote wireless communication station] receives an uplink signal (green) [first RF signal] at its antenna. EX-1004, 6:42-47, 1:67-2:4; ~~EX 1003 ¶135.~~

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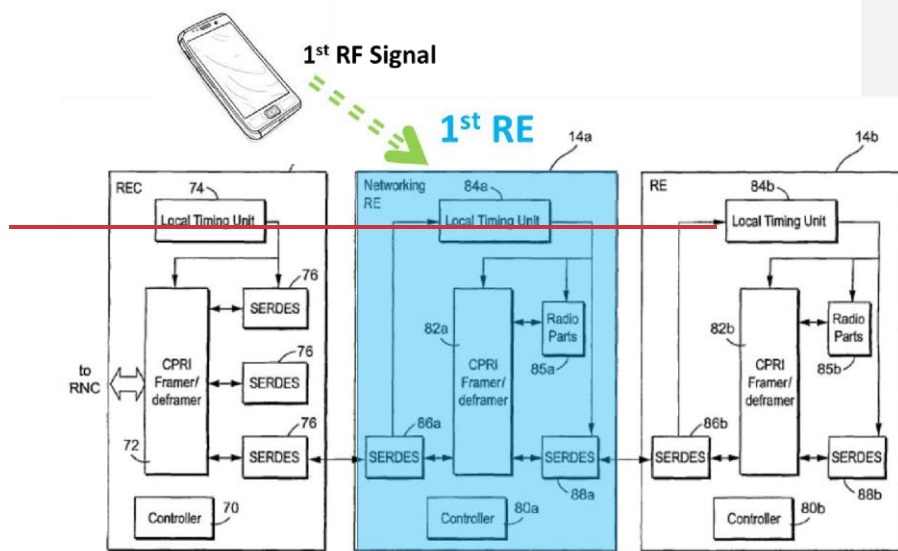


Fig. 8A

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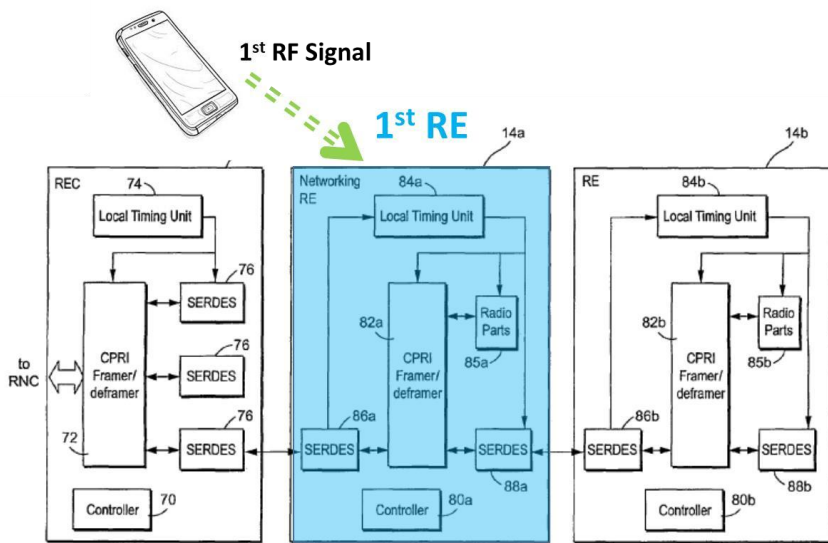


Fig. 8A

EX-1004, FIG. 8A; ~~EX 1003 ¶135.~~

**[15.2] _____ processing the first RF signal by a base station
at the first remote wireless communication station;**

134. _____ Aarflot discloses functionality within networking RE (14a),
and within the ~~collocated~~co-located REC, [base station] that processes the
uplink signal [first RF signal]. ~~EX1003 ¶136.~~

135. _____ Aarflot discloses networking RE (14a) serializes, ~~de-~~
~~serializes~~deserializes, de-frames and frames the uplink signal and REC
perform numerous additional functions (purple) upon the received frames

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including De-coding, De-interleaving, De-spreading; ~~Descrambling~~
scrambling etc.;

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TABLE 1-continued

Functions of REC		Functions of RE	
Downlink	Uplink	Downlink	Uplink
Channel Coding Interleaving	Channel De-coding De-Interleaving	ON/OFF control to each carrier Carrier Multi-plexing	Automatic Gain Control Carrier De-multiplexing
Spreading	De-spreading	Power amplification and limiting	Low Noise Amplification
Scrambling	De-scrambling	Antenna supervision	
Adding of physical channels	Signal distribution to signal processing units	RF filtering	RF filtering
Transmit Power Control of each physical channel	Transmit Power Control & Feedback Information detection	Measurements	
Frame and slot signal generation (including clock stabilization)			
Measurements			

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TABLE 1-continued

Functions of REC		Functions of RE	
Downlink	Uplink	Downlink	Uplink
Channel Coding Interleaving	Channel De-coding De-Interleaving	ON/OFF control to each carrier	Automatic Gain Control
Spreading	De-spreading	Carrier Multiplexing	Carrier De-multiplexing
Scrambling	De-scrambling	Power amplification and limiting	Low Noise Amplification
Adding of physical channels	Signal distribution to signal processing units	Antenna supervision	RF filtering
Transmit Power Control of each physical channel	Transmit Power Control & Feedback Information detection	RF filtering	Measurements
Frame and slot signal generation (including clock stabilization)			
Measurements			

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EX-1004, Table 1; ~~EX-1003 ¶137.~~

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136. As discussed in [1.5] and [8.4] above, Aarflot discloses functionality within networking RE (14a₇), and within the co-located REC, is that of a distributed base station (orange) and performs the functions of a base station. EX-1004, 1:61-66; ~~EX-1003 ¶138.~~

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TABLE 1

Functions of REC		Functions of RE	
Downlink	Uplink	Downlink	Uplink
Radio base station control & management		RRC Channel Filtering	
Iub transport		D/A conversion	A/D conversion
Iub Frame protocols		Up Conversion	Down Conversion

TABLE 1

Functions of REC		Functions of RE	
Downlink	Uplink	Downlink	Uplink
Radio base station control & management		RRC Channel Filtering	
Iub transport		D/A conversion	A/D conversion
Iub Frame protocols		Up Conversion	Down Conversion

EX-1004, Table 1; EX-1003 ¶137.

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1st RF Signal

REC

Networking RE

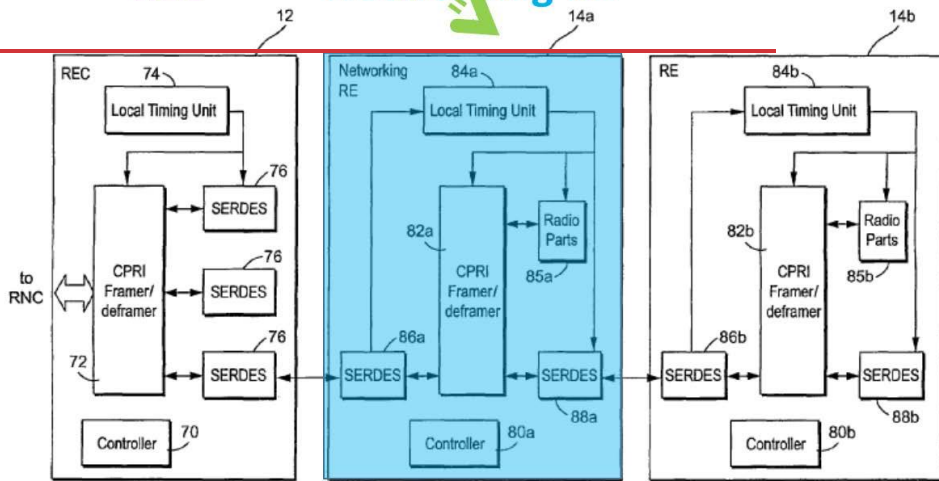


Fig. 8A

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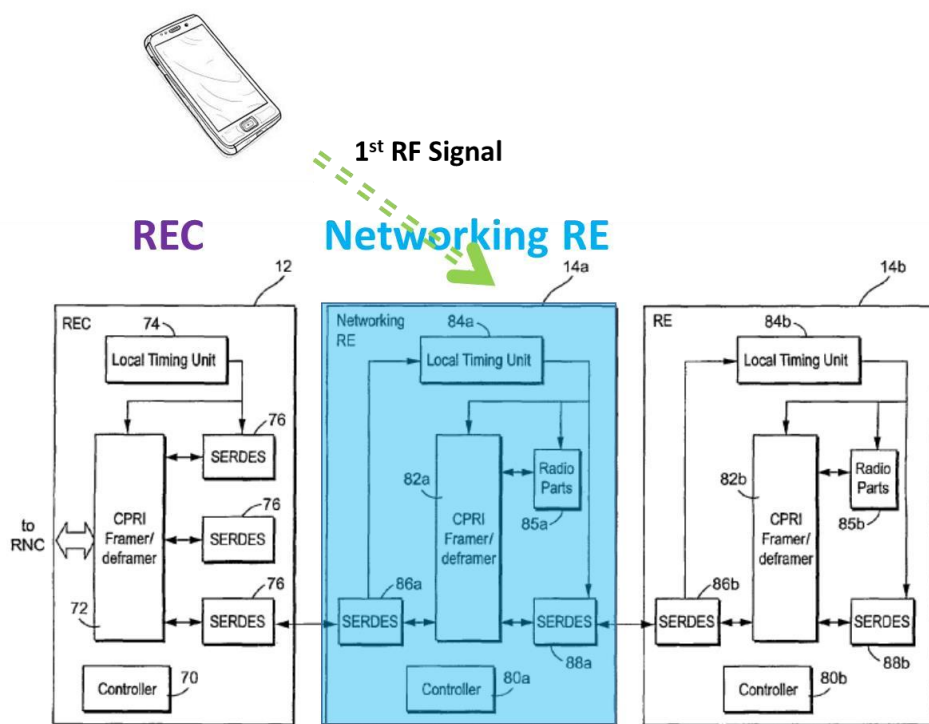


Fig. 8A

EX-1004, FIG. 8A; §V.A (discussing EX-1001 FIGS. 6-8); EX-1003 ¶138.).

[15.3] generating a second RF signal and a first transport signal representing a duplicate of the second RF signal at the first remote wireless communication station;

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137. Aarflot discloses generating a RF signal [*second RF signal*] from downlink signals received from the REC at the networking RE (14a). EX-1004, 6:42-47, 8:1-7; ~~EX-1003 ¶139~~.

138. Aarflot also discloses networking RE (14a) frames and serializes a signal representative of the second RF signal [*generates a first transport signal*]. ~~EX-1004~~ EX-1004, 10:44-50, 24:33-38; ~~EX-1003 ¶140~~; see limitations [1.8.i], [8.7], [8.9].

[15.4] transmitting the second RF signal from the antenna at the first remote wireless communication station;

139. Aarflot discloses each RE, including networking RE (14a), is configured to transmit an RF signal “from one or more antennas.” EX-1004, 1:67-2:11, 24:33-38; ~~EX-1003 ¶141~~.

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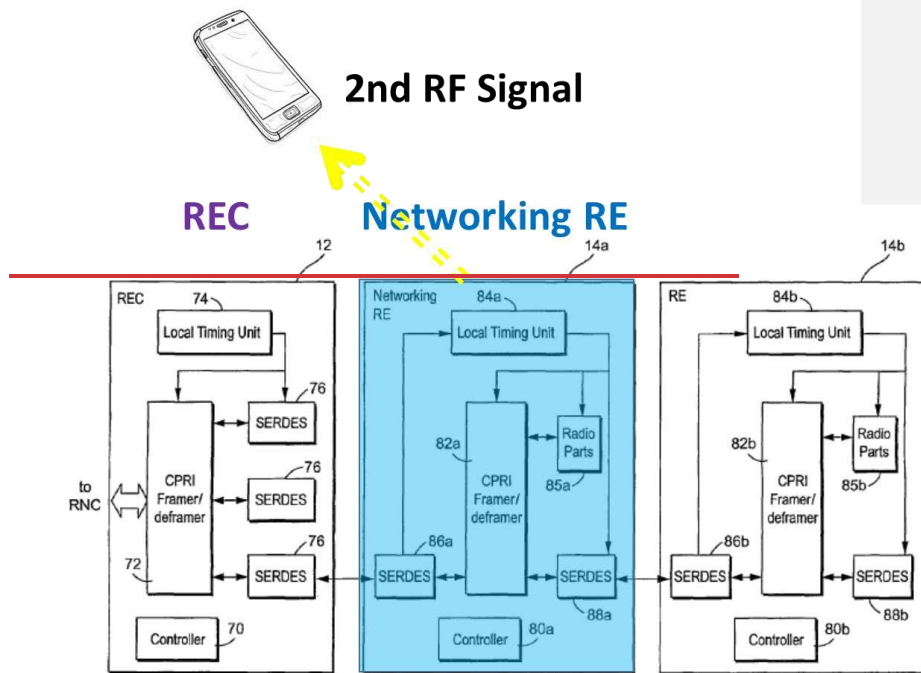


Fig. 8A

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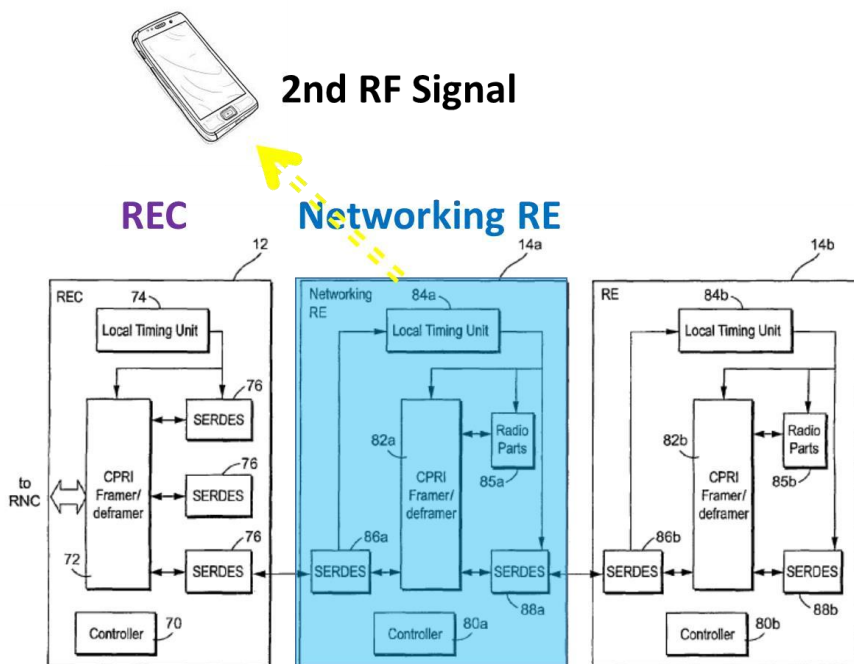


Fig. 8A

EX-1004, FIG. 8A; EX 1003 ¶141; see limitations [1.8.ii], [8.8].

[15.5] routing the first transport signal through a network of remote wireless communication stations to a second remote wireless communication station, each remote wireless communication station having a co-located, network layer router;

140. Aarflot discloses, via the processing circuitry/CPRI framer deframer (red) [network layer router] located in each RE (see limitation [1.5] above), routing frames including data corresponding to the received downlink RF signals [first transport signal] to RE 14b (dark

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blue) [*second remote wireless communication station*]. EX-1004,
24:33-38, 10:52-64; ~~EX 1003 ¶142~~.

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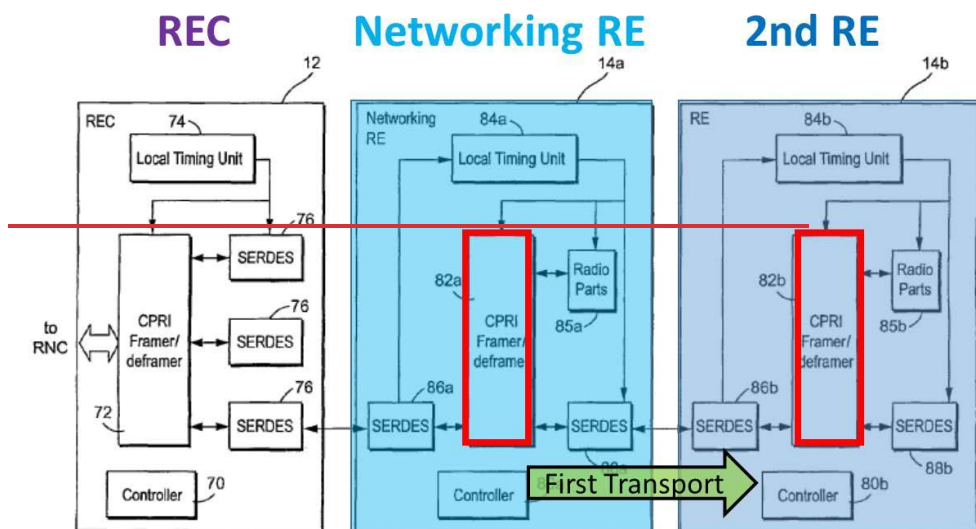


Fig. 8A

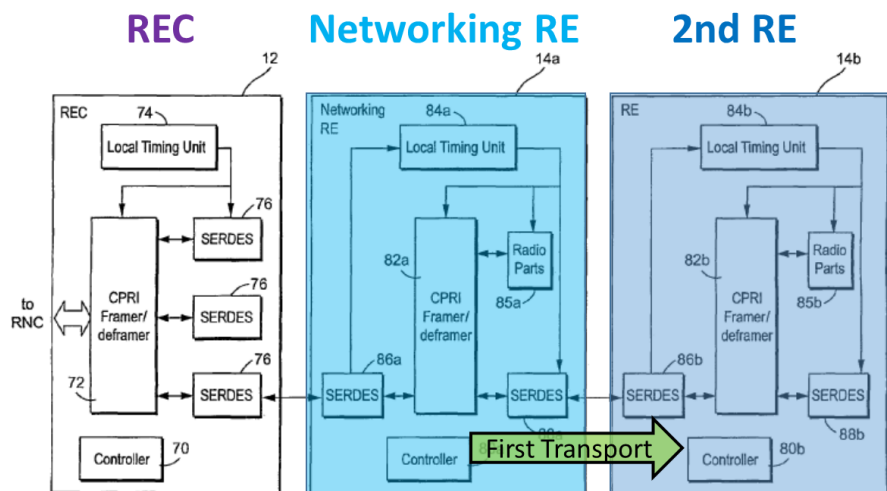


Fig. 8A

EX-1004, FIG. 8A; ~~EX-1003 ¶142~~; see limitations [1.8.iii], [8.10].

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[15.6] transmitting a duplicate of the second RF signal based on the first transport signal from the antenna of the second remote wireless communication station;

141. Aarflot discloses the second RE (14b) [second remote antenna unit] is configured to receive and transmit the RF signal represented in the frames received from the networking RE (14a) [a duplicate of the second RF signal based on the first transport signal] from its antenna. EX-1004, 1:67-2:11, 24:33-38; ~~EX 1003 ¶143.~~

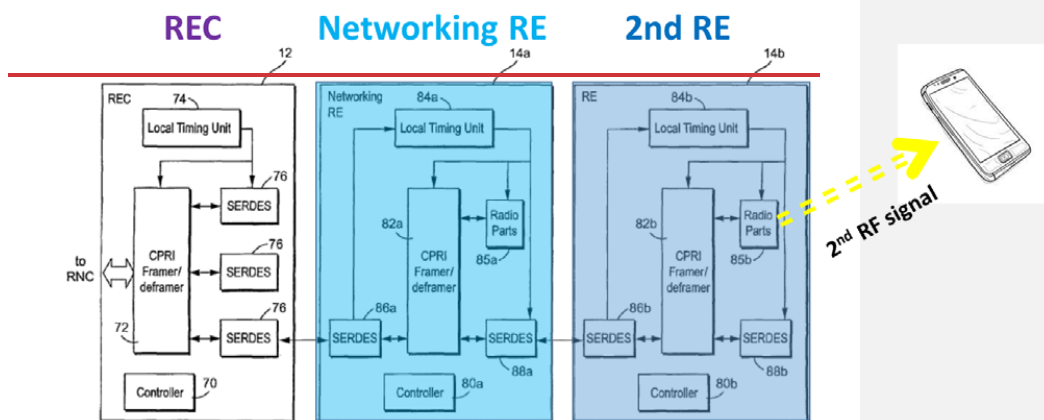


Fig. 8A

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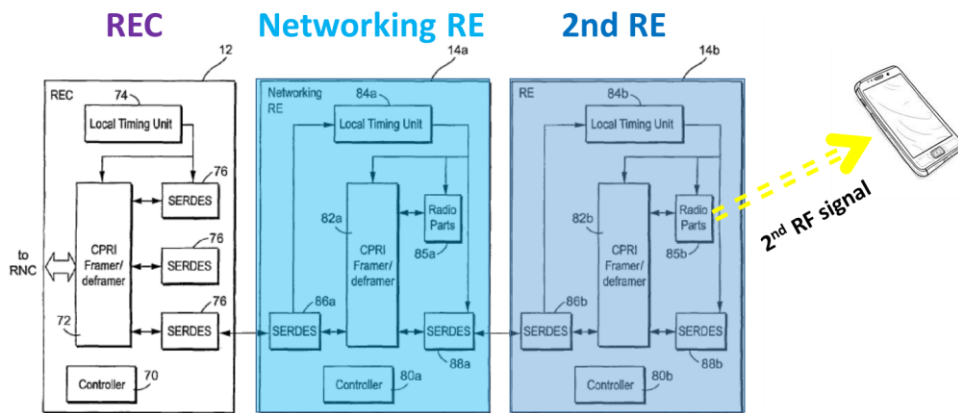


Fig. 8A

EX-1004, FIG. 8A; ~~EX-1003 ¶143~~; see limitations [1.9], [8.11].

142. To the extent that PO asserts that Aarflot does not explicitly disclose that the framed signal [second transport signal] represents a duplicate of the RF signal [second RF signal] transmitted from the networking RE [first wireless communication station], a POSA would be motivated to modify the teachings of Aarflot with Laroia's teaching of transmitting the same signal from multiple remote antenna units. ~~EX-1003 ¶144~~. Thus, it would have been obvious to a POSA to modify the method of Aarflot to send to, via the transport signal, and transmit at the second RE [second wireless communication station], a duplicate of the RF signal sent from the networking RE 14a [first wireless communication station], for the same reasons discussed regarding "fourth RF signal" and "duplicate of fourth RF signal" in limitations [1.8]-[1.9], and [8.7]-[8.11]. ~~EX-1003 ¶144~~.

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[15.7] _receiving a third RF signal at the first remote wireless communication station; and

143. Aarflot discloses networking ~~RE-14a~~RE14a (blue) [first remote wireless communication station] receives a second uplink signal (green) [third RF signal] from a user. EX-1004, 6:42-47; ~~EX-1003~~¶145.

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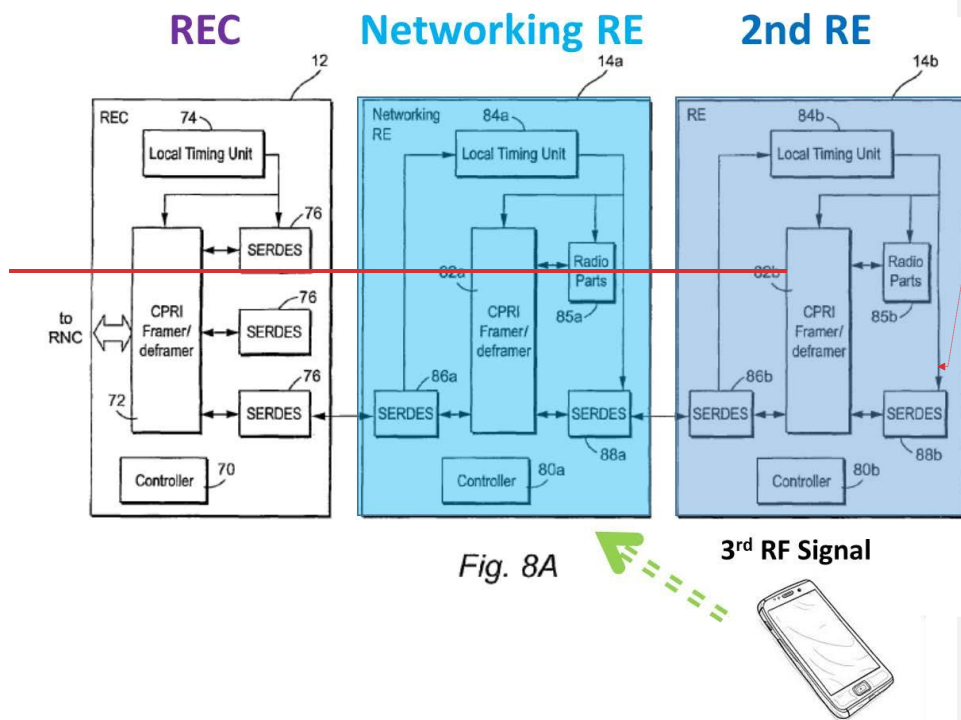
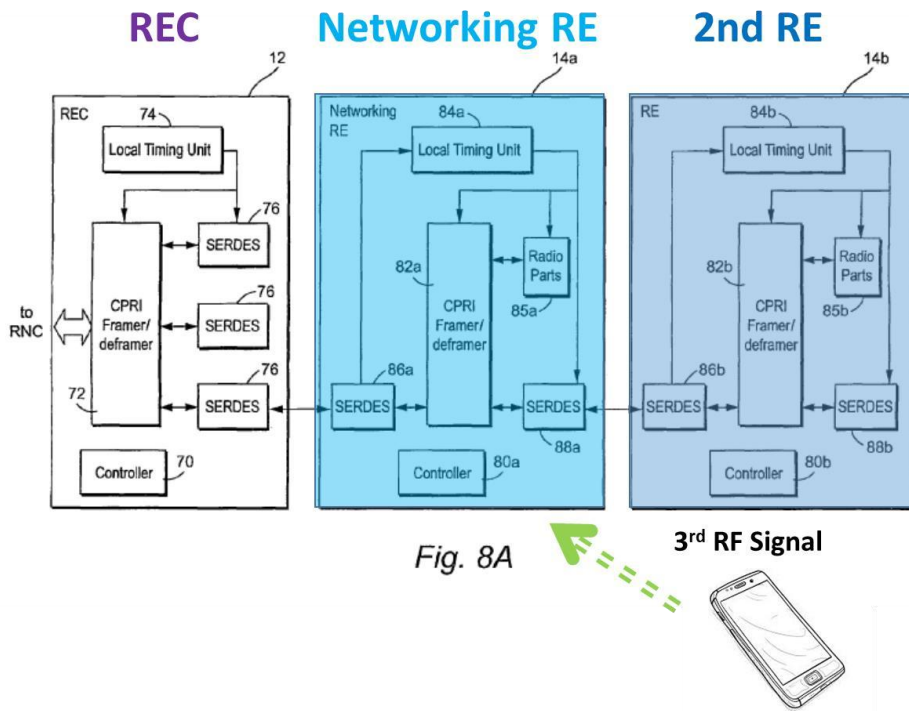


Fig. 8A

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EX-1004, FIG. 8A; EX-1003 ¶145.

[15.8] sending a second transport signal to a host unit based on the second RF signal.

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144. Aarflot discloses networking RE (14a) is configured to route frames [second transport signal] representing a copy of RF signals [based on the second RF signal] over a second communications link to the REC [host unit]. EX-1004, 4:8138-13, 10:44-50, 19:1-2, 24:33-38; EX-1003 ¶146.

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145. To the extent that PO asserts that Aarflot does not explicitly disclose the framed signal [*second transport signal*] sent to the REC [*host unit*] is based on the RF signal [*second RF signal*] transmitted from the networking RE [*first wireless communication station*], a POSA would be motivated to modify the teachings of Aarflot with Laroia's teaching of transmitting the same signal from multiple remote antenna units. ~~EX 1003 ¶147~~. Thus, it would have been obvious to a POSA to modify Aarflot's method to send, via the transport signal, a duplicate of the RF signal to the REC for transmission from another wireless communications unit/system connected to the REC for the same reasons discussed regarding "fourth RF signal" and "duplicate of fourth RF signal" in limitations [1.8]-[1.9], and [8.7]-[8.11]. ~~EX 1003 ¶147~~.

Claim 17

The method of claim 15, wherein transmitting further comprises: transmitting the second RF signal to a mobile device.

146. See Claim 11 above.

Claim 18

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The method of claim 15, wherein receiving the first RF signal receives the first RF signal via an antenna at the first remote wireless communication station.

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147. See Claim 10 above.

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Claim 19

[19.0] A remote wireless communication station for transmitting high speed wireless data comprising:

150. To the extent the preamble is limiting, Aarflot discloses a distributed radio base station [remote wireless communication station] for wireless data transmission. EX-1004, 1:24-29; ~~EX 1003 ¶150~~; limitation [1.0] above.

[19.1] a remote unit;

151. Aarflot discloses a Networking radio equipment node (RE) (14a) (blue) [remote unit]. EX-1004, Abstract; ~~EX 1003 ¶151~~.

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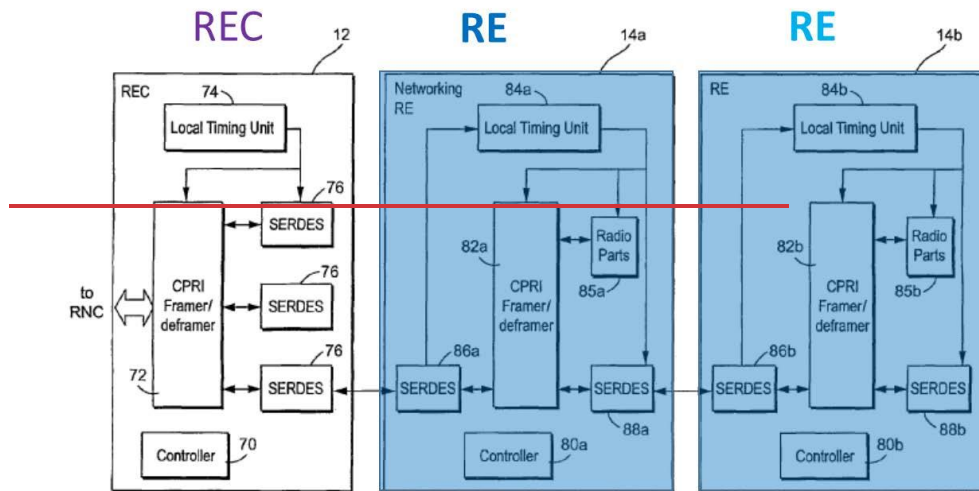


Fig. 8A

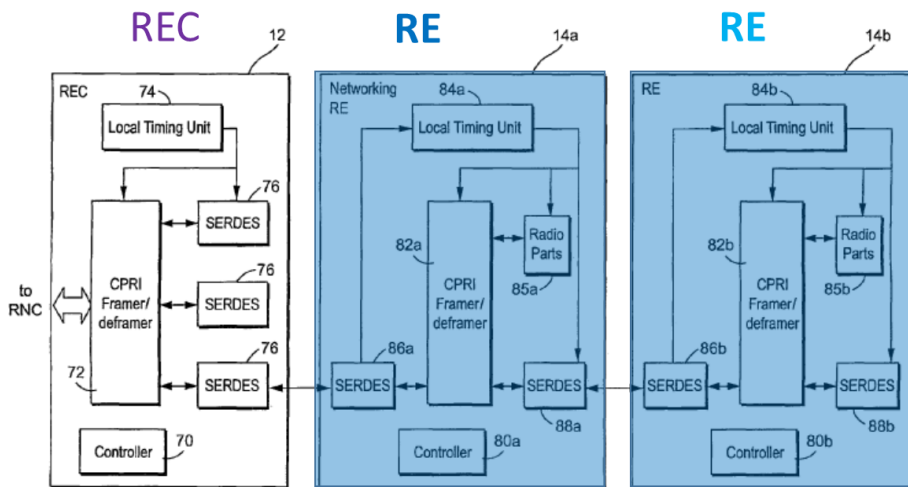


Fig. 8A

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EX-1004, FIG. 8A; EX 1003 ¶151.

[19.2] a router co-located with and coupled to the remote unit;

152. Aarflot discloses processing circuitry/CPRI Framer/deframer (red)
[router] operationally within [co-located and coupled to] each RE [remote unit].
EX-1004, 1:58-67, 23:58-62, 24:13-16, ~~24:33-38; EX 1003 ¶152; see limitation~~
~~[1.5].~~

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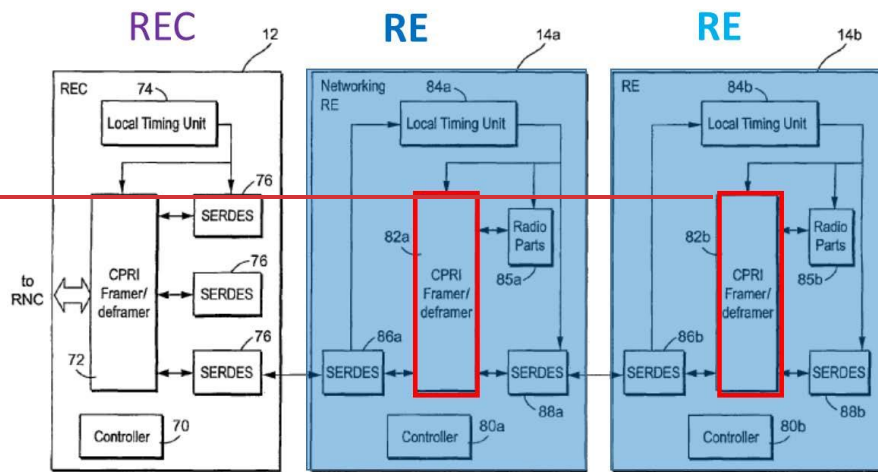


Fig. 8A

24:33-38; see limitation [1.5].

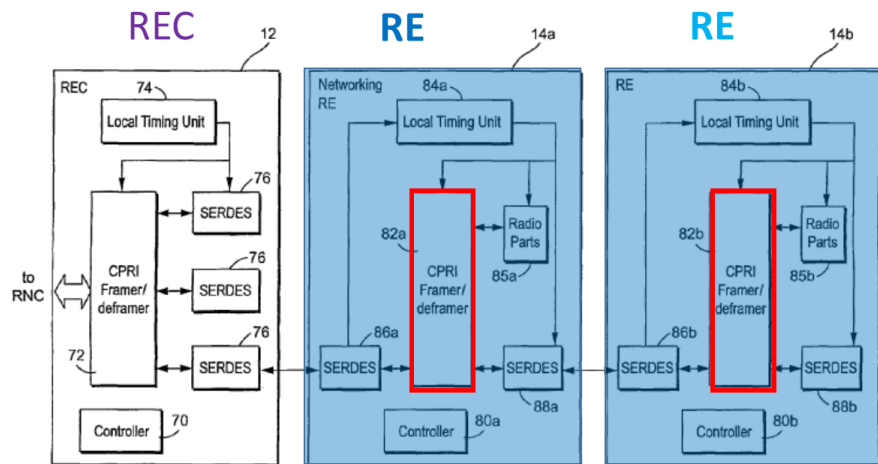


Fig. 8A

EX-1004, FIG. 8A; EX 1003 ¶152.

[19.3] a baseband unit co-located with and coupled to the remote unit; and

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Aarflot discloses a main baseband processing unit/Radio

Equipment Controller (REC) (**pink**) [baseband *unit*] coupled to networking RE (14a) [*remote unit*] and “both may be co-located” [*co-located*]. EX-1004, 1:58-67; ~~EX 1003~~

153. ¶153:

The radio equipment control (REC) performs baseband signal processing, and each radio equipment (**RE**) **converts between baseband and radio frequencies** and transmits and receives signals over one or more antennas.

EX-1004, 1:67-2:3(~~emphasis added~~); ~~EX 1003~~ ¶153.

[A] main baseband processing unit coupled to one or more remote radio units where RF processing occurs, and in particular, to the radio interface between the main baseband processing unit and the one or more remote radio units.

EX-1004, 1:25-29; ~~EX 1003~~ ¶153.

[T]he REC is concerned with the Iub transports, the radio base station control and management, and the digital baseband processing.

EX-1004, 6:51-53;

[A]n interface, apparatus, and method are described for communication between a radio control (REC) node and first and second radio equipment (RE) nodes in a radio base station.

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EX-~~1003~~ 153.

~~[A]n interface, apparatus, and method are described for communication between a radio control (REC) node and first and second radio equipment (RE) nodes in a radio base station.~~

~~EX 1004, 2:37-40; EX 1003 ¶153.~~

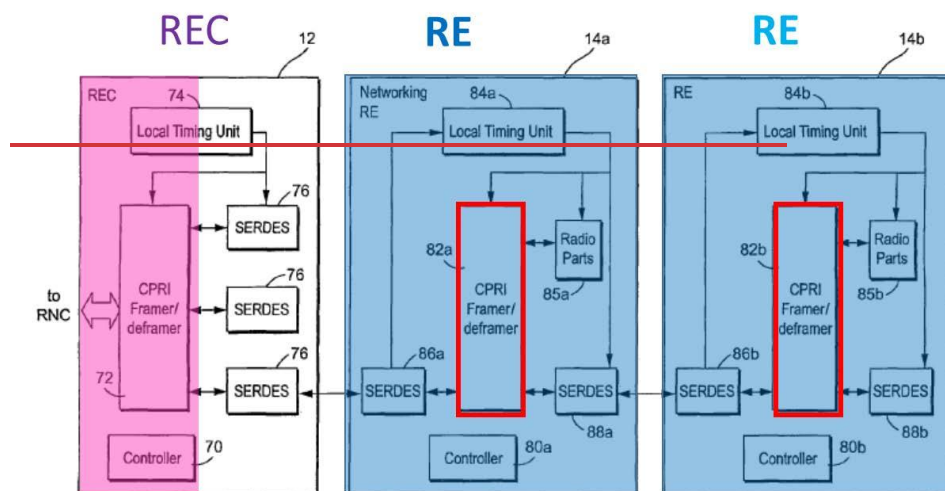


Fig. 8A

1004, 2:37-40.

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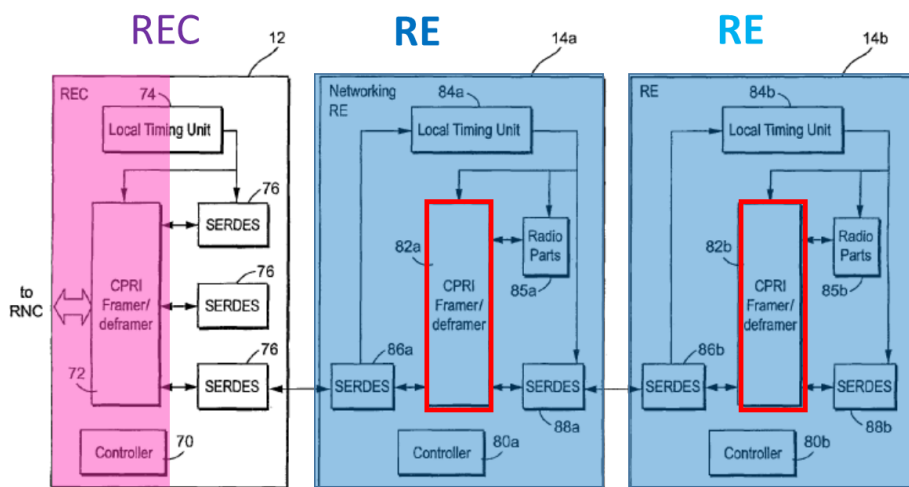


Fig. 8A

[19.4] an antenna coupled to the remote unit;

154. Aarflot discloses each RE [remote unit], has or is associated with [coupled to] an antenna (pink): EX-1004, 1:67-2:11, 6:43-464346, 10:23-35; EX-1003 ¶154,

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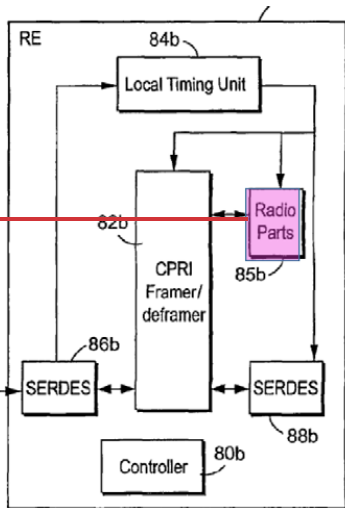


FIG. 8A

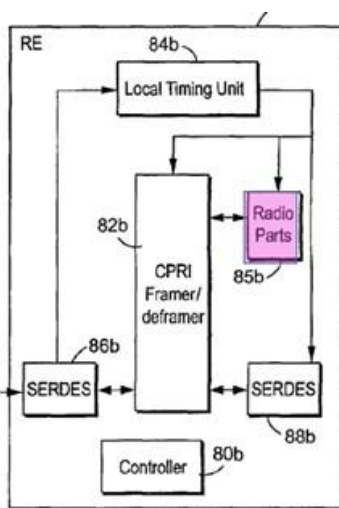


FIG. 8A

EX-1004, FIG. 8A; EX 1003 ¶154.

[19.5] wherein the remote unit is configured to send uplink RF sampled data to a host unit based on RF signals received, and is configured to route data corresponding to RF signals transmitted and/or received over a network of remote units of which the remote unit is a member;

155. Aarflot discloses networking RE (14a) [remote unit] sends uplink data [uplink RF sampled data] to the REC (purple) [host unit]⁶ which is the interface to, and in communication with, networking RE. The uplink data [RF

⁶ The host unit may also be or include the Radio Network Controller (RNC) of Aarflot which is coupled to the REC. EX-1001 6:41-43, FIGS. 6, 8A; EX 1003

¶155.

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sampl~~ed~~ data] is based upon uplink signals [*RF signals*] received at the RE from users. EX-1004, 2:37-40, 6:32-41, 7:24-27, 7:46-48, 8:1-7; ~~EX-1003 ¶155~~; *see* limitations [1.3], [1.4].

156. Aarflot discloses the processing circuitry/CPRI framer/deframer [*network layer routers*] of networking RE (14a) routes data corresponding to the uplink and downlink RF signals received or transmitted at the RE over the network formed by the REs, and of which networking RE is a member. EX-1004, 6:32-41, 24:33-38; ~~EX-1003 ¶156~~; *see* limitation [1.6].

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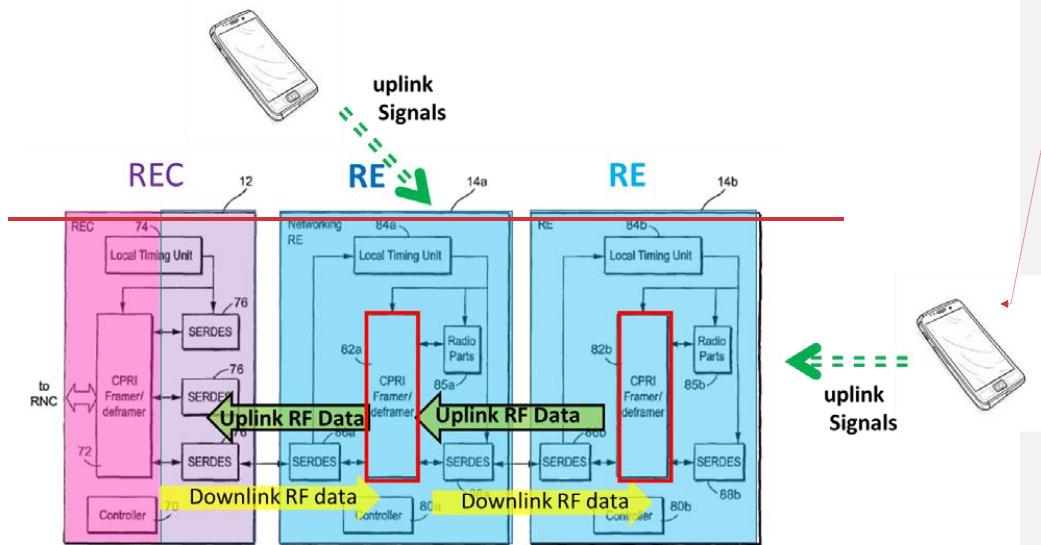


Fig. 8A

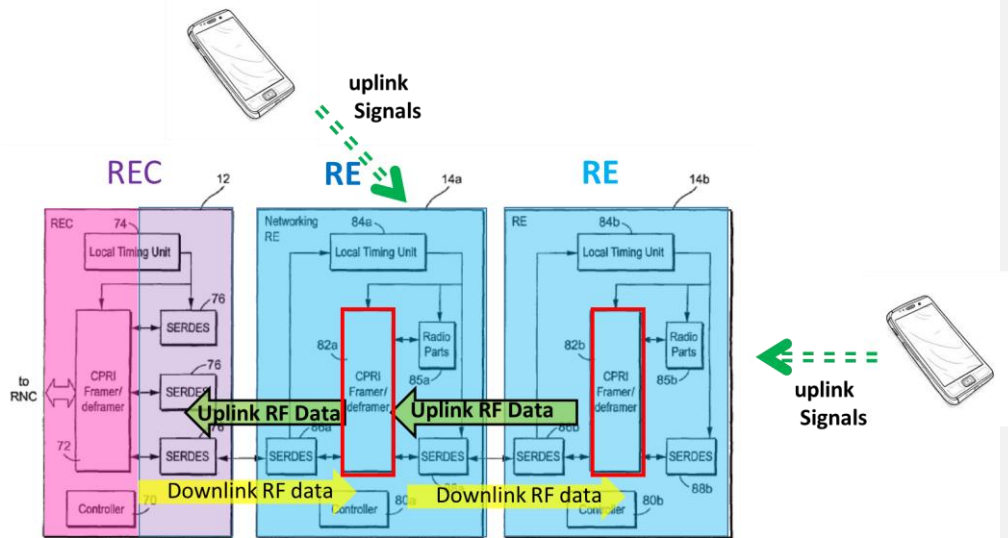


Fig. 8A

EX-1004, FIG. 8A; EX-1003 ¶156.

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[19.6] _____ wherein the baseband unit is configured to generate a first RF signal and a transport signal representing a duplicate of the first RF signal,

157. Aarflot discloses the main baseband processing unit functionality of the ~~co-located~~co-located REC [baseband unit] is configured to recover data flows received over the Iub interface from baseband [generate a first RF signal] and generate frames representative of the recovered data flows [transport signal representing a duplicate of the first RF signal]. EX-1004, 6:21-22, 6:42-44; ~~EX 1003 ¶157~~; see limitations [19.3], [1.8.i], [8.7], [8.9].

[19.7] _____ wherein the remote unit is configured to:

i. _____ process the first RF signal to be transmitted from the antenna coupled to the remote unit; and

158. Aarflot discloses processing of the received frames [first RF signal] at the networking RE (14a) [remote unit] for transmission from the networking RE's antenna.

first and second radio equipment (RE) nodes in a radio base station that transceives information over radio interface using multiple antenna carriers.

EX-1004, Abstract; ~~EX 1003 ¶158~~; see limitation [19.4].

159. Aarflot discloses the networking RE [remote unit] receives frames from the co-located REC and deframes/de-serializes and converts between

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baseband and radio frequencies [*process the first RF signal*] for transmission over its antenna. EX-1004, Abstract, 1:67-2:11, 10:29-35.

~~EX 1004, Abstract, 1:67-2:11, 10:29-35; EX 1003 ¶159.~~

ii. send the transport signal over the network to be routed to a second of the remote units, such that a duplicate of the first RF signal can be transmitted from the second of the remote units.

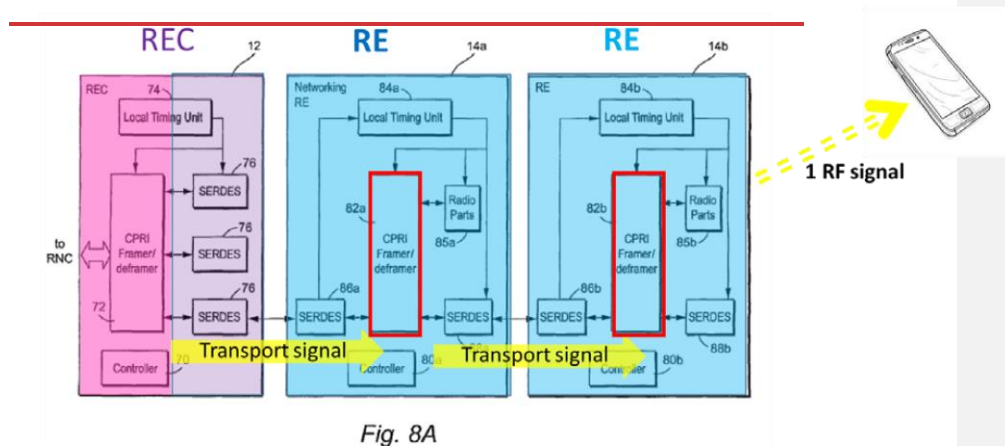
160. Aarflot discloses the networking RE (14a) [*remote unit*] is configured to route frames [*transport signal*] representing a copy of the RF signal over a second communications link [*through the network*] to a second RE (14b) [*a second of the remote units*]. EX-1004, 4:8-13, 10:44-50, 19:1-2, 24:33-38; ~~EX 1003 ¶160~~; see limitations [1.8.iii], [8.10], [8.11].

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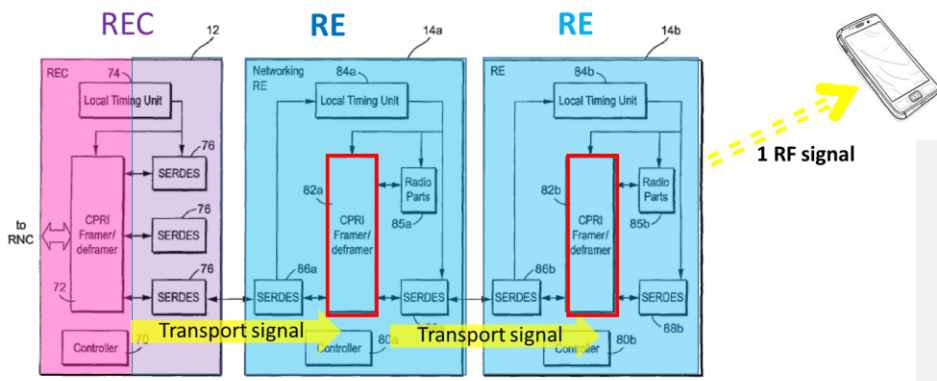


Fig. 8A

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EX-1004, FIG. 8A; EX 1003 ¶160.

161. To the extent that PO asserts that Aarflot does not explicitly disclose the framed signal [transport signal] represents a duplicate of the RF signal [first RF signal] processed to be transmitted from the networking RE's (14a) [first remote unit] antenna, and for transmission from the RE 14b [second remote unit], a POSA would be motivated to modify the teachings of Aarflot with Laroia's teaching of transmitting the same signal from multiple remote antenna units. EX 1003 ¶161. Thus, it would have been obvious to a POSA to modify the operation of Aarflot's system to send, via the transport signal, a duplicate of the RF signal processed for transmission from the networking RE (14a) [first remote unit], for the same reasons discussed regarding "fourth RF

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signal” and “duplicate of fourth RF signal” in limitations [1.8]-[1.9], and [8.7]-[8.11]. ~~EX 1003 ¶161.~~

~~VIII. Discretionary Denial Would be Inappropriate~~

~~A. — Discretionary Denial Under 35 U.S.C. §325(d) is Not Appropriate~~

~~Denial under §325(d) is not warranted because the challenges presented in this Petition are neither cumulative nor redundant to the prosecution of the '100 Patent. None of the asserted prior art references were cited or considered by the Examiner during the '100 Patent's prosecution. Further, the '100 Patent has not been previously challenged in an IPR.~~

~~B. — Discretionary Denial Under 35 U.S.C. §314(a) is Not Appropriate~~

~~Under *Fintiv*, the Board takes a holistic view of whether efficiency, fairness, and the merits support the exercise of authority to deny institution in view of an earlier trial date in the parallel proceeding. *Apple Inc. v. Fintiv, Inc.*, Case IPR2020-00019, Paper 11 at 6 (March 20, 2020).~~

~~Factor 1 is neutral because no request for stay has been filed.~~

~~Under factor 2, trial has been set for October 20, 2025. A Final Written Decision is expected in the present matter in June 2026. However, given the variability of trial schedules, this factor is neutral.~~

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Factor 3 favors institution. The co-pending litigation is in its early stages, and the investment in it has been minimal. Thus, this factor weighs against discretionary denial.

Factor 4 weighs against discretionary denial. Petitioners stipulate that if the IPR is instituted, it will not pursue the same grounds in the district court litigation. *Sand Revolution II LLC v. Continental Intermodal Group—Trucking LLC*, IPR2019-01393, Paper 24 at 7 (June 16, 2020) (informative). In addition, PO has only identified in the Complaint a subset of the claims that are being challenged in the present Petition.

Under factor 5, Petitioners are defendants in the Related Litigation and thus this factor is neutral.

Assessing *Fintiv* factors 1–5, the Board should find that discretionary denial is not supported. Nevertheless, should the Board reach the compelling merits question, the merits of the Petition are particularly strong.⁷

Under factor 6, other circumstances weigh in favor of institution. Here, the merits of the Petition are particularly strong and compelling. For example, Aarflot is a parallel disclosure to the '100 Patent both disclosing distributed base stations, with identical architecture and

⁷ *CommScope Techs. LLC v. Dali Wireless Inc.* IPR2022-01242, Paper 23 at 6 (February 27, 2023).

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~~concepts disclosed in the '100 Patent, thus demonstrating that the Petition is particularly strong in the underlying merits. The evidence presented, if un rebutted in trial, would plainly lead to a conclusion that one or more claims are unpatentable by a preponderance of the evidence.~~

~~When viewed holistically, the efficiency, fairness, and the merits support 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 parties in interest in this Petition are Ericsson Inc., Telefonaktiebolaget LM Ericsson, and Celco Partnership d/b/a Verizon Wireless. 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.~~

~~Additionally, out of an abundance of caution in light of prior challenges to the named real parties in interest in separate and unrelated IPR petitions, Verizon Wireless further identifies Verizon Communications Inc. and Verizon Corporate Resources Group LLC as real parties in interest for the IPR requested by this Petition, solely to the extent that Patent Owner contends that these separate legal entities should be named real parties in interest in the requested IPR, and Verizon Wireless does so to avoid the potential expenditure of resources to resolve such a challenge. Also, Verizon Wireless notes that Verizon Wireless has several hundred~~

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~~affiliated entities and each of these entities agrees to be estopped under the provisions of 35 U.S.C. §315 as a result of any final written decision in the requested IPR to the same extent that Verizon Wireless is estopped.~~

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~~Respectfully submitted,~~

~~DUANE MORRIS LLP~~

~~BY: /Patrick D.~~

~~McPherson/~~

~~Patrick D. McPherson~~

~~USPTO Reg. No. 46,255~~

~~Duane Morris LLP~~

~~901 New York Avenue N.W.,~~

~~Suite~~

~~700 East~~

~~Washington, D.C. 20001 Dated: December 31st, 2024~~

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CONCLUSION AND DECLARATION

My findings and opinions set forth in this Declaration are based on my work and examination to date. I may continue my examinations in view of additional documents or other factual evidence over the course of this proceeding that may necessitate supplementing and/or refining my opinions. I reserve the right to add to, alter, or delete my opinions and my Declaration upon discovery of additional information. I reserve the right to make such changes as necessary.

In signing this Declaration, I understand that the Declaration will be filed as evidence in a contested case before the Patent Trial and Appeal Board of the United States Patent and Trademark Office. I acknowledge that I may be subject to cross-examination in this case and that cross-examination will take place within the United States. If cross-examination is required of me, I will appear for cross examination within the United States during the time allotted for cross examination.

I declare that all statements made herein of my knowledge are true, and that all statements made on information and belief are believed to be true, and that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001, of Title 18 of the United States Code.

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[SIGNATURE ON FOLLOWING PAGE]

Date: 9/15/24

By:

Henry H. Houh.

Henry Houh Ph.D

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