

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

Nokia of America Corp., Ericsson Inc., AT&T Services, Inc., Cellco Partnership
d/b/a Verizon Wireless, T-Mobile, USA, Inc.,
Petitioners

v.

Wireless Alliance, LLC,
Patent Owner

Case No. IPR2024-00619
Patent. No. 10,045,383

**DECLARATION OF JOSEPH CAMP IN SUPPORT OF PETITION FOR
INTER PARTES REVIEW OF U.S. PATENT 10,045,383**

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I, Joseph Camp, declare as follows:

I. INTRODUCTION

1. I have been retained by Nokia of America Corporation, Ericsson Inc., AT&T Services, Inc., Cellco Partnership d/b/a Verizon Wireless, and T-Mobile USA, Inc., (“Petitioners”) as an independent expert consultant in this proceeding before the United States Patent and Trademark Office (“PTO”) against Wireless Alliance, LLC. (“Patent Owner”) regarding U.S. Patent No. 10,045,383 (“’383 patent”) (Ex. 1001).¹ I have been asked to submit this Declaration on behalf of Petitioners.

2. I have been asked to consider whether certain references disclose or render obvious features recited in claims 1-8 (“the challenged claims”) of the ’383 patent.

3. My opinions are set forth below. Based on my experience and expertise, it is my opinion that the prior art discloses and/or renders obvious all limitations of the challenged claims, as I discuss in detail below.

4. I am being compensated at a rate of \$750 per hour for my work in this proceeding. My compensation is in no way contingent on the nature of my findings,

¹ Where appropriate, I refer to exhibits that I understand are to be attached to the petition for Inter Partes Review of the ’383 patent.

the presentation of my findings in testimony, or the outcome of this or any other proceeding. I have no other interest in this proceeding.

5. All of my opinions stated in this Declaration are based on my own personal knowledge and professional judgment. I am over 18 years of age and, if I am called upon to do so, I would be competent to testify as to the matters set for the in this Declaration.

II. BACKGROUND AND QUALIFICATIONS

6. My background and expertise that qualify me as an expert are described in detail in my Curriculum Vitae attached as Ex. 1006, which further includes an accurate list of all publications authored by me in the previous 10 years and a list of all cases in which I testified as an expert at trial or by deposition during the previous 4 years. Below I have summarized those qualifications, as well as any other background and expertise relevant to the technical issues in this matter:

7. My educational background includes a B.S. with honors in Electrical and Computer Engineering (ECE) from UT-Austin in 2003, an M.S. in ECE from Rice University in 2006, and a Ph.D. in ECE from Rice University in 2009. My master's thesis focused on a novel multi-tier architecture for deploying a mesh network in which multiple frequency bands were aggregated to provide Internet access to over 4000 users in an underserved community in Houston. My Ph.D. dissertation focused on addressing observed performance problems in the deployed

mesh network based on stretching the existing wireless standards to serve a large area in a multihop/mesh topology with multiple frequency bands. The main performance issues identified pertained to HARQ-type signaling that reduced the effective throughput of in-field wireless links. For my Ph.D. dissertation, I was honored to receive the Ralph Budd Award for Best Engineering Thesis at Rice University.

8. In the summer of 2009, I was hired as an Assistant Professor at SMU in the Electrical and Computer Engineering Department. I received the NSF Faculty Early Career Development Program (CAREER) award in 2012. In 2014, I was additionally honored to receive the Golden Mustang Teaching Award, which is given to one pre-tenured faculty per year. In 2016, I received tenure and promotion to Associate Professor. In 2021, I received promotion to Professor and the Gerald J. Ford Research Fellowship, and was promoted to ECE Department Chair, *ad interim*, in November of 2022, where I still serve in that capacity.

9. Over my career, I have published over 80 peer reviewed conference and journal papers, most of which are affiliated with IEEE, and received over \$6M in federally funded grants.

III. MATERIALS REVIEWED

10. The opinions contained in the Declaration are based on the documents I reviewed, my professional judgment, as well as my education, experience, and knowledge.

11. In forming my opinions expressed in this Declaration, I also reviewed the following materials and information:

Exhibit No.	Description
1001	U.S. Patent No. 10,045,383 to Lee et al.
1002	Prosecution History of U.S. Patent No. 10,045,383
1003	U.S. Patent Application Publication No. 2011/0223900 to Yu et al.
1004	U.S. Patent Application Publication No. 2013/0089034 to Acharya et al.
1006	<i>Curriculum Vita</i> of Dr. Joseph Camp
1007	Amended Ex. E to Wireless Alliance's Preliminary Infringement Contentions (AT&T)
1008	Damnjanovic et al., <i>A Survey of 3GPP Heterogeneous Networks</i> , IEEE Wireless Communications (June 2011)
1009	3GPP TS 36.214 version 9.1.0 Release 9 (2010-04)
1010	Ye, Q. et al., <i>User Association for Load Balancing in Heterogeneous Cellular Networks</i> , arXiv e-prints (2012)
1011	Oh, J., et al., <i>Cell Selection for Range Expansion with Almost Blank Subframe in Heterogeneous Networks</i> , IEEE International Symposium on Personal, Outdoor and Mobile Radio Communication (2012)
1012	Docket Control Order in <i>Wireless Alliance, LLC v. AT&T Mobility LLC, et al.</i> No. 2:23-cv-00095-RWS-RSP (E.D. Tex.) (Dkt. No. 29)
1013	Katherine K. Vidal, <i>Interim Procedure for Discretionary Denials in AIA Post-Grant Proceedings with Parallel District Court Litigation</i> (June 21, 2022)

12. I also reviewed any other materials I refer to in this Declaration in support of my opinions.

13. My opinions in this Declaration are based on the documents I reviewed and my knowledge and professional judgment. My opinions have also been guided by my appreciation of how a person of ordinary skill in the art would have understood the state of the art, the prior art, and the claims and the specification of the '383 patent at the time of the alleged invention.

IV. LEGAL STANDARDS

14. Petitioners' attorneys have explained to me the legal standards that apply in this case. My understanding of those standards is described below. I am not an attorney, and I do not have formal training in the law regarding patents. I have used my understanding of the following legal principles set forth in this section in reaching my opinions.

15. I understand that, in this proceeding, Petitioners have the burden of proving that the challenged claims are invalid by a preponderance of the evidence.

A. Obviousness

16. I have been informed that a claim is invalid as obvious under 35 U.S.C. § 103 (post-AIA) if the differences between the claimed subject matter and the prior art are such that the subject matter as a whole would have been obvious at the effective filing date to a person of ordinary skill in the art. I have been informed that

the following matters are relevant to determining whether the claimed invention would have been obvious: (1) the scope and content of the prior art, (2) the difference or differences between the patent claim and the prior art, (3) the level of ordinary skill in the art at the time the invention of the patent, and (4) any secondary considerations or objective indicia of non-obviousness.

17. I have been informed that the combination of familiar elements according to known methods is likely to be obvious when it does no more than yield predictable results. When a claim simply arranges prior art elements with each performing the same function it had been known to perform and yields no more than one would expect from such an arrangement, then such a combination is obvious. When a patent claims a structure already known in the prior art altered by the mere substitution of one element for another known in the field, the combination is likely to be obvious unless the combination yields an unpredictable result.

18. I have been informed that when a work is available in one field of endeavor, design incentives and other market forces can prompt variations of it, either in the same field or a different one. If a person of ordinary skill in the art can implement a predictable variation, such a variation is likely unpatentable. For the same reason, if a technique has been used to improve one device, and one of ordinary skill in the art would recognize that it would improve similar devices in the same way, using the technique is obvious unless its actual application is beyond his or her

skill. One question to consider is whether the improvement is more than predictably using prior art elements according to their established functions.

19. I have been informed that it may often be necessary, in a validity analysis, to consider whether there was an apparent reason to combine the known elements in the fashion claimed by the patent at issue. This can be accomplished by looking to interrelated teachings of multiple patents or other publications or pieces of prior art; the effects of demands known to the design community or present in the marketplace; and the background knowledge possessed by one of ordinary skill in the art.

20. I have been informed that a validity analysis need not seek out precise teachings directed to the specific subject matter of the challenged claim; it is appropriate to take account of the inferences and creative steps that a person of ordinary skill in the art would employ. I have been informed that a person of ordinary skill in the art is a person of ordinary creativity, not an automaton.

21. I have been informed that a claim composed of several elements is not proved obvious merely by demonstrating that each element was, independently, known in the prior art. I have been informed that it can be important to identify a reason that would have prompted a person of ordinary skill in the art in the relevant field to combine the elements in the way the claimed new invention does. I am told that one way that subject matter can be proved obvious is by noting there existed at

the time of the invention a known problem for which there was an obvious solution encompassed by the patent's claims. I have been informed that any need or problem known in the field of endeavor at the time of the claimed invention and addressed by the patent can provide a reason for combining the elements in the manner claimed.

22. I have been informed that one should not assume that a person of ordinary skill in the art attempting to solve a problem will be led only to those elements of prior art designed to solve the same problem. Instead, I have been informed that since familiar items may have obvious uses beyond their primary purposes, in many cases a person of ordinary skill in the art will be able to fit the teachings of multiple prior art references together like pieces of a puzzle.

23. I have been informed that, when there is a design need or market pressure to solve a problem and there are a finite number of identified, predictable solutions, persons of ordinary skill in the art have good reason to pursue the known options within their technical grasp. If this leads to the anticipated success, the product was likely not accomplished by innovation but by using ordinary skill and common sense. I have been informed that, in such an instance, the fact that the combination was obvious to try may show that the combination was obvious.

24. I have been informed that, when determining whether a claimed combination would have been obvious, the correct analysis is not whether a person of ordinary skill in the art, writing on a blank slate, would have chosen the particular

combination of elements described in the claim. Instead, I have been informed that the correct analysis considers whether one of ordinary skill, facing the wide range of needs created by developments in the field of endeavor, would have seen a benefit to selecting the combination claimed.

25. I have been informed that, when determining whether a claimed invention is obvious, any “secondary considerations” of non-obviousness identified by the patentee should also be considered. These secondary considerations can include:

- commercial success of the invention, causally related to the invention itself rather than to companion factors, such as advertising or attractive packaging;
- the invention taught away from the technical direction followed by those skilled in the art;
- a long-felt but unsatisfied need for the invention while the needed implementing arts and elements had long been available;
- the invention achieves results unexpected to those skilled in the art;
- copying of the invention by competitors as distinguished from their independent development
- unsuccessful attempts by those skilled in the art to make the invention;

- acquiescence by the industry to the patent's validity by honoring the patent through taking licenses or not infringing the patent, or both; and
- skepticism, disbelief in or incredulity by those skilled in the art that the patentee's approach worked.

26. I have been informed that, for the above information to impact the obviousness of a patent claim, there must be a nexus between the alleged secondary considerations and the claims. In addition, I have been informed that the burden of introducing evidence of secondary considerations generally is on the Patent Owner. If the Patent Owner or its expert should assert secondary considerations of non-obviousness, I reserve the right to provide a Declaration addressing assertions of non-obviousness due to secondary considerations.

B. Claim Construction

27. I have been informed that claim terms are typically given their plain and ordinary meanings, as would have been understood by a person of ordinary skill in the art at the time of the earliest alleged priority date. I have further been informed that when considering the meaning of the claims, one must consider the language of the claims, the specification, and the prosecution history of record.

28. I have been informed that in general, a preamble limits the invention if it recites essential structure or steps, or if it is necessary to give life, meaning, and

vitality to the claim. I have further been informed that a preamble is not limiting where a patentee defines a structurally complete invention in the claim body and uses the preamble only to state a purpose or intended use for the invention. I have further been informed that dependence on a particular disputed preamble phrase for antecedent basis may limit claim scope because it indicates a reliance on both the preamble and claim body to define the claimed invention. I have further been informed that clear reliance on the preamble during prosecution to distinguish the claimed invention from the prior art transforms the preamble into a claim limitation because such reliance indicates use of the preamble to define, in part, the claimed invention.

V. PERSON OF ORDINARY SKILL IN THE ART AND THE TIME OF THE ALLEGED INVENTION

29. I have been asked to assume that the '383 patent is entitled to its earliest alleged priority date of March 28, 2013. *See* Ex. 1001. Based on my knowledge and experience, I was a person of ordinary skill in the art as of this priority date and can provide opinions regarding the knowledge of a person of ordinary skill in the art as of that time. My opinions herein are, where appropriate, based on my understandings as to a person of ordinary skill in the art at that time.

30. Based on the materials and information I have reviewed and based on my experience in the technical areas relevant to the '383 patent, a person of ordinary skill in the art at the time of the alleged invention of the '383 patent would have had

had at least a bachelor's degree in electrical engineering, computer engineering, computer science, physics, or the equivalent, and at least two years of experience working in the field. Relevant working experience would include experience with cellular telecommunications and networking, radio-access networking architectures, protocols, and signal propagation in wireless networks. More education can supplement practical experience and vice versa. Based on my knowledge and experience, including as discussed above in Section II, I was a person of ordinary skill in the art at the time of the alleged invention of the '383 patent and can provide opinions regarding the knowledge of a person of ordinary skill in the art as of that time. My opinions herein are, where appropriate, based on my understanding as to a person of ordinary skill in the art at that time. I myself had these capabilities at the time of the alleged invention of the '383 patent.

VI. TECHNICAL BACKGROUND

31. Below, I present a brief overview of certain technical concepts and features that would have been known to a person of ordinary skill in the art prior to and at the time of the earliest alleged priority date of the '383 patent. The technical concepts and features that I describe in this Technical Background section reflect the state of the art that a person of ordinary skill in the art would have had knowledge of and would have understood prior to and at the time of the '383 patent. I rely on, and incorporate as applicable (even if not expressly mentioned below in Section IX),

the following disclosures to support my opinions in this Declaration, including those opinions relating to how the prior art discloses and/or suggests the challenged claims of the '383 patent and how (and why) a person of ordinary skill in the art would have been motivated to consider and combine the disclosures and suggestions from one or more prior art references.

A. Heterogeneous 3GPP Networks

32. Prior to the filing date of the '383 patent, heterogeneous networks were well-known and deployed by cellular network operators. Heterogeneous networks comprised nodes with different levels of transmission power, such as a deployment of high-power nodes such as macro base stations with lower-power nodes, such as relays, pico-cells, femto-cells. Ex. 1008 at 1. Network operators using heterogeneous networks could mitigate and fill coverage holes in macro-cells by deploying lower-power nodes and thereby improve the capacity of the network, Ex. 1008 at 19-20. An exemplary heterogeneous network configuration is shown in the figure below, which shows a deployment including a relay node, two HeNBs, a pico node and a macro node.

Ex.1008, Figure 1

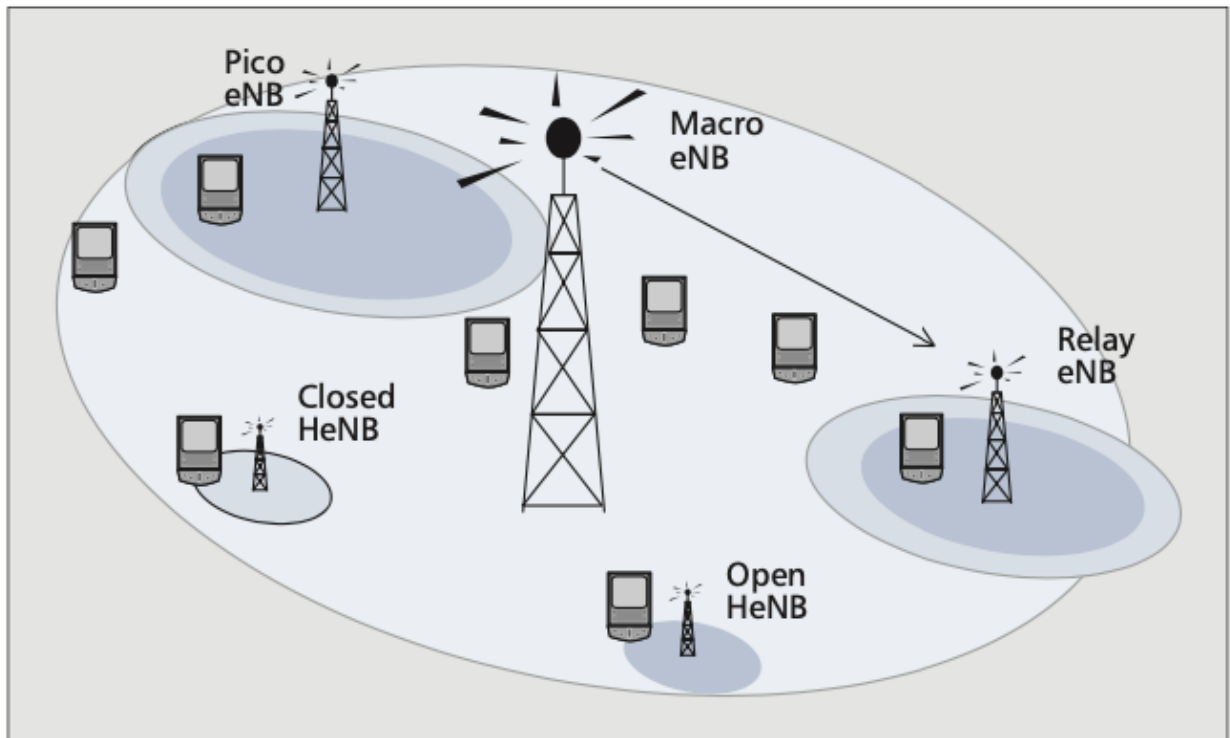


Figure 1. *Heterogeneous network topology utilizing a mix of high-power (macro) and low-power base stations.*

33. At the time, it was known that the difference between the transmit power levels of base stations deployed in heterogeneous networks, such as macro and pico nodes, could cause network performance problems. Ex. 1008 at 1. For example, it was a known problem that using low-power nodes in a macro network could lead to imbalance between uplink and downlink coverage. Ex. 1008 at 11. Uplink interference problems were known because of the larger transmit power of the macro base station, where the coverage boundary is shifted to be closer to the

low-power node, which creates uplink interference problems because the UEs served by macro base stations create interference to the low-power nodes. It was known prior to the '383 patent that these geographic changes in traffic result in under-utilization of the low-power nodes. However, a solution to this known problem in heterogeneous networks was also deployed prior to the filing date of the '383 patent. At a high level, it was known that coordination of data and control transmissions among heterogeneous base stations deployed in a heterogeneous network was a solution to these load balancing and interference problems. Ex. 1008 at 17.

34. Other solutions to the load balancing and interference problem existed prior to the '383 patent. For example, biasing approaches were a known means of actively pushing mobile users onto more lightly loaded lower power nodes, even if they offer lower instantaneous channel quality (based on signal-to-interference-plus-noise ratio (SINR)) than the macrocell base station. Ex. 1010 at 1. Examples of these biasing approaches known prior to the '383 patent included multiplying the SINR of the low power node by a bias factor greater than or equal to 1, which makes the low power node appear more attractive for connection with the UE than the more heavily-loaded macrocell. Ex. 1010 at 1. Other biasing factor algorithms were also known prior to the '383 patent as a load balancing solution. Ex. 1010 at 1; Ex. 1004, ¶[0027].

B. Cell-Specific Measurements in LTE

35. In LTE and prior cellular systems, there were well-known UE measurements prior to the '383 patent that are used to provide the UE with a reference or pilot signal referred to as a common reference signal (CRS) so that the UE can obtain channel quality information about the base stations with which they may interact. Ex. 1008 at 13. One such measurement is reference signal received power (RSRP), which is a well-known UE measurement in LTE and LTE-Advanced (LTE-A) that measured the linear average of the downlink cell-specific reference signals across the channel bandwidth. Ex. 1009 at § 5.1.1. The RSRP can be used by the UE to compare two cells because RSRP provides the UE with information about the signal power from different base stations in a network, and the relative RSRP is used in multi-cell scenarios, such as mobility. Ex. 1008 at 13

36. Mobility procedures in the heterogeneous networks I described above, such as cell selection, are based on RSRP. In particular, prior to the '383 patent, it was well-known that a UE could determine the best cell to be used to establish a connection. As a result, the UE could select a cell based on the RSRP that is calculated from measurements performed on the cell-specific reference signals. Ex. 1012 at 654.

VII. THE '383 PATENT

A. Description of the '383 patent's Specification

37. The '383 patent describes a technique for establishing separate connections for uplink and downlink communications between a terminal, or a user equipment, in a wireless network. Ex. 1001, 1:22-25. This technique is applicable to various cellular networks defined by technical standards, such as wideband code division multiple access (WCDMA), 3GPP LTE, and LTE-A. Ex. 1001, 12:10-15. In a heterogeneous cellular network, the '383 patent describes that different types of base stations, such as macrocell base stations and femtocell base stations, have varying transmission power levels. As a result, different base stations will have different coverage areas. Ex. 1001, 1:29-41. The '383 patent describes that the variance in transmission power and coverage area could result in load balancing issues caused by a greater number of UEs connecting to a base station with relatively higher transmission power. Ex. 1001, 1:44-49.

38. Further, the '383 patent explains that differences in transmission power and coverage area also influences when a UE performs cell association with a base station. Ex. 1001, 1:50-52, 1:55-58. A problem described in the '383 patent is that, due to the typical cell association between a UE and a base station based on downlink signal strength, the selected base station may not be the optimal base station in terms

of uplink signal strength, which can result in a loss in the SINR or imbalance between the SINR of the downlink and the SINR of the uplink. Ex. 1001, 1:55-62.

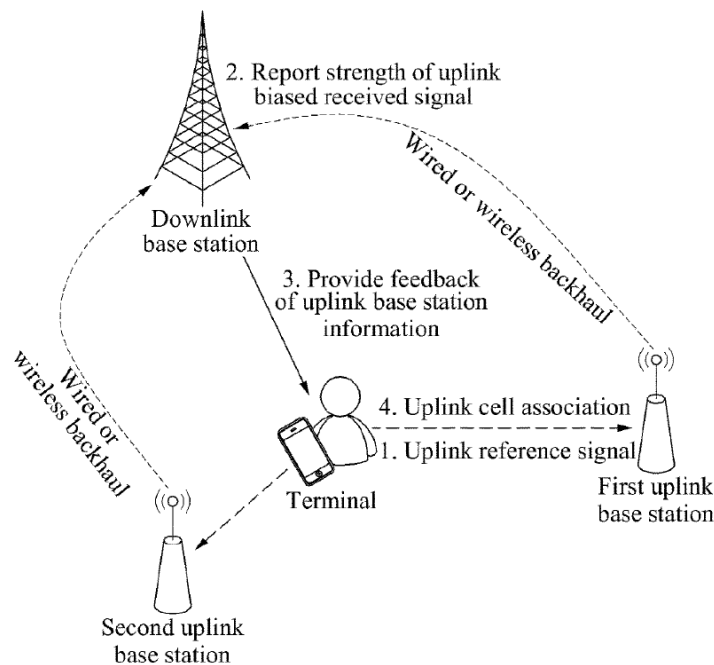
39. The '383 patent discloses a process for performing separate connections for a downlink and an uplink connection between a terminal and one or more base stations as a solution to these problems associated with differences in transmission power and coverage areas of heterogeneous base stations Ex. 1001, 2:3-5. In general, the '383 patent describes a process involving a terminal transmitting an uplink reference signal to a set of candidate uplink base stations, where each candidate base station provides feedback information on a measured strength for the uplink reference signal to a downlink base station that is associated with the terminal. Ex. 1001, 2:27-35. The process also involves the downlink base station collecting feedback information from the candidate uplink base stations across a wired or wireless backhaul and then, based on the feedback information, providing information to the terminal for establishing an uplink connection with one of the candidate uplink base stations. Ex. 1001, 1:38-43.

40. In Figure 3 of the '383 patent below, the process described in the '383 patent for establishing separate downlink and uplink connections is shown as an example. Ex. 1001, 5:48-50. In Figure 3, the terminal transmits an uplink reference signal to a set of uplink base station candidates shown as the “first uplink base station” and “second uplink base station.” Ex. 1001, 5:52-55, 5:58-62. The uplink

reference signal includes an identifier of a downlink base station that is associated with the terminal. Ex. 1001, 5:63-6:5. The candidate uplink base stations each measure the signal strength of the uplink reference signal and transmits the measured signal strength over a wired or wireless backhaul to the downlink base station that is associated with the terminal. Ex. 1001, 6:11-18. The signal strength information is collected by the downlink base station, which in turn provides the terminal with the information needed to establish an uplink connection with one of the candidate base stations based on the signal strength information collected from those base stations. Ex. 1001, 6:21-26.

Ex. 1001, Figure 3

FIG. 3



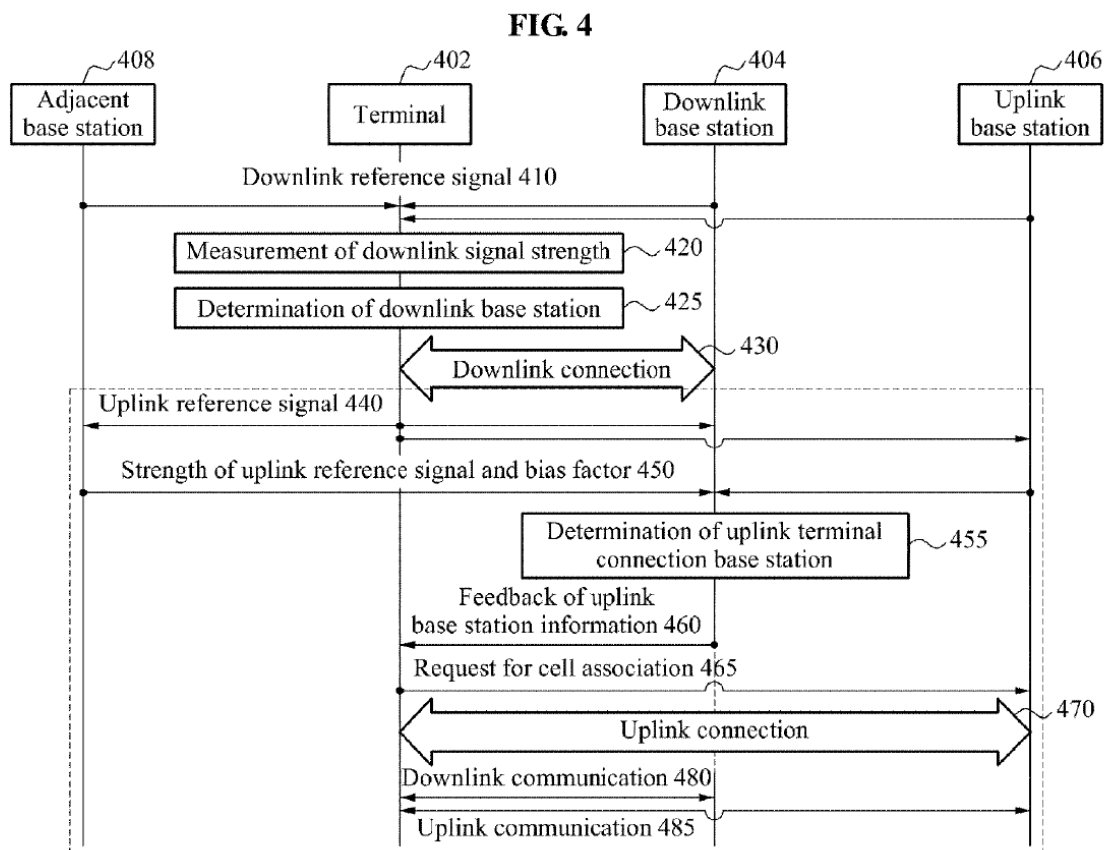
41. In Figure 4 of the '383 patent, an example of a signal flow of the process disclosed by the '383 patent for establishing separate downlink and uplink connections is shown below. Ex. 1001, 6:31-33. The '383 patent explains that, in this example, a downlink cell association is achieved based on the base stations in a network transmitting a downlink reference signal to a terminal. The terminal measures the strength of the respective downlink reference signals and selects a downlink base station based on the strongest measured downlink reference signal strength, which is shown in step 425 of Figure 5. Ex. 1001, 6:54-56, 7:1-20, Fig. 5.

42. Once the downlink connection is established according to the process described above, the '383 patent explains that the uplink connection is established based on a process where the terminal transmits an uplink reference signal to a set of uplink base station candidates. Ex. 1001, 7:27-33, 7:41-49. In response to receiving the uplink reference signal, each candidate base station measures the signal strength of the uplink reference signal and transmits the signal strength information to the downlink base station that is associated with the terminal in the downlink direction. Ex. 1001, 7:61-67, 8:5-11. After receiving the signal strength information from the uplink base station candidates, the downlink base station identifies an uplink base station with the greatest signal strength of the uplink reference signal. Ex. 1001, 7:67-8:2, 8:12-22. The uplink base station information of the selected

uplink base station is then sent by the downlink base station to the terminal. Ex. 1001, 8:41-45.

43. Once the terminal receives the uplink base station information from the downlink base station, the next step in the process is the terminal establishing an uplink connection between the terminal and the identified uplink base station. Ex. 1001, 8:45-52, 8:55-59. The terminal may then begin communicating using the established uplink and downlink connections. Ex. 1001, 8:60-9:2.

Ex.1001, Fig. 4



VIII. SUMMARY OF THE PRIOR ART

A. Yu (Ex. 1003)

44. U.S. Patent Application Publication No. 2011/0223900 to Yu et al. (“Yu”), is titled “Supplemental node transmission assistance in a wireless communications network.” Ex. 1003 at cover.

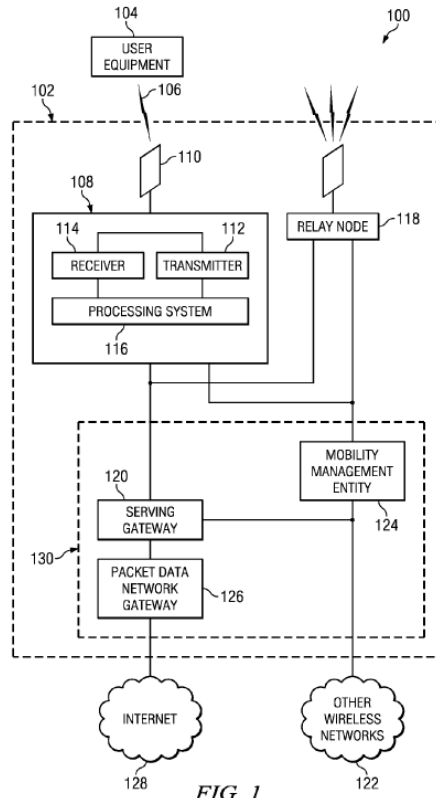
45. Based on the face of Yu, it was published on September 15, 2011 based on an application filed on March 12, 2012. Ex. 1003 at cover. I understand Yu is therefore prior art under at least 35 U.S.C. § 102(a) (AIA).

46. Yu is generally directed to establishing and improving uplink and downlink connections within a wireless network (*e.g.*, LTE or LTE-A). Ex. 1003, ¶¶[0001], [0004], [0023]. Notably, like the ’383 patent, Yu is directed to solving problems arising from transmission power differences in heterogenous cellular networks. Ex. 1003, ¶¶[0004], [0005], [0022], [0023], [0025].

47. To solve these problems, Yu discloses systems and methods for establishing uplink and downlink connections with separate base stations in a communication network. For example, in Figure 1 of Yu, shown below, Yu’s wireless communication system includes a wireless network, such as an LTE network, a UMTS network, and a Global Systems for Mobile (GSM) network. Ex. 1003, ¶¶[0025]. The user equipment and network node disclosed in Yu respectively

correspond with the terminal and base station in the '383 patent. Ex. 1003, ¶¶[0026], [0031], [0032], [0033].

Ex. 1003, Fig. 1



48. Considering Figures 5-7 of Yu, an exemplary implementation of Yu's process for establishing uplink and downlink connections between a user equipment and nodes in a network is shown. Ex. 1003, Figs. 5-7.

49. Figure 5 is a high-level illustration of Yu's process for establishing an uplink node and a downlink node for a user equipment. Ex. 1003, Fig. 5.

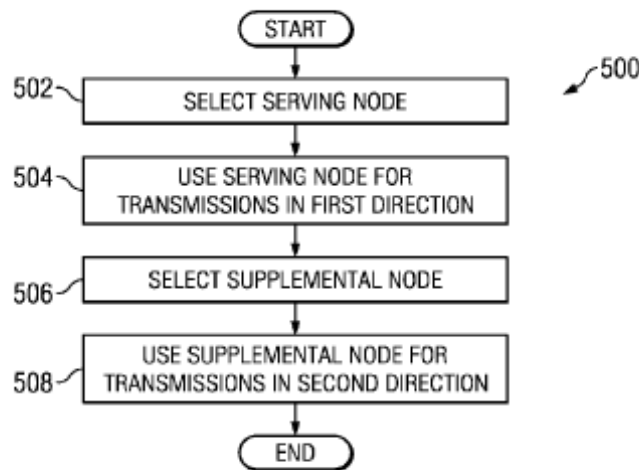
Ex. 1003, Fig. 5

FIG. 5

50. The first step (502) includes “select[ing] the network node from which the user equipment receives the strongest reference signal receive power, RSRP, to be the serving node.” Ex. 1003, ¶[0079]. “In this case, the serving node is the node whereby the user equipment receives its downlink control signal,” but Yu discloses that the serving node could also be used for uplink communications. Ex. 1003, ¶[0079].

51. In step 506, a supplemental node is selected, which includes establishing an uplink connection between the terminal and another network node, referred to as a supplemental node. In step 508, the selected supplemental node is then used for transmissions in a different direction than the first selected node. Ex. 1003, ¶[0080]. Yu discloses that the supplemental node could be used as a supplemental uplink node. Ex. 1003, ¶[0080].

52. Figure 6 illustrates more details for the selection of the uplink supplemental node by showing the message flow for the user equipment when selecting an uplink supplemental node in Figure 5 of Yu. Ex. 1003, ¶[0084].

Ex. 1003, Fig. 6

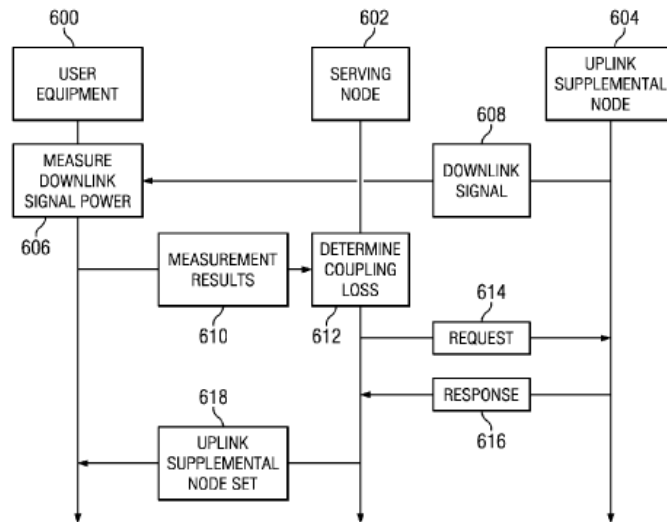


FIG. 6

53. Yu discloses that, in Figure 6 above, “user equipment 600 in communication with serving node 602 measures the downlink signal power 606 in downlink signal 608 received from network nodes that may be considered for operations as uplink supplemental node 604.” Ex. 1003, ¶[0085]. Based on the measurement result information from the uplink supplemental node candidates, the serving node can identify an uplink supplemental node for user equipment 600 based on the determined coupling losses and/or transmission power of the uplink supplemental node candidates. Ex. 1003, ¶¶[0088], [0106]; *see also* ¶¶[0091], [0092]. The serving node will then transmit information regarding the identified

uplink supplemental node candidate in step 618 to the user equipment and an uplink connection is established between the user equipment and the identified uplink supplemental node. Ex. 1003, ¶[0093].

54. Yu explains that the serving node is used for downlink transmissions whereas the identified and selected supplemental node is used for uplink transmissions. Ex. 1003, ¶[0080]. The benefits of having two different network nodes for downlink and uplink described by Yu include the supplemental node being able to provide a better wireless channel connection than the serving node in the opposite direction of what is being provided by the serving node. Ex. 1003, ¶[0080]; *see also* Ex. 1003, ¶[0082]. Moreover, the serving node and the supplemental node will communicate with each other over the network backhaul or wireless network backhaul and those communications may include uplink data transmissions and coordination of control information. Ex. 1003, ¶[0090].

B. Acharya (Ex. 1004)

55. U.S. Patent Application Publication No. 2013/0089034 to Acharya et al. (“Acharya”) is titled “Separate associations of a mobile to different base stations in uplink and downlink.” Ex. 1004 at cover.

56. Based on information on its face, Acharya published on April 11, 2013, based on an application filed on October 5, 2011. Ex. 1004 at cover. I understand that Acharya is therefore prior art under at least 35 U.S.C. § 102(a) (AIA).

57. Similar to the '383 patent and Yu, Acharya is generally directed to improving uplink and downlink connections between base stations and user equipment. Acharya discloses a process wherein different base stations can be associated with the same UE can for uplink and downlink communications. Ex. 1004, Abstract. The solution presented in Acharya is to establish a connection with an appropriate base station to handle downlink traffic for a UE and establishing a connection with an appropriate base station to handle uplink traffic for a UE such that interference problems associated with conventional systems for selecting and associating base stations for uplink and downlink transmissions of data and control information are avoided. Ex. 1004, ¶[0048]. Acharya explains that different base stations may handle downlink and uplink traffic with different base stations to improve gain and lessen interference. Ex. 1004, ¶[0048]. The appropriate base station for UL and DL in Acharya is selected based on RSRP. Ex. 1004, ¶[0014]-[0015].

58. In the prior art systems disclosed in Acharya, once associated with a UE, the base station is then responsible for “[t]ransmission of control information to the UE,” “[t]ransmission of data to the UE,” [r]eception of control information from the UE,” and “[r]eception of data from the UE.” Ex. 1004, ¶¶[0008]-[0012]. An illustration of these communications is provided in Figure 2, which shows control and data transmission between a base station and UEs 1 and 2.

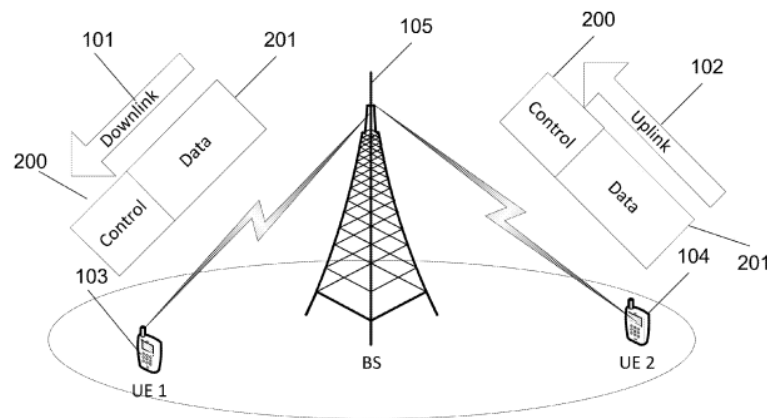
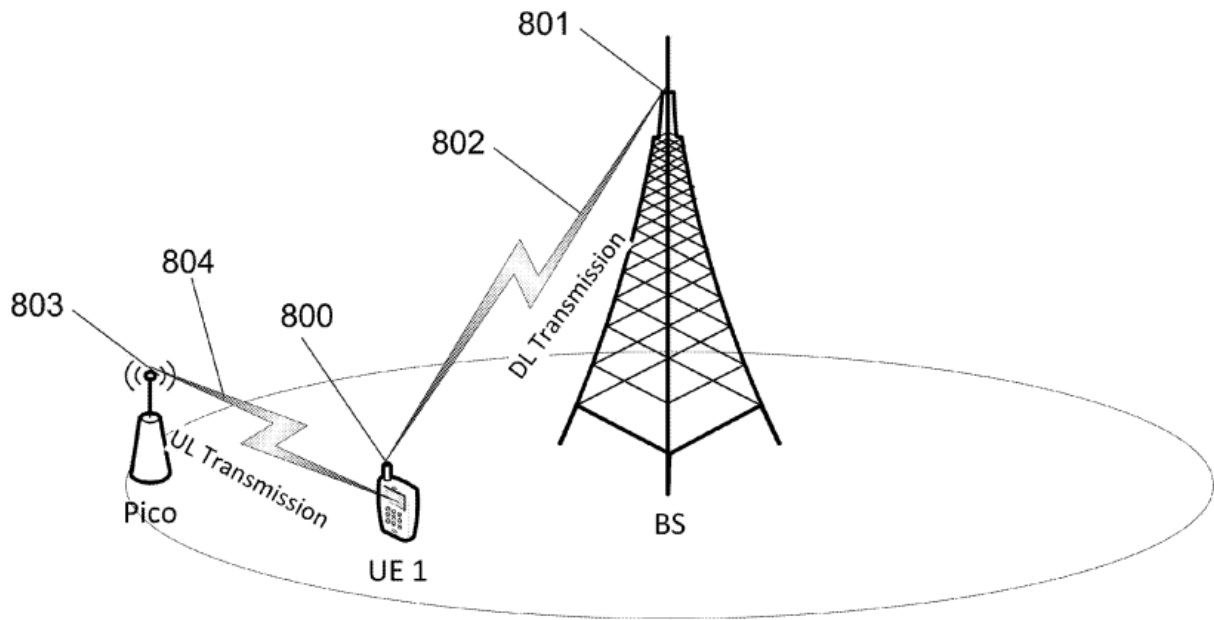
Ex. 1004, Fig. 2

Figure 2

59. The data and control channels for transmitting uplink and downlink control information, such as control channels 200 and channel for transmitting uplink and downlink data, such as data channels 201, between one base station and multiple UEs are shown in Figure 2 of Acharya. Ex. 1004, Fig. 2, ¶[0013]. In prior art systems, Acharya describes that base stations would make transmission decisions for the UEs they served without coordinating with the transmissions from different base stations, which can contribute to interference problems. Ex. 1004, ¶[0061].

60. Figure 8 illustrates an example of Acharya's disclosure of a UE associating with different base stations for UL and DL transmissions. Ex. 1004, ¶[0065]; Fig. 8. In Figure 8, UE 800 is associated with BS 801 for DL transmission and is associated with Pico BS 803 for UL transmission separately.

Ex. 1004, Fig. 8



61. The separate association of the same UE with different base stations for UL and DL transmission is accomplished through Acharya's disclosure of a detailed signaling protocol for communication and coordination between the two base stations. Ex. 1004, ¶[0067]. As I noted above with respect to Figure 2 of Acharya, there may be transmission and reception of both data and control information between the UE and the base stations. *Id.* The detailed signaling procedures of Acharya enables one base station, such as BS_{UL} , to handle control information for uplink transmission. Under these circumstances, the control information handled by BS_{UL} must be communicated to the UE. Embodiment disclosed in Acharya provide that this communication may be performed by a separate base station, BS_{DL} , which handles the DL transmission to the UE, which is not done by BS_{UL} . Ex. 1004,

¶¶[0067]-[0068]. Therefore, control information is communicated from BS_{UL} to BS_{DL} so that the UE can be informed of the control information. *Id.*

62. Acharya further discloses certain uplink and downlink channels used in 3GPP LTE. Those channels are listed in Tables 1 and 2, in addition to whether backhaul communication support is needed for those channels in view of the disclosure of separate UL and DL base stations disclosed in Acharya. Ex. 1004, ¶[0069]; Table 1. Acharya explains that the DL channels shown in Table 1 are transmitted to the UE and contain DL data and control for both UL and DL transmissions.

63. Further, Table 2 illustrates that the UL channels received from the UE contain UL data and control for both UL and DL transmissions. Ex. 1004, ¶[0069]. The description of the information sent on each channel is also included in Tables 1 and 2. For example, in Table 2, the information on the PUCCH (CQI/PMI/RI, HARQ) is “[c]ontrol information for DL data (PDSCH transmission).” Ex. 1004, Table 2. A POSITA would have been aware of the LTE channels disclosed in these Tables, including the PUCCH and PDSCH.

Ex. 1004, Table 2

TABLE 2				
Types of UL channels and if backhaul communication is needed amongst BS so that the relevant BS gets the information				
UL Channel	Description of Content	Received by	Intended Recipient	Backhaul Communication
PUSCH	UL Data (UE to BSUL)	BSUL	BSUL	None
PUCCH (SR)	UE requests BSUL for opportunity to transmit UL data	BSUL	BSUL	None
SRS	UL channel quality measurements	BSUL	BSUL,	None
PRACH	Timing alignment, initial access of UE to network	BSUL	BSUL, BSDL	BSUL -> BSDL
PUCCH (CQI/PMI/RI, HARQ)	Control information for DL data (PDSCH transmission)	BSUL	BSDL	BSUL -> BSDL

IX. GROUND 1: YU IN VIEW OF ACHARYA**A. Motivation to Combine**

64. A POSITA would have been motivated to combine Yu's supplemental uplink node selection and operation process with Acharya's disclosure that the uplink base station in a system where a UE is associated with a base station for downlink transmissions and a separate base station for downlink transmissions, provides an uplink control channel.

65. A POSITA would have been motivated to combine Yu with Acharya with a reasonable expectation of success because Yu discloses a supplemental uplink node selection and operation procedure in which a UE would be separately associated with a base station for downlink transmissions, on the one hand, and associated with another supplemental base station for uplink transmissions on the other hand. Ex. 1003, ¶[0075]. A POSITA implementing the disclosures of Yu would have understood that uplink and downlink transmissions could include

transmissions of both control information and data. Ex. 1003, ¶¶[0028]-[0029]. Even though Yu does not disclose the details of the use of certain channels, a POSITA would have been familiar with the LTE channels explicitly disclosed in Yu, such as the PUCCH. *Id.* To determine the application of these known channels to Yu's supplemental uplink node addition procedure, a POSITA would have been motivated to look to other LTE references directed to solving UL-DL problems in heterogeneous networks for additional details of implementation, as LTE was the current technology implemented at the time. A POSITA would have a reasonable expectation of success in such a combination because, while Yu discloses that control information may be transmitted on a PUCCH, Acharya describes the information sent on the PUCCH in greater detail, the receiving base station, and the backhaul support needed to implement a PUCCH in a system where uplink and downlink transmissions are separately handled by different base stations. Ex. 1003, ¶[0029]; Ex. 1004, Table 2.

66. A POSITA looking at Yu would have looked to Acharya for other reasons. For example, Acharya describes known LTE channels for uplink and downlink transmissions of different types of data and control information. Yu's supplemental uplink node selection and operation procedure could be implemented for supplemental node transmission assistance in either the uplink or downlink direction and is not limited to only control information or user data. Thus, a POSITA

would have looked to Acharya for different types of uplink and downlink channels provided by either the serving or supplemental nodes disclosed in Yu.

67. In addition, Yu and Acharya are analogous art to the '383 patent. I explained above that Yu, Acharya, and the '383 patent are all directed to solving the same problem: transmission power imbalances for uplink and downlink transmissions in heterogeneous networks.

68. Thus, a POSITA would have been motivated to implement Yu's supplemental uplink node procedure using the details of the uplink control channel of the supplemental uplink node provided by Acharya.

69. I discuss additional motivations to combine in relation to the specific limitations provided below.

B. Independent Claim 1

1) Yu in view of Acharya discloses and/or renders obvious [1.0] “An operating method of a network comprising at least a base station, the method comprising:

70. To the extent the preamble is limiting Yu in view of Acharya renders obvious “[a]n operating method of a network comprising at least a base station.” Yu is directed to “the use of supplemental wireless communication network nodes to improve uplink and downlink wireless transmissions between the network and wireless user equipment.” Ex. 1003, ¶[0001]. As explained in Yu, there were known wireless communication networks with different types of network nodes for

providing wireless communications with wireless user equipment, such as heterogeneous Long Term Evolution Advanced (LTE-A) networks employing “regular nodes,” such as “conventional evolved Universal Mobile Telecommunications System, UMTS, Terrestrial Radio Access Network, E-UTRAN, Node B nodes,” as well as “relay nodes.” Ex. 1004, ¶[0004]. At the time of the ’383 patent, it was well known that the regular nodes and relay nodes in the exemplary heterogeneous network described by Yu were also known generally as base stations, as claim 1 recites. Thus, a POSITA would understand this limitation to be obvious in view of Yu.

2) Yu in view of Acharya discloses and/or renders obvious [1.1] “transmitting, performed by each of base stations, a downlink reference signal to a terminal;”

71. Yu in view of Acharya renders obvious “transmitting, performed by each of base stations, a downlink reference signal to a terminal.”

72. Yu uses the term “serving node” in a similar fashion as what the ’383 patent describes as the “first base station.” The ’383 eventually shifts from the description of the “first base station” to the “downlink base station” to distinguish between the base station that is serving downlink traffic from the “uplink base station” that is serving the uplink traffic, respectively. Yu uses the term “supplemental node” in a similar fashion as what the ’383 patent describes as the “uplink base station.” The system disclosed in Yu selects the initial “serving node”

as well as the subsequent “supplemental node” based on measurements of downlink reference signals sent by each base station. Yu discloses that the terminal will, “select the network node from which the user equipment receives the strongest downlink signal as the serving node.” Ex. 1003, ¶[0005]. As described above, Yu’s method is illustrated in the steps of Figure 5.

Ex. 1003 at Fig. 5

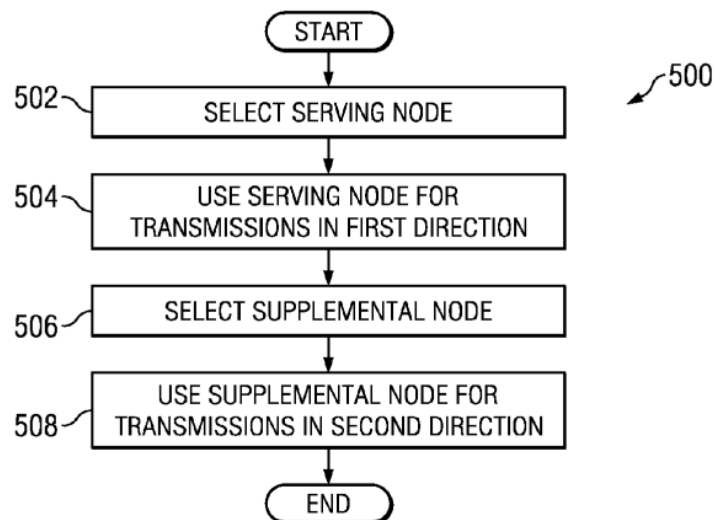


FIG. 5

73. The serving node is selected at step 502. To complete this step, Yu describes that the “user equipment may select the network node from which the user equipment *receives the strongest reference signal* receive power, RSRP, to be the serving node.” Ex. 1003, ¶[0079]; *see also* [0082]. As I explained above in Section VI, reference signal receive power (RSRP) is a well-known measurement in LTE and LTE-A performed by the UE that reports signal strength based on received downlink cell-specific reference signals. Therefore, the reception and determination

of the strongest RSRP requires that the downlink reference signals be transmitted from the base stations in the network to the UE.

74. The details of the following step 506, in which the system selects the supplemental node, is shown in Figure 6. Yu explains that Figure 6 “is a diagram illustrating message flows in a method for selecting an uplink supplemental node.” Ex. 1003, ¶[0084]. Figure 6 is annotated and reproduced below to explain these message flows.

Ex. 1003 at Fig. 6 (annotated)

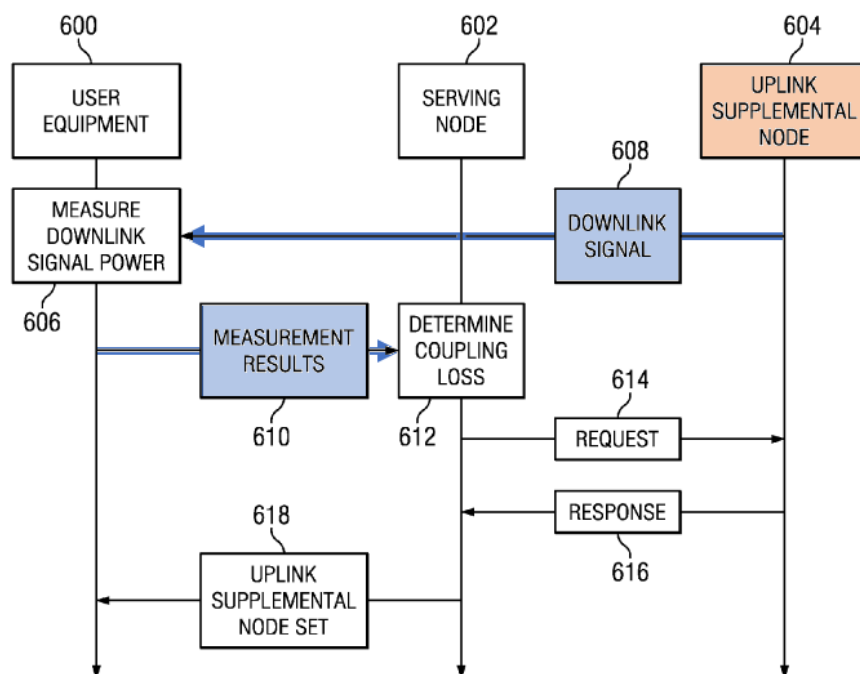


FIG. 6

75. Preceding the selection of the Uplink Supplemental Node (604) in Yu, User Equipment (600) in Figure 6 measures the downlink signal power, which the

UE receives from downlink signals transmitted from nodes in the network that may be considered for operation as the Uplink Supplemental Node (604) in step 608.

76. To accomplish this, the Uplink Supplemental Node (604, in orange) sends a “downlink signal” in step 608, which contains the downlink reference signal. Ex. 1003, Fig. 6. After The UE could, according to Yu, perform these measurements for a configured period of time or until a certain measurement threshold is met. Ex. 1003, ¶[1003]. If the time period ends or the measurement event is satisfied, the User Equipment (600) sends back the “measurement results” (labeled 610). *Id.* Yu states “measurement results 610 may include *the reference signal receive power.*” Ex. 1003, ¶[0086]. As I explained above, a POSITA would have understood that, for the UE to measure the reference signal receive power, the base station (*e.g.*, uplink supplemental node 604, in orange) had to send the downlink reference signal to be measured by the UE as a downlink signal.

77. A POSITA would therefore understand that Yu discloses both base stations (*e.g.*, the serving node and the uplink supplemental node) sending downlink reference signals to the UE. Yu thus renders obvious this limitation.

3) Yu in view of Acharya discloses and/or renders obvious [1.2] “receiving, performed by a first base station, a strength of the downlink reference signal from the terminal;”

78. Yu in view of Acharya discloses and/or renders obvious “receiving, performed by a first base station, a strength of the downlink reference signal from the terminal.”

79. As discussed above with respect to element [1.1], in relation to Figure 6, Yu discloses that “measurement results 610 may include *the reference signal receive power*.” Ex. 1003, ¶[0086]. Figure 6 shows that the reference signal receive power in the measurement results is sent to the serving node (602), or the first base station of the claim (annotated below in green).

Ex. 1003 at Fig. 6 (annotated)

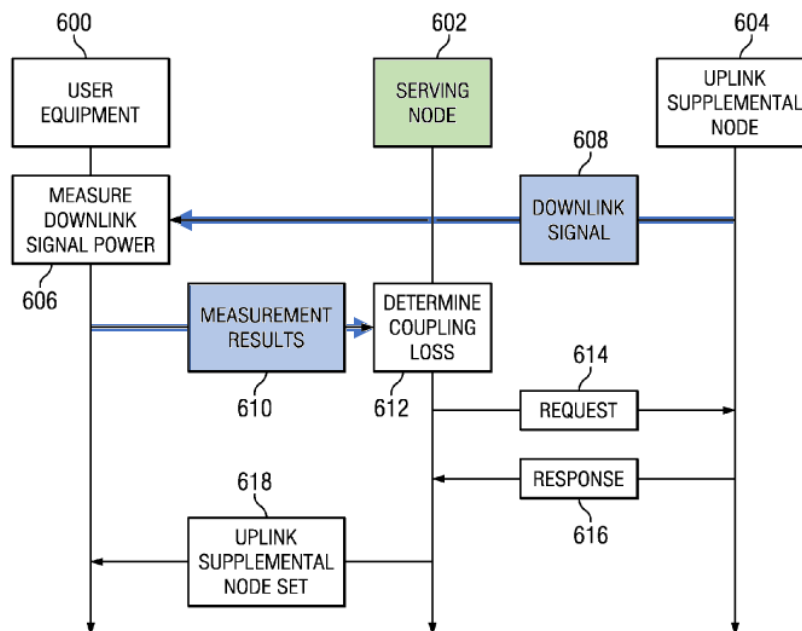


FIG. 6

80. Yu further explains that the measurement results are sent “for a number of nodes,” not just to the uplink supplemental node. Ex. 1003, ¶[0086]. This is also confirmed in Figure 8. Ex. 1003, ¶[0105]. Yu discloses “[d]ownlink signal power measurements for one or more nodes are received by the serving node from the user equipment (step 802)” in connection with Figure 8. Ex. 1003, ¶[0106].

81. To the extent Patent Owner argues that this limitation is not disclosed by Yu, the disclosure for selection of the first downlink base station is nearly identical in the '383 patent. The first downlink base station corresponds to the serving node disclosed in Yu. For example, the '383 patent discloses that, in its operating method described in relation to Figure 4, the terminal may measure a strength of the signals received from a set of base stations in a network, and as a result, the terminal may determine the downlink base station as the base station transmitting with the greatest signal strength of the set of base stations. A downlink cell association with the downlink base station is then established. Ex. 1001, 7:6-26.

82. Therefore, Yu discloses “receiving, performed by a first base station, a strength of the downlink reference signal from the terminal,” as recited in Claim 1.

4) Yu in view of Acharya discloses and/or renders obvious [1.3] “establishing, performed by the first base station, a downlink cell association with the terminal;”

83. Yu in view of Acharya discloses and/or renders obvious “establishing, performed by the first base station, a downlink cell association with the terminal.”

84. Yu describes that the serving node 108 in Figure 1 “performs many functions, including radio resource management, admission control, scheduling, enforcement of negotiated uplink quality of service, cell information broadcast, ciphering and deciphering of user and control data, and compression and decompression of downlink and uplink user packet headers.” Ex. 1003, ¶[0032]. A POSITA would have understood that functions such as radio resource management are used to establish downlink cell association with a terminal. Moreover, admission control and scheduling are used to establish a connection (or cell association) with a terminal. In addition, Yu discloses that the selected serving node is used “for transmissions in a first direction, i.e., downlink transmissions.” Ex. 1003, ¶[0079].

85. Thus, a POSITA would understand that Yu discloses “establishing, performed by the first base station, a downlink cell association with the terminal,” as recited in Claim 1.

5) Yu in view of Acharya renders obvious [1.4] “determining, performed by the first base station, an identifier of a second base station providing an uplink control channel;”

86. Yu in view of Acharya renders obvious “determining, performed by the first base station, an identifier of a second base station providing an uplink control channel.” This step can be separated into two parts, which I address below in turn.

a) “determining, performed by the first base station, an identifier of a second base station”

87. First, Yu discloses a serving node with a downlink cell association with the UE, wherein the serving node identifies and selects the supplemental uplink node(s) to serve that same UE. Ex. 1003, ¶[0074]

88. The supplemental uplink node is identified and determined by the serving base station that is associated with the UE. In connection with Figure 4, Yu states that “serving node 412 selects supplemental node 418 for transmission assistance in order to provide the best available downlink transmissions on downlink channel 406 and uplink transmissions on uplink channel 408 between network 402 and user equipment 404.” Ex. 1003, ¶[0085]. Thus, a POSITA would understand that the determination and selection of the supplemental node is done in Yu by the serving node, or the “first base station.”

89. A POSITA would appreciate that the UE must be informed of the assignment and identification of the correct base station, which is shown in Figure 6 of Yu. The context of Figure 6 is UE 600 having already selected the serving node 602 and is subsequently performing steps to measure the downlink signal power of the downlink signals received from the possible network nodes that could function as a supplemental node for supplemental uplink transmission. Ex. 1003, ¶[0085]. UE 600 then reports the measurement results of the downlink signal power of the

possible uplink supplemental nodes to the serving node in step 610. Ex. 1003, ¶[0086].

Ex. 1003, Fig. 6 (annotated)

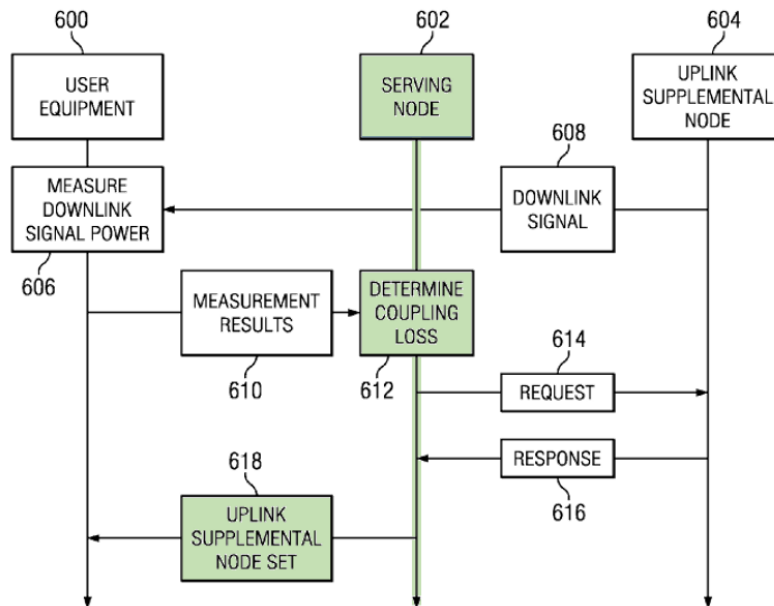


FIG. 6

90. The serving node 602 then identifies the candidate uplink supplemental nodes for UE 600 based on the measurement results and communicates them to the UE in step 618 shown above. Yu discloses that there may be only one candidate uplink supplemental nodes selected by the serving base station for the UE, because uplink supplemental node set 618 “includes each candidate node that was determined to be appropriate for operation as an uplink supplemental node for user equipment 600.” However, uplink supplemental node set 618 is an identifier of at least a second base station providing a channel for uplink transmission, as is recited in claim 1. Ex. 1003, ¶[0088].

91. Acharya also discloses this limitation. Acharya discloses “a first base station that . . . [includes] a selection module *that assigns a second base station* selected from a group of neighboring base stations on the basis of a highest signal strength value from the plurality of reception signal strength values to handle uplink traffic for the UE.” Ex. 1004, ¶[0043]. Specifically, Acharya discloses the selection of a second uplink base station wherein the UE sends an uplink reference signal to a group of base stations. Ex. 1004, ¶[0070]. The base stations in the group that received the uplink reference signal send the values of the received signal strength to the base station that is currently serving the UE in the downlink (the “ BS_{DL} ”). Ex. 1004, ¶[0070]. The serving base station then selects the base station with the highest received signal power metric as the BS_{UL} (“second base station”). Ex. 1004, ¶[0070].

92. The disclosure for selecting the second base station in the ‘383 patent is nearly identical to that of Acharya. The ‘383 patent discloses that a terminal may transmit an uplink reference signal to the uplink base station candidate group. Ex. 1001, 5:58-62. Each base station measures the strength of the uplink received signal and transmits the measured strength of the uplink received signal to the downlink base station through the backhaul connection. Ex. 1001, 6:11-18. The downlink base station may then determine the uplink base station from among the base stations based on the strength of the uplink reference signal transmitted from each of the base

stations. Ex. 1001, 8:12-15. Thus, a POSITA would understand this limitation is rendered obvious in view of Yu and Acharya.

b) “a second base station providing an uplink control channel”

93. Second, Yu in view of Acharya discloses or at least renders obvious an uplink control channel for the supplemental node. Ex. 1003, ¶[0072].

94. First, a POSITA would understand that an uplink control channel is sent in the uplink direction, which is consistent with the plain and ordinary meaning of uplink control channel. In other words, a POSITA would understand this to mean that network configuration or other control information sent on the uplink control channel is sent from the UE to a base station in the network.

95. For example, based on Figure 4 below, a POSITA would find it obvious to use an uplink control channel in Yu. In Figure 4, the serving node is in yellow, and the supplemental node is in blue:

Ex. 1003, at Fig. 4 (annotated)

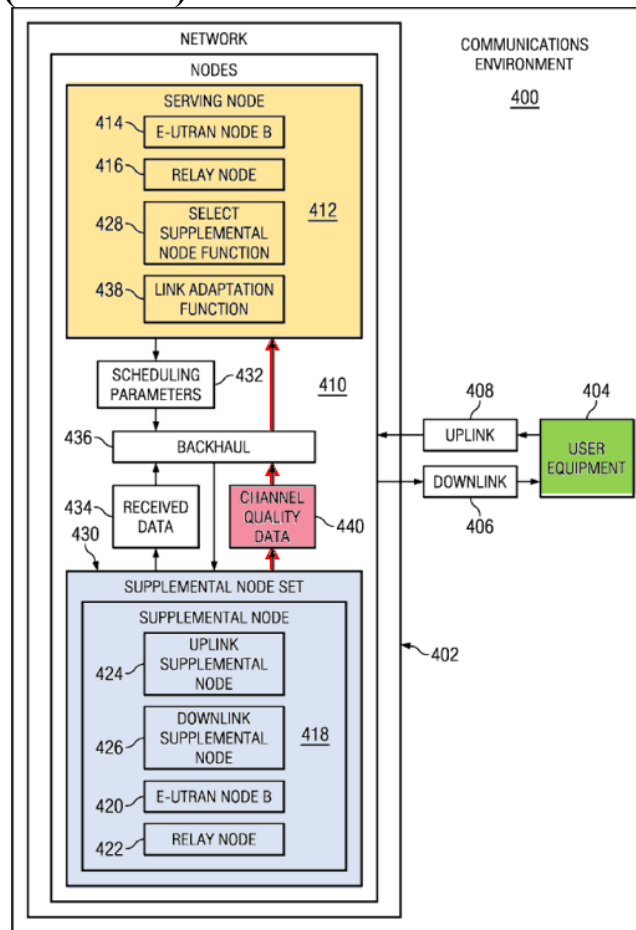


FIG. 4

96. As shown in Figure 4, “channel quality data” 440 is provided “by supplemental node 418 to serving node 412 over backhaul 436 in order to adapt the modulation and coding scheme, power, or other parameters of transmission on the channel to match changing channel conditions.” Ex. 1004 at [0076]. Thus, a POSITA would understand that the channel quality data in red is control information sent by the UE to the supplemental node and then passed by the supplemental node to the serving node in the backhaul. Ex. 1003, Fig. 4.

97. In addition, Yu explicitly discloses that the uplink channel from the UE to the base station includes the PUCCH, which a POSITA would have known to be used to transmit uplink control information such as channel quality data. Ex. 1003, ¶[0029]. A POSITA would have known that the supplemental node could acquire channel quality data through UE measurements, which would be sent to the supplemental node by the UE through an uplink control channel such as the disclosed PUCCH. Thus, it would have been obvious to a POSITA reading Yu that an uplink control channel would have been established between the UE and supplemental node or base station.

98. To the extent Patent Owner argues that it would not be obvious to a POSITA that Yu discloses an uplink control channel, a POSITA looking to implement the serving nodes and supplemental nodes disclosed in Yu would look to Acharya for implementation and signaling details for the possible channels for data and control information transmission on the uplink and downlink.

99. For example, Acharya describes detailed signaling procedures for different data or control information to be handled by separate base stations for UL and DL transmission. Ex. 1004, ¶¶[0067]-[0069]. Acharya discloses that it is “possible for some control information for uplink transmission to be handled by a separate BS, BSUL.” Ex. 1004, ¶[0067]. Acharya also explains how the “UE may want to pass some control information to BSDL (*such as measured DL channel*

quality) but since it can transmit only to BSUL, BSUL has to in turn pass the control information to BSDL.” Ex. 1004, ¶[0068]. A POSITA would therefore understand that Acharya discloses that the “channel quality” control information (*e.g.*, like the channel quality information in Yu) should be passed on the uplink through the UL base station.

100. Acharya also explicitly provides a list of the uplink channels used in LTE. For example, Table 2 of Acharya lists the PUCCH, or physical uplink control channel, as an LTE channel that would be used to transmit control information (*e.g.*, channel quality information) between the UE and “BSUL” (the uplink base station) in a system implemented with Acharya’s signaling procedures. Ex. 1004, ¶¶[0066]-[0069]. A POSITA would understand that the “Received by” column in Table 2 for the highlighted PUCCH indicates that the BSUL provides the PUCCH.

Ex. 1004, Table 2

TABLE 2

Types of UL channels and if backhaul communication is needed amongst BS so that the relevant BS gets the information				
UL Channel	Description of Content	Received by	Intended Recipient	Backhaul Communication
PUSCH	UL Data (UE to BSUL)	BSUL	BSUL	None
PUCCH (SR)	UE requests BSUL for opportunity to transmit UL data	BSUL	BSUL	None
SRS	UL channel quality measurements	BSUL	BSUL,	None
PRACH	Timing alignment, initial access of UE to network	BSUL	BSUL, BSDL	BSUL → BSDL
PUCCH (CQI/PMR), HARQ	Control information for DL data (PDSCH transmission)	BSUL	BSDL	BSUL → BSDL

101. As I explained previously, Yu discloses the PUCCH. Yu also teaches the same type of system taught by Acharya, wherein a UE has separate associations with multiple base stations for uplink and downlink transmissions. Thus, a POSITA would be motivated to combine Yu with Acharya to determine the use of LTE channels between the node serving the downlink transmissions and the node for uplink transmission and would arrive at the claimed limitation “a second base station providing an uplink control channel” if looking for further implementation details for the types of channels to be used with the disclosure of Yu. A POSITA would understand that the second base station providing an uplink control channel, or BSUL in Acharya, could be included in the supplemental uplink node set determined for the UE by the serving node in Yu.

102. Thus, a POSITA would understand that Yu in view of Acharya renders obvious “determining, performed by the first base station, an identifier of a second base station providing an uplink control channel,” as recited in Claim 1.

6) Yu in view of Acharya discloses and/or renders obvious [1.5] “transmitting, performed by the first base station, the identifier of a second base station through the downlink cell association; and”

103. Yu in view of Acharya discloses and/or renders obvious “transmitting, performed by the first base station, the identifier of a second base station through the downlink cell association.”

104. As I explained above, the message flows for the uplink supplemental node selection taught by Yu is shown in Figure 6. In addition, I also explained that, after the serving node determines the candidate uplink supplemental nodes based on the measurement results, the serving node and candidate uplink supplemental node set perform the query-response procedure, and an uplink supplemental node set shown in 618 in Figure 6 is determined at the conclusion of this procedure. Ex. 1003, ¶[0091]. Yu explains that the uplink supplemental node set for UE 600 “includes each candidate node that was determined to be appropriate for operation as an uplink supplemental node for user equipment 600.” Ex. 1003, ¶[0091]. In the following step, Yu states that the “*uplink supplemental node set 618 may . . . be transmitted to UE 600.*” Ex. 1003, ¶[0093] (emphasis added). As described above, “uplink supplemental node set 618” in Yu does not have to be a set of multiple nodes.

Instead, Yu discloses and a POSITA would understand, the example in a typical wireless network including “Type-I relay nodes,” where the uplink supplemental node set would include only one uplink supplemental node. Ex. 1003, ¶[0092].

105. Further, the communication of the uplink supplemental node set 618 includes the use of “dedicated radio resource control, RRC, signaling” to inform UE 600 of the identity of the uplink supplemental node. Ex. 1003, ¶[0093]. A POSITA would understand that RRC signaling would require and is a result of the downlink cell association established between the serving node and the UE. This disclosed communication of the identity of the uplink supplemental node from the serving node to the UE using RRC signaling is illustrated as the final step of the message flow, 618, in Figure 6 below.

Ex. 1003, Fig. 6 (annotated)

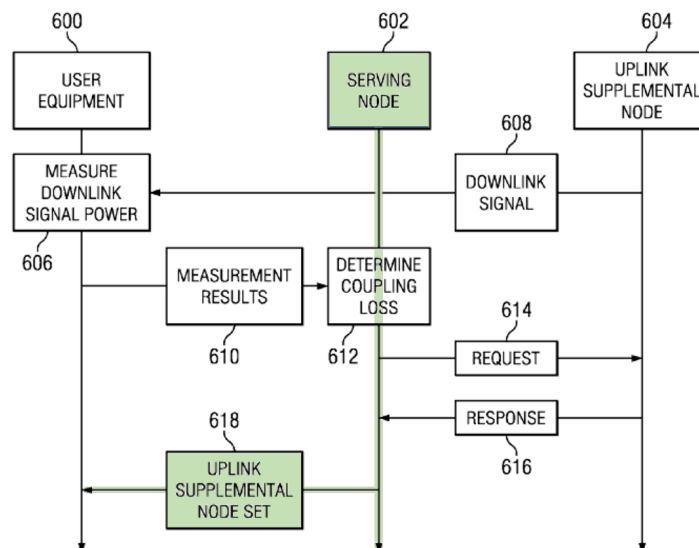


FIG. 6

106. Yu therefore discloses “establishing, performed by the second base station, an uplink cell association with the terminal,” as recited in Claim 1.

7) Yu in view of Acharya discloses and/or renders obvious [1.6] “establishing, performed by the second base station, an uplink cell association with the terminal.”

107. Yu in view of Acharya discloses and/or renders obvious “establishing, performed by the second base station, an uplink cell association with the terminal.”

108. Yu discloses that, after the selection of the uplink supplemental node described above, use of the supplemental node for uplink transmission is initiated. Ex. 1003, ¶¶[0093]-[0095]. The message flows for establishing an uplink connection between the UE and the uplink supplemental node are shown in Figure 7 of Yu.

Ex. 1003, Fig. 7 (annotated)

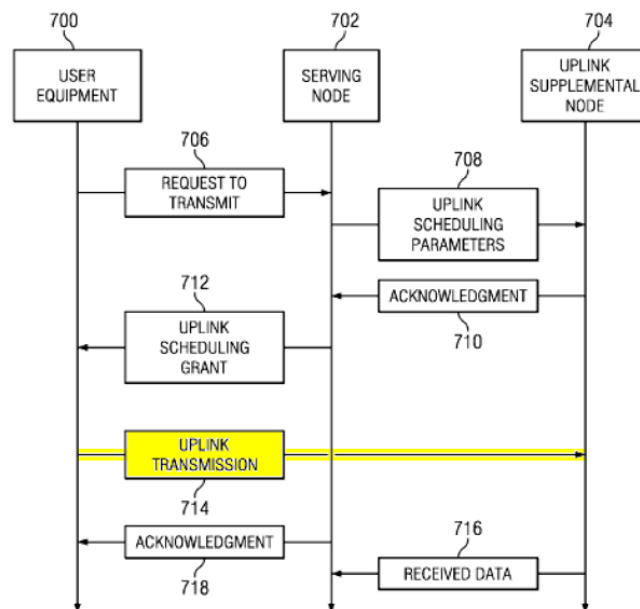


FIG. 7

109. The supplemental uplink node is prepared to receive an uplink transmission, and the serving node (downlink node) sends an uplink scheduling grant to the user equipment in step 712. The UE subsequently performs an uplink transmission shown as 714 in Figure 7 (annotated in yellow). A POSITA would appreciate that reception of an uplink transmission by the uplink supplemental node and the successful decoding of that transmission indicates an uplink cell association.

110. Therefore, Yu discloses “establishing, performed by the second base station, an uplink cell association with the terminal,” as recited in Claim 1.

C. Dependent Claim 2

[2] The method of claim 1, wherein the strength of the downlink reference signal is measured by the terminal.

111. Yu and Acharya renders obvious this limitation. Claim 2 depends from Claim 1, and I incorporate my discussion above with respect to Claim 1 by reference. Yu also discloses the additional limitation of Claim 2: “wherein the strength of the downlink reference signal is measured by the terminal.”

112. Yu states that, prior to selecting the serving node, the user equipment “may select the network node from which the user equipment receives the *strongest reference signal receive power, RSRP*, to be the serving node.” Ex. 1003, ¶[0079]. The UE is therefore measuring and determining the strongest RSRP, based on downlink reference signals sent by candidate base stations. As I discussed in detail above, RSRP is a known UE-determined measure of signal strength of a cell, and

can be used in multi-cell scenarios, Yu further discloses that, after the selection of the serving node, but before the selection of the supplemental uplink node by the serving node, the user equipment 600 in connection with Figure 6 “measures the downlink signal power in downlink signal 608 received from candidate nodes.” Ex. 1003, ¶[0085]. Yu discloses that the measurement results of the downlink signal may include the RSRP for a number of nodes. Ex. 1003, ¶[0086].

113. Thus, Yu discloses “wherein the strength of the downlink reference signal is measured by the terminal,” as recited in Claim 2.

D. Dependent Claim 3

[3] The method of claim 1, wherein the base station candidate group is updated by the terminal based on the strength of the downlink reference signal.

114. Yu renders obvious Claim 3, which depends from Claim 1, and thus, the discussion above with respect to Claim 1 is incorporated by reference. Yu renders obvious “wherein the base station candidate group is updated by the terminal based on the strength of the downlink reference signal.”

115. “Updating” the base station candidate group to serve as the uplink supplemental node is rendered obvious based on Yu’s supplemental node selection process. In particular, Yu discloses that “user equipment 600 . . . measures the downlink signal power 606 in downlink signal 608 received from network nodes that may be considered for operations as uplink supplemental node 602.” Ex. 1003,

¶[0085]. As I explained described above in claim 1, a POSITA would understand that the claimed “strength of the downlink reference signal” in claim 3 is the same as measuring the downlink signal power 606 in downlink signal 608 disclosed in Yu. Yu also discloses that the UE may perform these measurements based on a configured time interval or based on the satisfaction of an event measurement threshold. Ex. 1003, ¶¶[0085]-[0086]. After those measurements are complete, the UE reports the measurement results to the serving node for supplemental node selection. Ex. 1003, ¶¶[0085]-[0086]. Based on this disclosure, it would have been obvious to a POSITA that a UE is “updating” the base station candidate group by measurement of the downlink signal strength of possible supplemental nodes until a certain threshold or for a certain period of time, and subsequently reporting those results to the serving node.

116. To the extent Patent Owner argues that this limitation is not disclosed by Yu, the disclosure for updating the base station candidate group is nearly identical in the '383 patent. For example, the '383 patent discloses that the uplink base station candidate group is determined based on the downlink received signal. Ex. 1001, 5:43-47. Thus, Yu renders claim 3 obvious.

E. Dependent Claim 4

[4] The method of claim 1, further comprising: receiving, performed by the second base station, an uplink reference signal.

117. Yu and Acharya render obvious this limitation. Claim 4 depends from Claim 1, and therefore, I incorporate my discussion above with respect to Claim 1 by reference. Yu and Acharya also disclose the additional limitation of Claim 4: further comprising: receiving, performed by the second base station, an uplink reference signal.”

118. In Yu’s supplemental uplink node operation, “an uplink supplemental node may measure the condition of the uplink channel between the uplink supplemental node and the user equipment.” Ex. 1003, [0112]. One way to determine the channel conditions is to measure “sounding reference signal transmissions from the user equipment.” Ex. 1003, ¶[0113]. A POSITA would have recognized that a Sounding Reference Signals (SRS) described in Yu is a type of reference standardized in LTE. Thus, the supplemental uplink node operation in Yu requires that the uplink node receive an uplink reference signal from the UE.

119. Acharya also discloses this limitation. Specifically, Acharya discloses the selection of a second uplink base station wherein the UE sends an uplink reference signal to a group of base stations. Ex. 1004, ¶[0070]. This is illustrated in step 905 of Figure 9. Ex. 1004, Fig. 9. The base stations in the group that received the uplink reference signal send the values of the received signal strength to the base station that is currently serving the UE in the downlink (the “ BS_{DL} ”). Ex. 1004,

¶[0070]. The serving base station then selects the base station with the highest received signal power metric as the BS_{UL} (“second base station”). Ex. 1004, ¶[0070].

Ex. 1004, Fig. 9

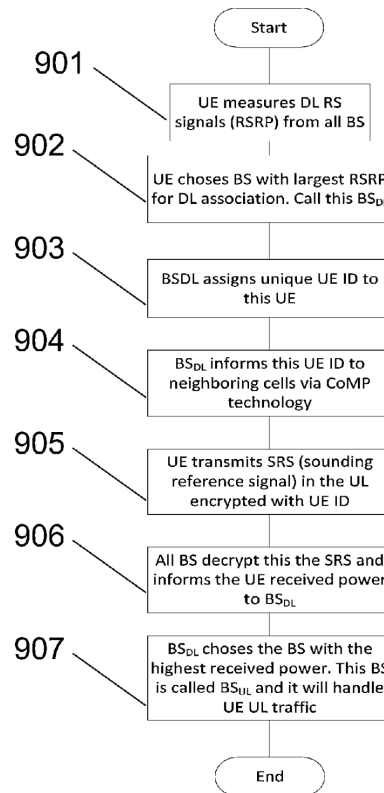


Figure 9

120. Therefore, Yu and Acharya render obvious “further comprising: receiving, performed by the second base station, an uplink reference signal,” as recited in Claim 4.

F. Dependent Claim 5

[5] The method of claim 1, wherein the first base station is a macro base station and the second base station is a small base station.

121. Yu and Acharya renders obvious this limitation. Claim 5 depends from Claim 1, and therefore, I incorporate my discussion above with respect to Claim 1 by reference. Yu also discloses the additional limitation of Claim 5: “wherein the first base station is a macro base station and the second base station is a small base station.”

122. The heterogeneous networks to which Yu is directed refers to a network that employs both regular nodes, such as conventional LTE eNodeBs, and relay nodes. Ex. 1003, ¶[0004]. The difference between regular and relay nodes are differences in their transmission power. A POSITA would understand that the regular LTE eNodeB disclosed by Yu is a macro base station, because Yu discloses that the base station has a relatively higher transmission power and larger coverage area. In contrast, a POSITA would understand a relay node to be a small base station, as Yu describes relay nodes as having a much smaller transmission power relative to an eNodeB. Yu also discloses different types of relay nodes, such as Type 1, Type 1a, Type 1b, and Type 2 Relay nodes, all of which provide less transmission power than standard nodes. Ex. 1003, ¶[0033]. Based on this disclosure, a POSITA would understand regular and relay nodes disclosed in Yu to be a macro base station and a small base station, respectively.

123. Therefore, Yu discloses “wherein the first base station is a macro base station and the second base station is a small base station,” as recited in Claim 5.

G. Independent Claim 6

1) Yu discloses [6.0] “A base station, comprising:”

124. For at least the reasons discussed above regarding claim limitation [1.0], Yu discloses and/or renders obvious this limitation.

125. In addition, Yu discloses node 108 as part of a wireless communication system. Node 108 may be a radio access node providing the communication interface between a wireless network and a UE, and node 108 could be generically referred to as “a base transceiver station.” Ex. 1003, ¶[0031]. Thus, a POSITA would understand the node disclosed by Yu to be a base station, as recited in claim 6.

126. Further, as shown in Figure 1, Node 108. Yu teaches that node 108 comprises a receiver and a transmitter, shown in green, and a processing unit, shown in yellow.

Ex. 1003, Fig. 1 (annotated)

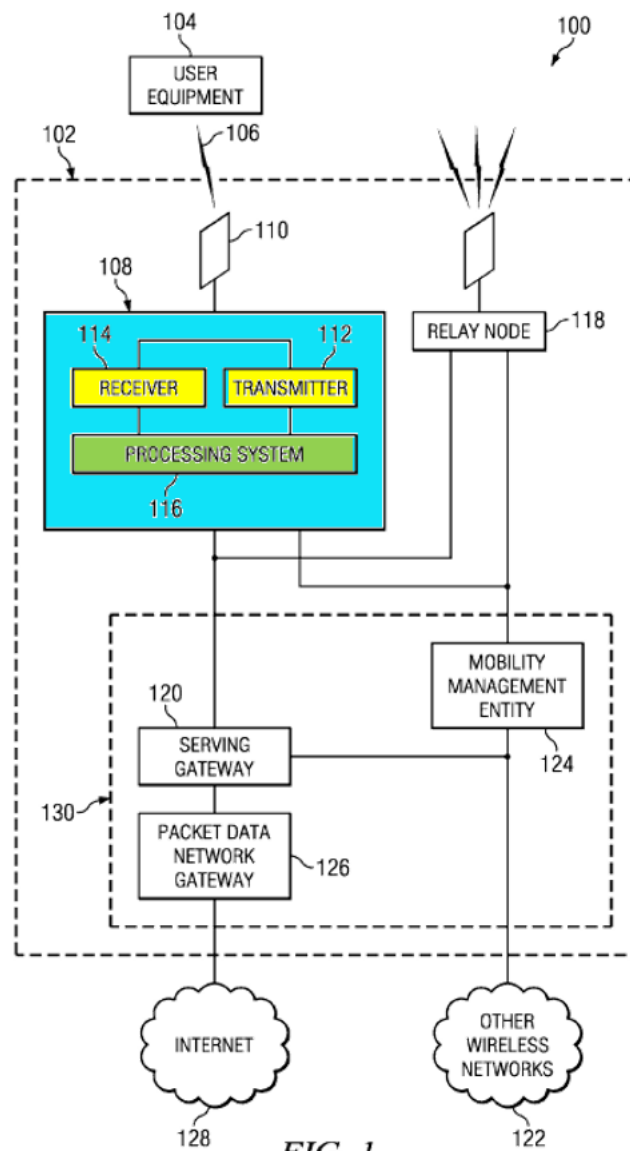


FIG. 1

2) Yu discloses [6.1] “a networking unit configured to transmit a downlink reference signal to a terminal; and”

127. For at least the reasons discussed above regarding claim limitation [1.1], Yu discloses and/or renders obvious this limitation. A POSITA would

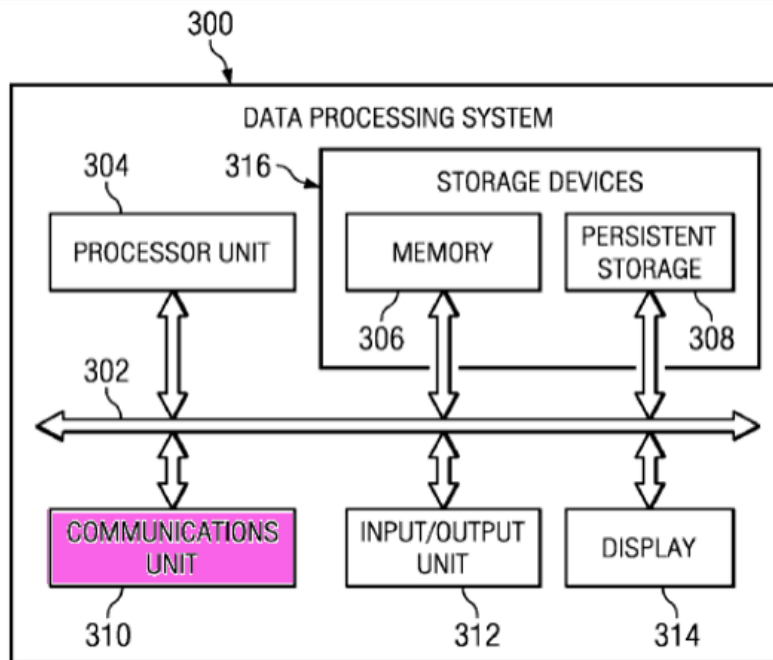
understand Yu to further disclose a base station comprising a networking unit configured to transmit a downlink reference signal.

128. As I explained above with respect to claim limitation [6.pre], Yu discloses a node 108, or a base station, that includes transmitters 112, “which are used by node 108 to communicate directly with mobile devices. Ex. 1003, ¶[0032], Fig. 1. Transmitter 112 in the base station shown in Figure 1 is connected to processing system 116, also included in the base station, which Yu discloses is used “for implementing the functionality provided by node 108.” Ex. 1003, ¶[0032]. Therefore, a POSITA would appreciate that these transmitters and the processing system of the base station, would be used to carry out functionality disclosed in Yu, such as transmitting a downlink reference signal to a UE.

129. Further details of processing system 116 of the base station disclosed in Yu is shown in Figure 3, which “is a block diagram of a data processing system that is part of a network node” or a base station in a communications network taught by Yu. Ex. 1003, ¶[0054]. The data processing system of the base station shown in Figure 3 includes communications unit 310, which provides the capability of the base station to communicate with other data processing systems or devices in the network. Ex. 1003, ¶[0057]. In one embodiment, Yu discloses that the communications unit 310 could be a “network interface card” which may provide communications through the use of physical or wireless communications links. A

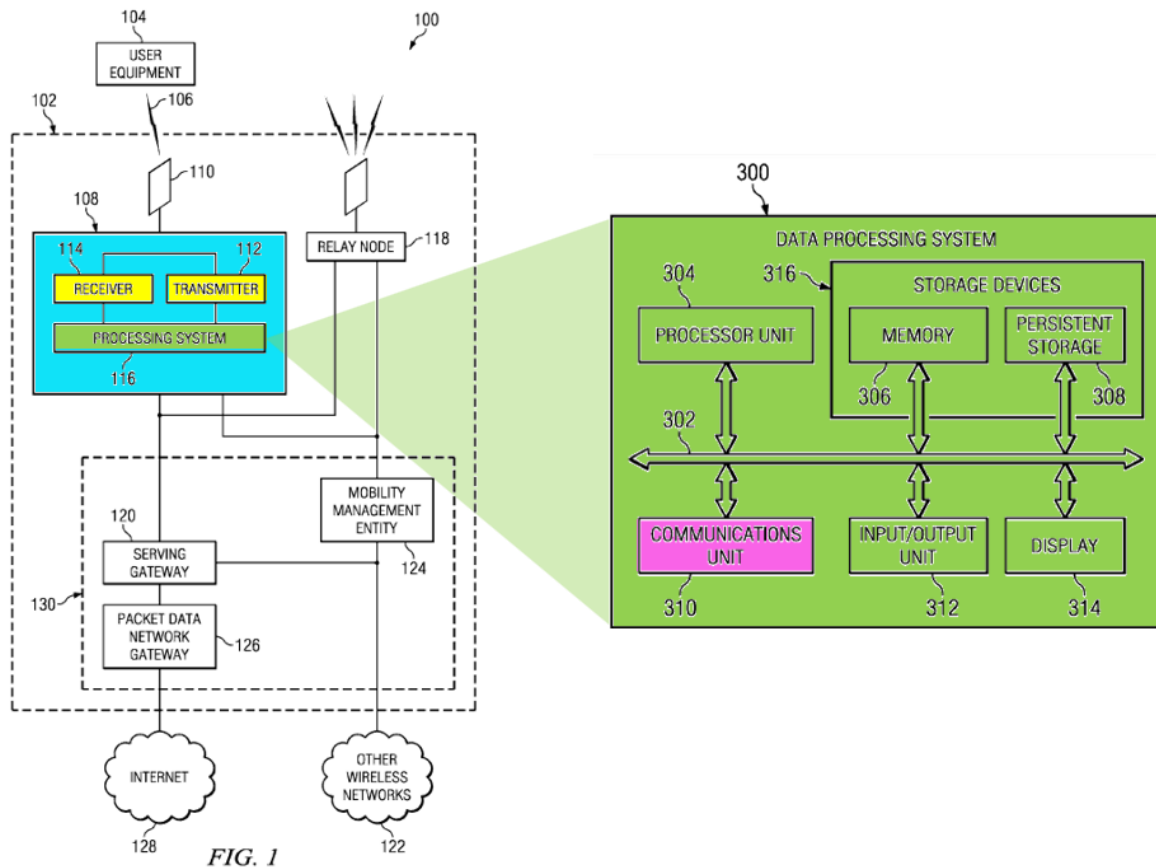
POSITA would therefore understand that the communications unit 310 shown in Figure 3 of Yu is a networking unit configured to perform the communications and networking functions of the methods disclosed in Yu.

Ex. 1003, Fig. 3 (annotated; partial)



130. I have annotated Figures 1 and 3 together to more clearly show the inclusion of the data processing system in the network node of Figure 1.

Ex. 1003, Figs. 1, 3 (annotated; partial)



131. Yu therefore discloses, or at least renders obvious, a base station comprising a networking unit that is configured for carrying out the functionality of the node, such as “transmitting a downlink reference signal to a terminal.”

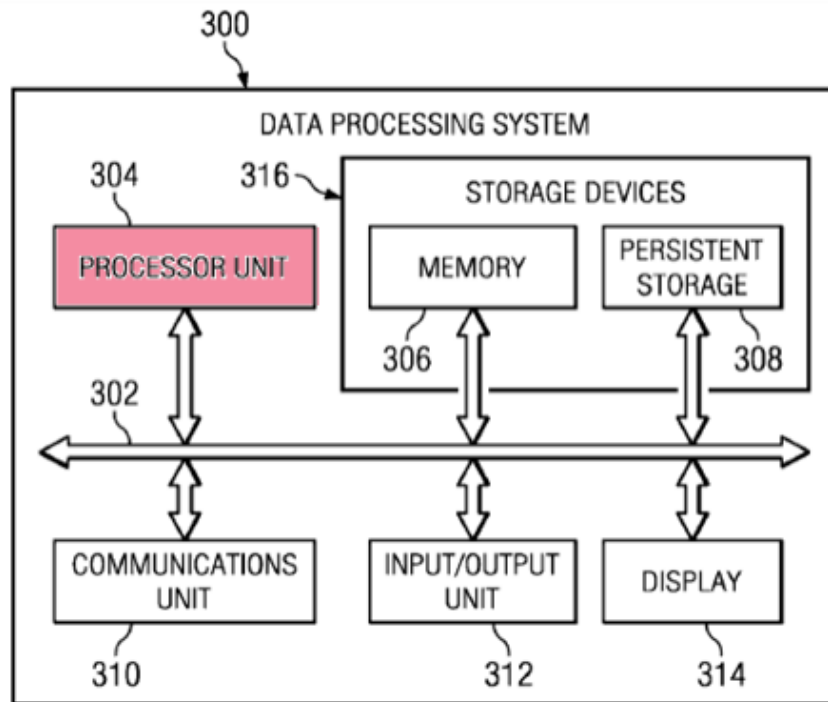
3) Yu discloses [6.2] “a processor configured to establish a downlink cell association with the terminal,”

132. For at least the reasons discussed above regarding claim limitation [1.3], Yu discloses and/or renders obvious this limitation.

133. As I explained above regarding claim limitations [6.0] and [6.1], Yu discloses a base station comprising a processing system that is configured for

carrying out the functionality of the node, such as establishing a downlink cell association with the terminal. In particular, the data processing system of the base station shown in Figure 3 discussed above includes processor unit 304, which gives the base station the ability to execute software instructions that dictate the functionality of the node. Ex. 1003, ¶[0055]. A POSITA would therefore understand that the processor unit 304 shown in Figure 3 of Yu is a processor configured to execute the communications and networking functions of the methods disclosed in Yu, such as “establish a downlink cell association with the terminal configured to.”

Ex. 1003, Fig. 3 (annotated; partial)



134. I have annotated Figures 1 and 3 together to more clearly show the inclusion of the data processing system that includes the processing unit in the network node of Figure 1.

Ex. 1003, Figs. 1, 3 (annotated; partial)

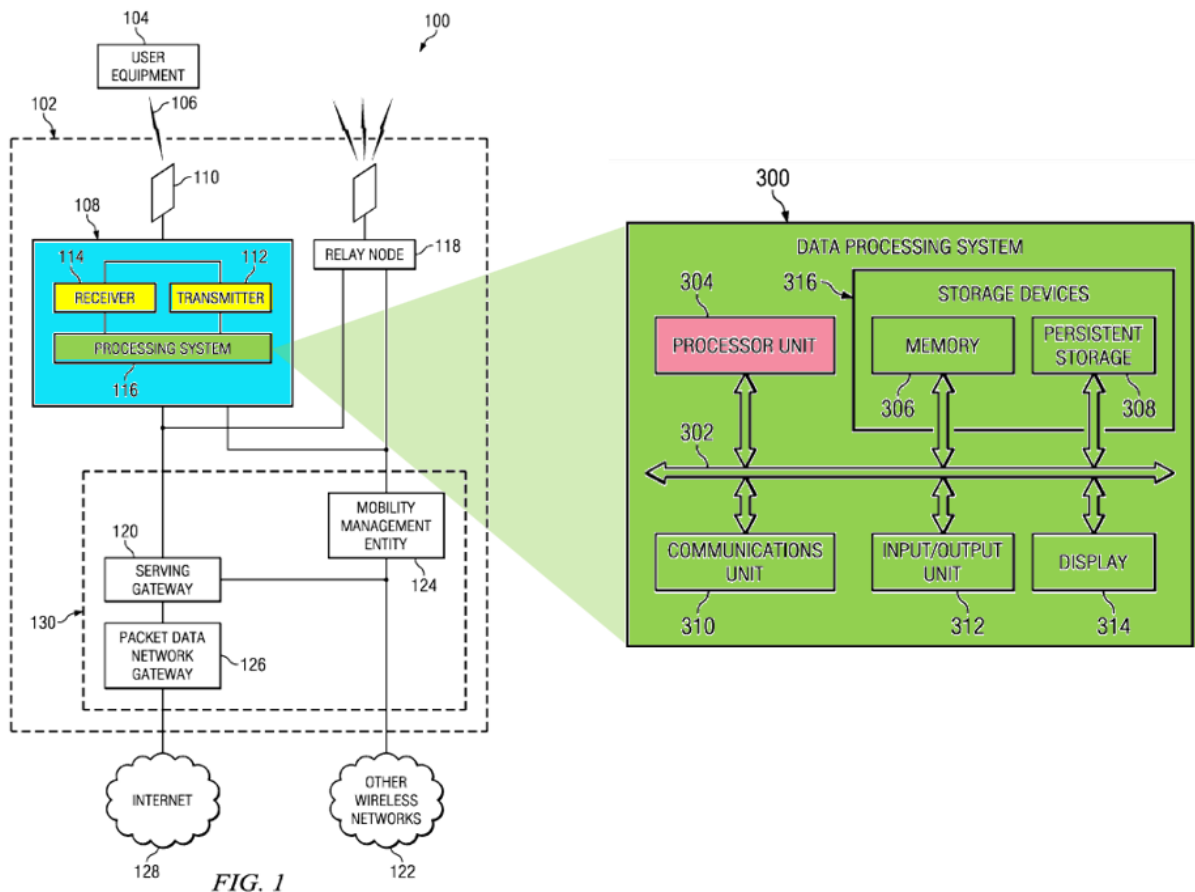


FIG. 1

4) Yu in view of Acharya discloses and/or renders obvious [6.3] “wherein the processor further configured to determine an identifier of a second base station providing an uplink control channel, and”

135. For at least the reasons discussed above regarding claim limitation [1.4], Yu and Acharya render obvious this limitation. In addition, as I explained above with respect to limitation [6.2], Yu discloses a processor configured to execute the communications and networking functions of the methods disclosed in Yu, such as “determine an identifier of a second base station providing an uplink control channel.”

- 5) Yu in view of Acharya discloses and/or renders obvious [6.4] “wherein the networking unit further configured to receive a strength of the downlink reference signal from the terminal, and to transmit the identifier of the second base station through the downlink cell association.”**

136. For at least the reasons discussed above regarding claim limitations [1.2] and [1.5], Yu in view of Acharya discloses and/or renders obvious this limitation.

137. For at least the reasons I explained above regarding claim limitations [6.0] and [6.1], Yu discloses a base station comprising a networking unit that is configured for carrying out the functionality of the node, such as receiving a strength of the downlink reference signal from the terminal, and to transmit the identifier of the second base station through the downlink cell association. Furthermore, the base station disclosed in Yu includes transmitters and receivers 114, which are used by the node to communicate directly with a UE. Ex. 1003, ¶[0032]. The transmitters and receivers are shown in yellow in Figure 1 and are connected to processing system 116, also included in the node, which Yu discloses is used “for implementing the functionality provided by node 108.” Ex. 1003, ¶[0032]. A POSITA would understand that these transmitters and receivers would be used in connection with the processing system of the station to carry out functionality disclosed in Yu, such as “receive a strength of the downlink reference signal from the terminal, and to

transmit the identifier of the second base station through the downlink cell association.”

Ex. 1003, Fig. 1 (annotated)

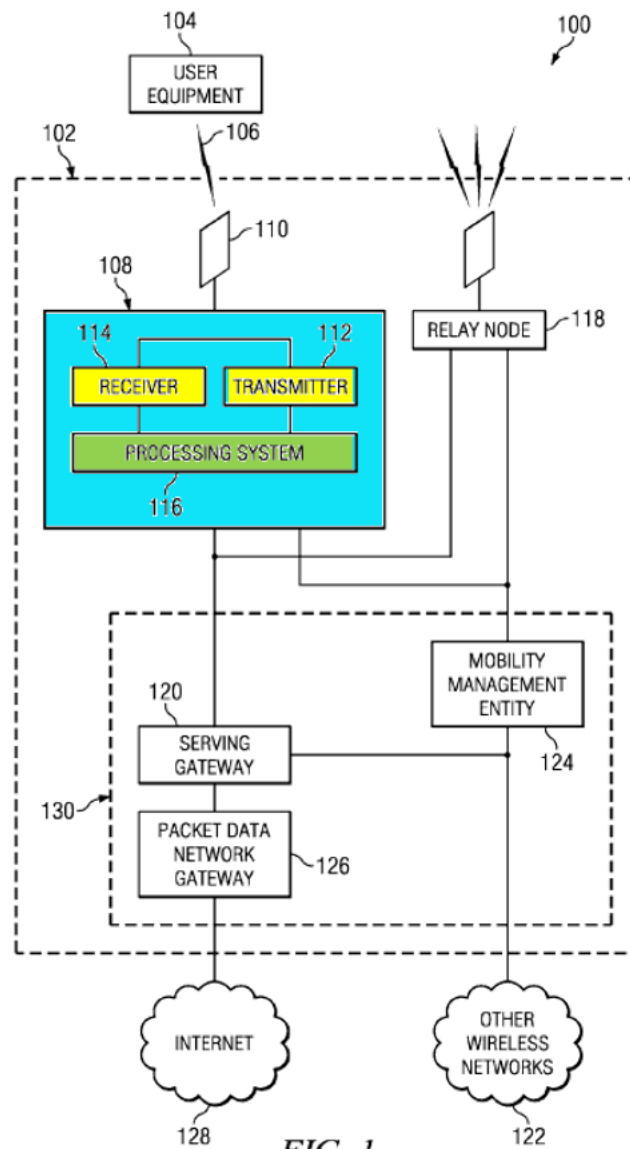


FIG. 1

H. Dependent Claim 7

[7] The base station of claim 6, wherein the base station is a macro base station and the second base station is a small base station.

138. Claim 7 depends from Claim 6, and therefore I incorporate my discussion above with respect to Claim 6 by reference. For the same reasons discussed above regarding claim 5, Yu and Acharya disclose and/or render obvious this limitation.

I. Independent Claim 8

[8.0] Yu discloses and/or renders obvious “An operating method of a terminal performed by the terminal, the method comprising:

139. To the extent the preamble is limiting, Yu discloses “[a]n operating method of a terminal performed by the terminal, the method comprising:”.

140. Yu is explicitly directed towards “the use of supplemental wireless communication network nodes to improve uplink and downlink wireless transmissions between the network and wireless user equipment.” Ex. 1003, ¶[0001]. As Yu explains, it was known that heterogeneous network could be deployed including with different types of network nodes for communication with a UE. Ex. 1003, ¶[0004].

141. Specifically, Yu describes a supplemental node selection procedure that involves UE 600. Ex. 1004, ¶[0085]; Fig. 6. In addition, Yu names examples of user equipment including pagers, cellular phones, cellular smart-phones, wireless

organizers, personal digital assistants, computer, laptops, among other. It was well known that the user equipment described by Yu could also be referred to as terminals, as recited in Claim 3. Thus, Yu discloses this limitation.

[8.1] Yu discloses and/or renders obvious “receiving a downlink reference signal from each of base stations;” & [8.2] “measuring a strength of the downlink reference signal;”

142. Yu discloses and/or renders obvious “receiving a downlink reference signal from each of base stations” and “measuring a strength of the downlink reference signals.”

143. In Yu, the UE’s measurement of downlink reference signals sent by each base station is the basis of both the initial “serving node” and the subsequent “supplemental node” by the UE’s measuring of downlink reference signals sent by each base stations. As described above in Claim 1, the method described in Yu is performed according to the steps of Figure 5.

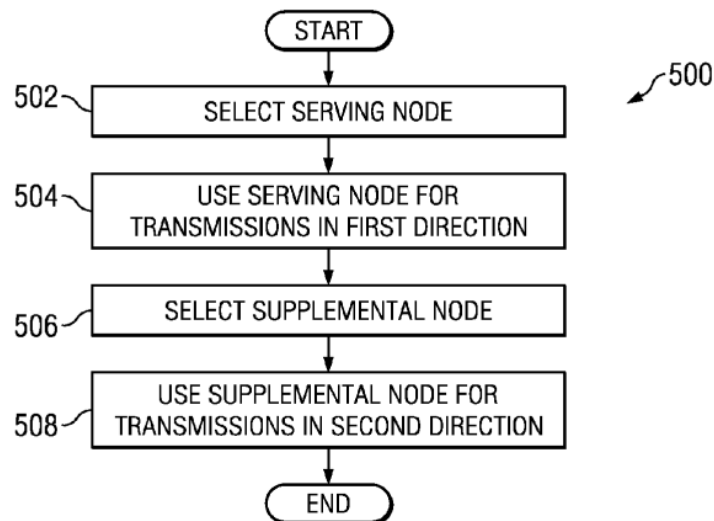
Ex. 1003, Fig. 5

FIG. 5

144. At step 502, the system selects the serving node. To select the serving node, Yu states the “user equipment may select the network node from which the user equipment *receives the strongest reference signal* receive power, RSRP, to be the serving node.” Ex. 1003, ¶[0079]; *see also* ¶[0082] (disclosing a UE selecting “a serving node based on downlink signal strength, such as *reference signal* receive power”). Thus, the fact that Yu discloses the step of selecting amongst various network nodes based upon their RSRP necessarily means that the UE is measuring the downlink reference signal from each of the base stations.

145. This is shown in more detail in Figure 6. Figure 6 “is a diagram illustrating message flows in a method for selecting an uplink supplemental node.” Ex. 1003, ¶[0012].

Ex. 1003, Fig. 6 (annotated)

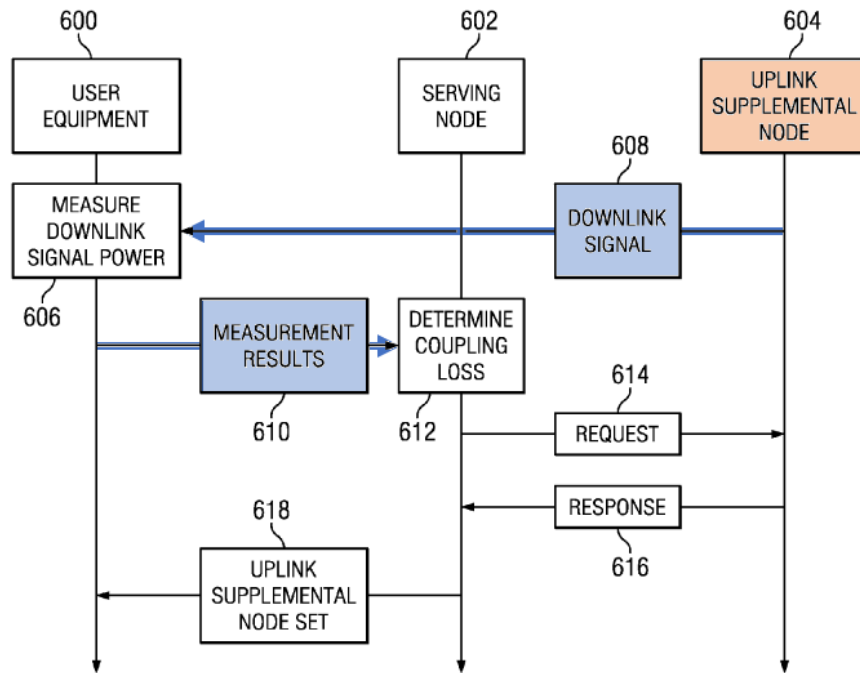


FIG. 6

146. The selection of the Uplink Supplemental Node (604) in Yu’s disclosed system, includes User Equipment (600) that measures the downlink signal power received in downlink signals transmitted from nodes in the network that may be considered for operation as the Uplink Supplemental Node. Ex. 1003, ¶[0085]. I understand this to be shown in step 608, where the Uplink Supplemental Nodes 604 (in orange) sends a “downlink signal” which contains the downlink reference signal. Ex. 1003, Fig. 6. Yu discloses that User Equipment 600 could perform these measurements for a specified period of time or until a measurement threshold is met. Ex. 1003, ¶[0085].

147. Accordingly, Yu discloses a UE receiving and measuring a strength of a downlink reference signal, thereby rendering this claim limitation obvious.

[8.3] Yu discloses and/or renders obvious “updating a base station candidate group by adding at least one base station among the base stations to the base station candidate group;”

148. Yu discloses and/or renders obvious “updating a base station candidate group by adding at least one base station among the base stations to the base station candidate group.”

149. Yu’s supplemental node selection includes steps where, “user equipment 600 . . . measures the downlink signal power 606 in downlink signal 608 received from network nodes that may be considered for operations as uplink supplemental node 602.” Ex. 1003, ¶[0085]. In this case, Yu explains that the downlink signal strength measurement could be performed by the UE until a certain measurement threshold event is satisfied, or a configured time interval for measurement expires. Once the event is satisfied, Yu discloses that the UE reports the measurement results it obtains to the serving node for supplemental node selection. Ex. 1003, ¶¶[0085]-[0086]. Based on this disclosure, it would have been obvious to a POSITA that a UE is “updating” the base station candidate group and adding a base station to the base station candidate group by reporting its measurement of the downlink signal strength of possible supplemental nodes until a

certain threshold or for a certain period of time, and subsequently reporting those results to the serving node. *Id.* Thus, Yu renders this limitation obvious.

[8.4] Yu discloses and/or renders obvious “establishing a downlink cell association with a first base station;”

150. Yu discloses and/or renders obvious “establishing a downlink cell association with a first base station.”

151. A POSITA would understand that Yu discloses that a downlink cell association is established between the serving node (*e.g.*, the first base station) and the terminal. For example, Yu describes that serving node 108 and that “performs many functions, including radio resource management, admission control, scheduling, enforcement of negotiated uplink quality of service, cell information broadcast, ciphering and deciphering of user and control data, and compression and decompression of downlink and uplink user packet headers.” Ex. 1003, ¶[0032]. It would have been obvious to a POSITA that functions such as radio resource management are used to establish downlink cell association between the base station and the UE because the radio resource control (RRC) protocol is the higher-layer signaling in LTE that performs the control plane procedures, including connection management. Likewise, admission control and scheduling are used to establish a connection (or cell association) with the terminal, and Yu discloses that the selected serving node is used “for transmissions in a first direction, i.e., downlink transmissions.” Ex. 1003, ¶[0079].

152. Thus, a POSITA would understand that Yu discloses “establishing a downlink cell association with a first base station,” as recited in Claim 8.

[8.5] Yu in view of Acharya renders obvious “receiving an identifier of a second base station providing an uplink control channel from the first base station through the downlink cell association, wherein the second base station is selected by the first base station;”

153. Yu discloses “receiving an identifier of a second base station providing an uplink control channel from the first base station through the downlink cell association, wherein the second base station is selected by the first base station.”

154. I explained in connection with previous elements that the message flows for the uplink supplemental node selection taught by Yu is shown in Figure 6. As I described above, after the serving node determines the candidate uplink supplemental nodes, the serving node and candidate uplink supplemental node set perform the query-response procedure, and an uplink supplemental node set shown in 618 in Figure 6 is determined at the conclusion of this procedure by the serving node (“wherein the second base station is selected by the first base station”). Ex. 1003, ¶[0091]. The uplink supplemental node set for UE 600 “includes each candidate node that was determined to be appropriate for operation as an uplink supplemental node for user equipment 600.” Ex. 1003, ¶[0091]. Notably, Yu discloses that in the next step, the “*uplink supplemental node set 618 may . . . be transmitted to UE 600.*” Ex. 1003, ¶[0093] (emphasis added). As explained above,

Yu discloses that the “uplink supplemental node set 618” does not have to be a set of multiple nodes. Rather, Yu discloses an example in typical wireless network including “Type-I relay nodes,” where the uplink supplemental node set would include only one uplink supplemental node. Ex. 1003, ¶[0092].

155. Further, transmitting the uplink supplemental node set 618 includes the use of “dedicated radio resource control, RRC, signaling” to inform UE 600 of the identity of the uplink supplemental node. Ex. 1003, ¶[0093]. It was known in the art that RRC signaling is a function of the downlink cell association established between the serving node and the UE. The last step of Figure 6 below illustrates this transmission of the identity of the uplink supplemental node from the serving node to the UE using RRC signaling.

Ex. 1003, Fig. 6 (annotated)

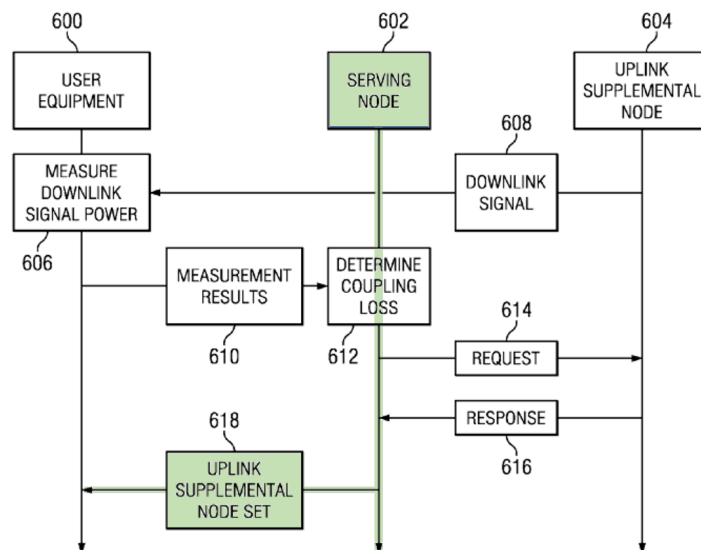


FIG. 6

156. Thus, Yu discloses or renders obvious “establishing, performed by the second base station, an uplink cell association with the terminal,” as recited in Claim 8.

[8.6] Yu discloses and/or renders obvious “establishing an uplink cell association with the second base station based on the identifier of the second base station.”

157. Yu discloses “establishing an uplink cell association with the second base station based on the identifier of the second base station.”

158. After the selection of the uplink supplemental node described above, Yu discloses that the use of the supplemental node for uplink transmission is then initiated. Ex. 1003, ¶¶[0093]-[0095]. Prior to use of the supplemental uplink node, as described above in Claim 1, Yu discloses that uplink supplement node may be transmitted to the UE. The UE, thereby sends scheduling requests to the resultant supplemental nodes. *Id.* ¶¶[0092]-[0095]. The message flows for establishing an uplink connection between the UE and the uplink supplemental node are shown in Figure 7 of Yu.

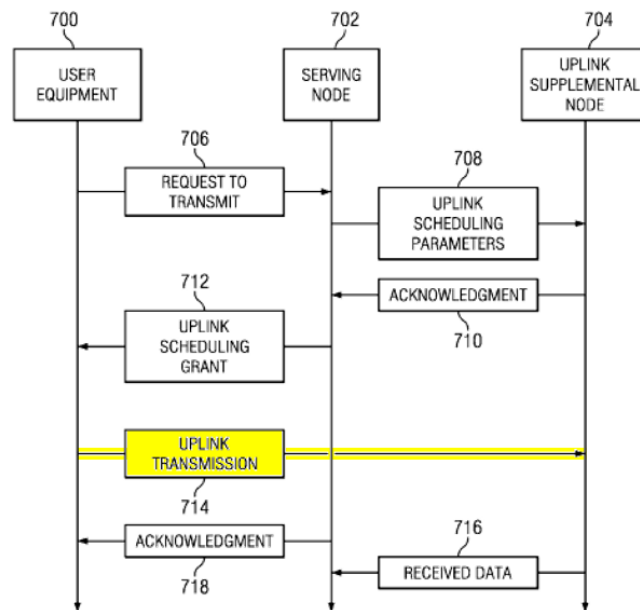
Ex. 1003, Fig. 7 (annotated)

FIG. 7

159. The supplemental uplink node is prepared to receive an uplink transmission, and the serving node (downlink node) sends an uplink scheduling grant to the user equipment. Then, importantly, the UE performs an uplink transmission 714 shown in Figure 7. The successful decoding of the transmission would indicate to a POSITA that an uplink cell association occurred.

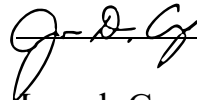
160. Thus, Yu discloses and/or renders obvious this limitation.

X. CONCLUSION

161. I hereby declare that all statements made of my own knowledge are true and that all statements made on information and belief are believed to be true. I further declare 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 the Title 18 of the United States Code and that such willful false statements may jeopardize the validity of this proceeding.

Executed on this February 29, 2024 by:

A handwritten signature in black ink, appearing to read 'J. D. G.', is written over a horizontal line.

Joseph Camp, Ph.D.

XI. CLAIM LISTING

Cl. No.	Elem.	Claim Language
1	[1.0]	An operating method of a network comprising at least a base station, the method comprising:
	[1.1]	transmitting, performed by each of base stations, a downlink reference signal to a terminal;
	[1.2]	receiving, performed by a first base station, a strength of the downlink reference signal from the terminal;
	[1.3]	establishing, performed by the first base station, a downlink cell association with the terminal;
	[1.4]	determining, performed by the first base station, an identifier of a second base station providing an uplink control channel;
	[1.5]	transmitting, performed by the first base station, the identifier of a second base station through the downlink cell association; and
	[1.6]	establishing, performed by the second base station, an uplink cell association with the terminal.
2	[2]	The method of claim 1, wherein the strength of the downlink reference signal is measured by the terminal.
3	[3]	The method of claim 1, wherein the base station candidate group is updated by the terminal based on the strength of the downlink reference signal.
4	[4]	The method of claim 1, further comprising: receiving, performed by the second base station, an uplink reference signal.
5	[5]	The method of claim 1, wherein the first base station is a macro base station and the second base station is a small base station.
6	[6.0]	A base station, comprising:
	[6.1]	a networking unit configured to transmit a downlink reference signal to a terminal; and
	[6.2]	a processor configured to establish a downlink cell association with the terminal,
	[6.3]	wherein the processor further configured to determine an identifier of a second base station providing an uplink control channel, and
	[6.4]	wherein the networking unit further configured to receive a strength of the downlink reference signal from the terminal, and to transmit the identifier of the second base station through the downlink cell association.
7	[7]	The base station of claim 6, wherein the base station is a macro base station and the second base station is a small base station.
8	[8.0]	An operating method of a terminal performed by the terminal, the method comprising:
	[8.1]	receiving a downlink reference signal from each of base stations;
	[8.2]	measuring a strength of the downlink reference signal;
	[8.3]	updating a base station candidate group by adding at least one base station among the base stations to the base station candidate group;
	[8.4]	establishing a downlink cell association with a first base station;

	[8.5]	receiving an identifier of a second base station providing an uplink control channel from the first base station through the downlink cell association, wherein the second base station is selected by the first base station
	[8.6]	establishing an uplink cell association with the second base station based on the identifier of the second base station.