

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

TESLA, INC.,
Petitioner,

v.

INTELLECTUAL VENTURES II LLC,
Patent Owner.

IPR2025-00219
U.S. Patent No. 9,706,500

**DECLARATION OF MICHAEL D. KOTZIN, PH.D.
UNDER 37 C.F.R. § 1.68 IN SUPPORT OF PETITION FOR
INTER PARTES REVIEW**

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I. INTRODUCTION

1. I am making this declaration at the request of Tesla, Inc. in the matter of the *Inter Partes* Review of U.S. Patent No. 9,706,500 (“the ’500 patent”) to Anderson.

2. I am also being reimbursed for reasonable and customary expenses associated with my work and testimony in this investigation. My compensation is not contingent on the outcome of this matter or the specifics of my testimony, and I have no other interest in this case or the parties thereto.

3. I have been asked to provide my opinions regarding whether claims 11-22 (“the Challenged Claims”) of the ’500 patent are unpatentable as they would have been obvious to a person having ordinary skill in the art (“POSITA”) at the time of the alleged invention, in light of the prior art. It is my opinion that all of the limitations of the Challenged Claims would have been obvious to a POSITA.

4. In preparation of this declaration, I have studied:

Exhibit	Description
Ex.1001	U.S. Patent No. 9,706,500 to Anderson (“’500 Patent”)
Ex.1004	U.S. Patent No. 6,600,772 to Zeira et al. (“Zeira”)
Ex.1005	U.S. Patent Application Publication No. 2004/0190485 by Khan (“Khan”)
Ex.1006	U.S. Patent No. 7,493,133 to Krishnan et al. (“Krishnan”)

Exhibit	Description
Ex.1007	U.S. Patent No. 6,529,741 to Tong et al. (“Tong”)
Ex.1008	U.S. Patent Application Publication No. 2004/0077370 by Dick et al. (“Dick”)
Ex.1009	U.S. Patent No. 6,334,047 to Andersson et al. (“Andersson”)
Ex.1010	U.S. Patent Application Publication No. 2001/0036238 by Baker et al. (“Baker”)
Ex.1012	Harri Holma & Antti Toskala, WCDMA for UMTS: Radio Access for Third Generation Mobile Communications (2d ed. 2002) (“Holma”)
Ex.1016	Shin & Zeira et al., “Pathloss-Aided Closed Loop Transmit Power Control for 3G UTRA TDD,” IEEE (2003)
Ex.1025	Andrew S. Tanenbaum, “Computer Networks,” 4th ed. (2002) (“Tanenbaum”)
Ex.1027	Behrouz A. Forouzan, “Data Communications and Networking,” (3 rd ed. 2003) (“Forouzan”)
Ex.1029	Prabhakar Chitrapu, et al., “Wideband TDD: WCDMA for the Unpaired Spectrum,” (2004) (“Chitrapu”)
Ex.1030	U.S. Patent No. 7,519,390 (“’390 patent”)
Ex.1031	U.S. Patent No. 6,351,460 (“’460 patent”)

5. In forming the opinions expressed below, I have considered:

the documents listed above;

the relevant legal standards, including the standard for obviousness, as

explained to be by counsel, and any additional authoritative documents as

cited in the body of this declaration; and

my own knowledge and experience based upon my work in the field of wireless communication systems as described below.

6. Unless otherwise noted, all emphasis in any quoted material has been added.

II. QUALIFICATIONS AND PROFESSIONAL EXPERIENCE

7. My complete qualifications and professional experience are described in my *Curriculum Vitae*, a copy of which can be found in Exhibit 1014. The following is a brief summary of my relevant qualifications and professional experience.

8. My academic and professional background is in electrical engineering and computer science, and I have been working in those fields since the completion of my B.S. in electrical engineering almost 50 years ago. The following is a brief summary of my relevant qualifications and professional experience.

9. In 1975, I received a Bachelor of Science in Electrical Engineering and a Bachelor of Science in Chemistry from the University of Illinois at Urbana. In 1977, I received a Masters of Science in Electrical Engineering from Northwestern University in Evanston, Illinois. My master's project was entitled "Digital Filter Implementation Using Cascaded Microprocessors." At the time, microprocessors were a nascent technology and there was great interest in using

them to perform useful digital signal processing operations especially those useful for wireless communications such as digital filtering. Practical speeds of single microprocessors were very limited, and there was great interest utilizing multiple devices simultaneously to collaboratively perform processing functions. My project demonstrated a design and hardware prototype for digital filtering of a signal utilizing three Motorola MC6800 microprocessors simultaneously to take advantage of a nearly three-fold increase in processing speed.

10. In 1981, I received a Ph.D. in Electrical Engineering and Computer Science from Northwestern University in Evanston, Illinois. My dissertation was entitled "Short Range Communication Using Diffusely Scattered Infrared Radiation." This research was related to the use of infrared light to provide communication within an enclosed area. While I focused on communicating speech, the method is also applicable for data communications, for example, as a wireless local area network. The research included a study of scattered light propagation, as well as circuit and system techniques for providing speech supporting multiple simultaneous users. A time division multiple access (TDMA) system with four timeslots was prototyped, providing the capability for two full duplex speech channels.

11. My professional experience begins immediately after I earn my

undergraduate degrees in 1975. At Motorola, I spent the first 15 years working in various research labs as a bench engineer. Almost all of my work during this time period focused on innovating and inventing new technology relating to or using radiocommunication systems, including cellular, public safety and private mobile systems.

12. Throughout this period, I was involved in what might be termed the transition of analog land mobile radio systems to digital technology. I was researching new systems including new radio access and modulation technologies. Several proposals were designed and prototyped for use with private land mobile radio. These proposals were contemporary with the initial investigations which were a precursor of the first digital cellular system standard occurring in Europe, namely GSM.

13. A key objective of my projects during this period was to provide new radio systems having an extremely high degree of spectrum efficiency. In other words, it was desired to serve the largest population of mobile users using as little spectrum as possible. Since reuse of existing spectrum allocations was necessary, maintaining the existing channel spacing that had already been deployed was a critical design factor. Our proposed solutions to addressing these issues involved the use of digital speech coding, both constant envelope and linear modulation

techniques and, again, TDMA. I was actively involved in the design and building of several of these prototype systems. Ultimately, this early work evolved into what became Motorola's successful proprietary dispatch and telephone system called iDEN, which was widely deployed by Nextel.

14. In 1989, I joined the Cellular Infrastructure and Networks Business of Motorola. In this capacity, I was responsible for ensuring the highest level of performance of Motorola's cellular infrastructure deployments. The first two years here were directed specifically to addressing unique technology issues facing the GSM product development communities. While I was in the infrastructure group, this team embraced a much broader systems view and thus addressed problems that would also be of significance to the group developing the mobile devices as well. Activities undertaken were often relevant to both the infrastructure and mobile development camps. For example, my participation in the channel equalizer activities provided results which were utilized in both base and mobile stations equipment.

15. Following the GSM activity, I became involved in numerous other digital cellular systems throughout the remainder of my career at Motorola. These include USDC (IS-54 and IS-136), CDMA (IS-95), W-CDMA (also known as 3G or UMTS) as well as LTE (Long Term Evolution also known as eUTRA [evolved

UMTS Terrestrial Radio Access] and often characterized as 4G). From time to time either I, or engineers reporting to me, participated in various standards activities, both domestic and international.

16. This work transitioned in the early 1990s to digital cellular applied research and development on cellular infrastructure and mobile devices. As a senior technologist and leader, first in the cellular infrastructure division and subsequently the mobile device division at Motorola, I was a significant participant and contributor to the development of new and evolving digital systems. Some of these evolutions included the adoption of functional improvements, continuing quality improvements, system generation advancement, etc.

17. As a senior level technologist, I was personally working on technology to advance, evolve, and improve the various digital cellular systems deployed throughout the world. I was also directing several worldwide research organizations working on digital cellular technology to create novel and enhanced cellular communications products and techniques. In 1997, I became the Vice President of Technical Staff and Director of Research and Advanced Technology in Motorola's Cellular Infrastructure and Networks division.

18. In 1998, I transferred organizations at Motorola to become Vice President of the Technical Staff, Office of the Chief Technology Officer, in the

mobile devices business. In this role, I provided leadership and strategic directions for the adoption and creation of new technology for handheld devices. In this position, in addition to providing ongoing technology proposals for advancing and improving digital cellular performance and functionality, I formulated strategy for the creation and adoption of new technologies relevant to mobile devices and wireless systems generally. I directly supervised and worked with engineers in the United States and Europe in developing technology focused on radio layer and signaling protocols. As part of this work, we developed and provided technical contributions to industry standards organizations.

19. In 2006, I accepted a position at Motorola as Vice President of the Technical Staff, Corporate Law Department, Patent Operations. In this role, my responsibilities included working with technology teams throughout Motorola to create, manage and maintain strategically important technology, patent portfolios and patent review committees. This included responsibility for decision making on patent filings, annuities, acquisitions and divestitures; formulating technology patent portfolio strategy; and continuing to oversee the protection of intellectual property across all Motorola's business entities. In this role, I created technology portfolio strategy across businesses including quantitative goals for new and retained intellectual property assets. I also managed processes and corporate-wide teams related to creating and maintaining patent portfolios. I served in this position

until I left Motorola in 2009.

20. As part of my activities over the years at Motorola, I served as a chairman or member of several patent review committees. Patent committees are groups of the most senior technologists from within an organization or technology area. These committees are charged with the responsibility to evaluate patentable ideas submitted from all engineers and make recommendations about whether the idea warrants the large investment for it to be pursued to obtain a patent.

21. While at many times during my Motorola career I was responsible for supervising other engineers, my key responsibilities were always more technology-related than managerial. My primary responsibilities were always to be actively engaged in technological innovation and, as possible, to provide technical leadership for those individuals I supervised.

22. I received several awards and recognitions within Motorola. I was designated an Associate of the Science Advisory Board in 1982. In 1990, I was recognized as a Dan Noble Fellow, which is the highest recognition given by Motorola to a technologist. I received the Distinguished Innovator Award, Master Innovator Award, a Special Intellectual Property Award for Defensive Contributions, and several "Patent of the Year" awards. "Patent of the Year" awards are presented to Motorola inventors whose patents are demonstrated to

have had significant business impact, such as resulting in significant patent licensing revenue or a major business impacting product improvement.

23. At various times during my Motorola employment, I was also an active TIA and 3GPP standards organization participant representing Motorola. I received several standards impact awards.

24. I created MDK Consulting, Inc. in 2009 when I left Motorola. As President of MDK Consulting, Inc., I serve as a consultant and expert regarding intellectual property analysis, portfolio management and technology strategy relating to aspects of wireless communications technology including systems and products. In addition to my consulting activities, I have served as an expert for a variety of patent-related litigations and arbitrations relating to various aspects of wireless communications technology.

25. I have been a member of the Institute of Electrical and Electronics Engineers (IEEE) for 43 years. In 1995, I received the IEEE Vehicular Technology Society's "Avant Garde" recognition "for pioneering leadership and continuing contributions in promoting new technology in the field of vehicular communications and electronics." In 2005, I was designated a Fellow of the IEEE "for contributions to cellular mobile radio communications." I am also a member of the Eta Kappa Nu and Tau Beta Pi engineering honors societies. In addition to

my industry experience, I have taught electrical engineering courses at Northwestern University as an Adjunct Professor in various wireless technologies.

26. I am a listed inventor on approximately 134 issued U.S. patents and over 500 issued patents worldwide in areas including signal processing, data compression, communications, and wireless systems. I have also authored published articles and presented at several public conferences.

27. Additional detailed information regarding my background, experience, and professional qualifications may be found in the attached Curriculum Vitae. My *Curriculum Vitae* (Ex. 1014) lists my publication record in archival journals, international conferences, and workshops and further includes a list of granted patents.

28. My technical background has addressed private/public wireless systems, base/mobile hardware and software, algorithms, networking and protocols, signal processing, software/hardware design methodologies, antennas and cybersecurity. Based on my experience and education, I consider myself to be an expert at least in the fields of telecommunications, cellular networking, infrastructure, and mobile devices. As of the earliest priority date of the '500 patent, I was at least a person of ordinary skill in the art, and I had personal knowledge of the technologies utilized therein.

III. LEVEL OF ORDINARY SKILL IN THE ART

29. I understand there are multiple factors relevant to determining the level of ordinary skill in the pertinent art, including (1) the levels of education and experience of persons working in the field at the time of the invention; (2) the sophistication of the technology; (3) the types of problems encountered in the field; and (4) the prior art solutions to those problems.

30. I have been informed that the earliest alleged priority date for the '500 patent is August 12, 2004.

31. A person of ordinary skill in the art ("POSITA") in the field of the '500 patent, as of its alleged priority date in August 2004, would have been someone knowledgeable and familiar with the wireless communications systems that are pertinent to the '500 patent. That person would have a bachelor's degree in electrical engineering, computer engineering, computer science, or equivalent training, and approximately two years of experience working in the field of wireless communication systems or design of similar communication systems. Lack of work experience can be remedied by additional education, and vice versa.

32. For purposes of this Declaration, in general, and unless otherwise noted, my statements and opinions, such as those regarding my experience and the understanding of a POSITA generally (and specifically related to the references I consulted herein), reflect the knowledge that existed in the field as of the alleged

priority date of the '500 patent (i.e., August 12, 2004). Unless otherwise stated, when I provide my understanding and analysis below, it is consistent with the level of a POSITA prior to the alleged priority date of the '500 patent.

IV. RELEVANT LEGAL STANDARDS

33. I am not an attorney. In preparing and expressing my opinions and considering the subject matter of the '500 patent, I am relying on certain basic legal principles that counsel have explained to me. These principles are discussed below.

34. I understand that prior art to the '500 patent includes patents and printed publications in the relevant art that predate the priority date of the alleged invention recited in the '500 patent.

35. I have been informed that a claimed invention is unpatentable under 35 U.S.C. § 103 if the differences between the invention and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which the subject matter pertains. I have also been informed by counsel that the obviousness analysis takes into account factual inquiries including the level of ordinary skill in the art, the scope and content of the prior art, and the differences between the prior art and the claimed subject matter.

36. I have been informed by counsel that the Supreme Court has

recognized several rationales for combining references or modifying a reference to show obviousness of claimed subject matter. Some of these rationales include the following: (a) combining prior art elements according to known methods to yield predictable results; (b) simple substitution of one known element for another to obtain predictable results; (c) use of a known technique to improve a similar device (method, or product) in the same way; (d) applying a known technique to a known device (method, or product) ready for improvement to yield predictable results; (e) choosing from a finite number of identified, predictable solutions, with a reasonable expectation of success; and (f) some teaching, suggestion, or motivation in the prior art that would have led one of ordinary skill to modify the prior art reference or to combine prior art reference teachings to arrive at the claimed invention.

V. THE '500 PATENT

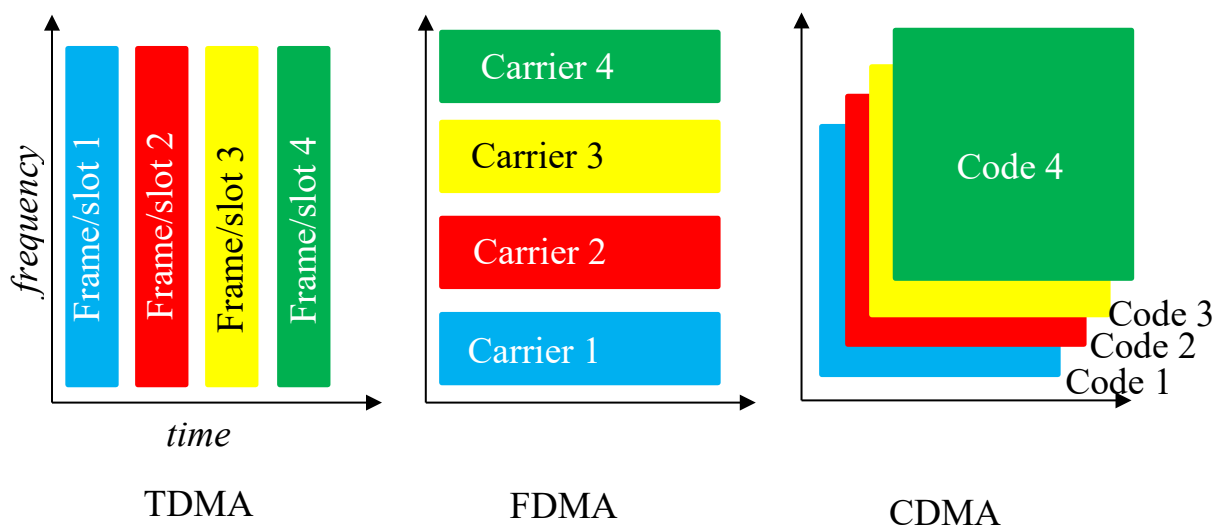
A. Technological background

1. Multiple Access Protocol for Enhanced Cellular Communication: Code Division Multiple Access (CDMA)

37. Multiple mobile devices (e.g., cell phones) typically need to communicate through the same medium (air space) to the same node (base station on a cell tower). With many devices sharing one communication medium, it is important to prevent and/or correct for interference from other mobile devices

trying to communicate at the same time. A “multiple access” protocol provides a way for those mobile devices to receive and transmit data on the same medium while keeping collisions and interference to a minimum. Tanenbaum, 247-251 (explaining challenges with providing multiple users access to a common link, and summarizing different types of multiple access solutions); Forouzan, 311-313 (same).

38. The multiple access protocol underlying Third Generation (3G) cellular communications is called Code Division Multiple Access (CDMA). Tanenbaum, 162, 166-167; Forouzan, 419-420. CDMA is different from other multiple access protocols which simply assign different time and/or frequency resources to different users. For instance, Time Division Multiple Access (TDMA) allocates separate time periods (e.g., time frames, slots), and Frequency Division Multiple Access (FDMA) allocates separate frequency resources (carriers). Tanenbaum, 162; Forouzan, 321. But CDMA allows multiple wireless devices to communicate in the same frequency band and at the same time by using unique codes. Tanenbaum, 162-165; Forouzan, 321-324. The figure below illustrates how TDMA, FDMA, and CDMA use time division, frequency division, or code division to allow multiple UEs (blue, red, yellow, and green) to communicate with a base station on a cell tower.



39. In CDMA, each user's signal is encoded with a unique spreading code, which includes a series of code bits or "chips." This code spreads the signal across a wide bandwidth. The receiver (base station on the cell tower) uses the same code to decode the signals and associate the decoded signals with each corresponding user. Tanenbaum, 162-163; Forouzan, 321-323 (explaining that both the transmitting device and receiving device use code sequence to transmit and receive data on CDMA channels).

40. This CDMA coding scheme is what allows multiple devices to communicate with the network concurrently without interfering with one another. Because each user's signal is spread over the same frequency spectrum and across time, CDMA increases spectrum efficiency, making it particularly useful in

environments with many simultaneous users, such as mobile networks.

Tanenbaum, 165-167 (explaining advantages of CDMA and its eventual adoption into 3G networks). Its interference mitigation and capacity for handling multiple signals efficiently made CDMA a desirable choice for 3G cellular providers attempting to deliver more advanced services in rapidly growing networks.

2. Third Generation (3G) Cellular: Universal Mobile Telecommunications System (UMTS) and UMTS Terrestrial Radio Access Network (UTRAN)

41. CDMA is the multiple access technology on which 3G cellular communication technologies are built. Two 3G systems were deployed by different providers in the United States: the Universal Mobile Telecommunications System (UMTS), and CDMA2000. Tanenbaum, 167; Chitrapu, 1-4. Both systems are based on CDMA, and systems that are based upon CDMA utilize many similar signaling techniques, such as control signaling techniques. At a high level, both systems had similar goals, e.g. the ability to provide high quality, reliable personal communication of voice and data using economical, compact and long-life battery powered equipment. The techniques / functions utilized for both systems to achieve these goals are very similar— use of advanced and efficient channel coding and modulation schemes, employing accurate synchronization schemes, design of both flexible and tailored high-speed channels with rapid access, use of hard and soft handover, provision for timely and accurate neighbor cell

measurements, as well as high-speed forward and reverse link power control, etc. Hence, in my experience, it was common for engineers working on the respective systems to implement beneficial techniques found in one system in the other system.

42. UMTS, which became the more widely deployed 3G technology compared to CDMA2000, provides high-speed voice, data, and multimedia services. Tanenbaum, 166-168; Chitrapu, 2. The UMTS Terrestrial Radio Access Network (UTRAN) is a component of the radio access network of UMTS. Chitrapu, 5-6. UTRAN is responsible for connecting mobile devices to the core network, managing communications between mobile devices (cell phones) and the UMTS core network, and handling both the radio transmissions and resource allocation. Chitrapu, 5-6.

3. Transmission power control

43. In 3G cellular networks, power control is important for managing interference and ensuring efficient use of the shared spectrum in CDMA systems. The goal of power control is that each device transmits at a power level high enough to maintain a reliable connection, but not too high that it interferes with other users.

44. CDMA systems like UMTS and CDMA2000 rely on a Transmission Power Control (TPC) mechanism. Chitrapu, 114-118. Power control is used to

adjust and regulate the transmission power of both the network device (base station on a cell tower), and the user equipment (UE), which may be a cell phone. For transmission power from the mobile device to the network device (referred to as “uplink”), the base station continuously monitors signals transmitted by the mobile device and assesses quality. Chitrapu, 115-118. Based on this evaluation, the base station sends TPC commands that instruct the mobile device to either increase or decrease its transmission power by discrete, incremental amounts. ’500 patent, 2:28-36. This is referred to as “closed loop” power control.

45. This closed loop feedback mechanism provided real-time transmission power optimization to increase the reliability of communications, reduce interference, and reduce unnecessary power consumption.

B. ’500 patent overview

46. The ’500 patent is directed to uplink power control in a wireless communication system. ’500 patent, 1:23-26. A wireless communication system generally involves a mobile radio (abbreviated as “UE” or user equipment) and a base station. *Id.*, 1:51-60. The ’500 patent background acknowledges the two well-known power control modes, “open loop” and “closed loop.” *Id.*, 1:51-53.

47. “Open loop” power control involves a UE measuring a received signal strength to set its transmission power based on “path loss.” *Id.*, 2:16-27. Path loss

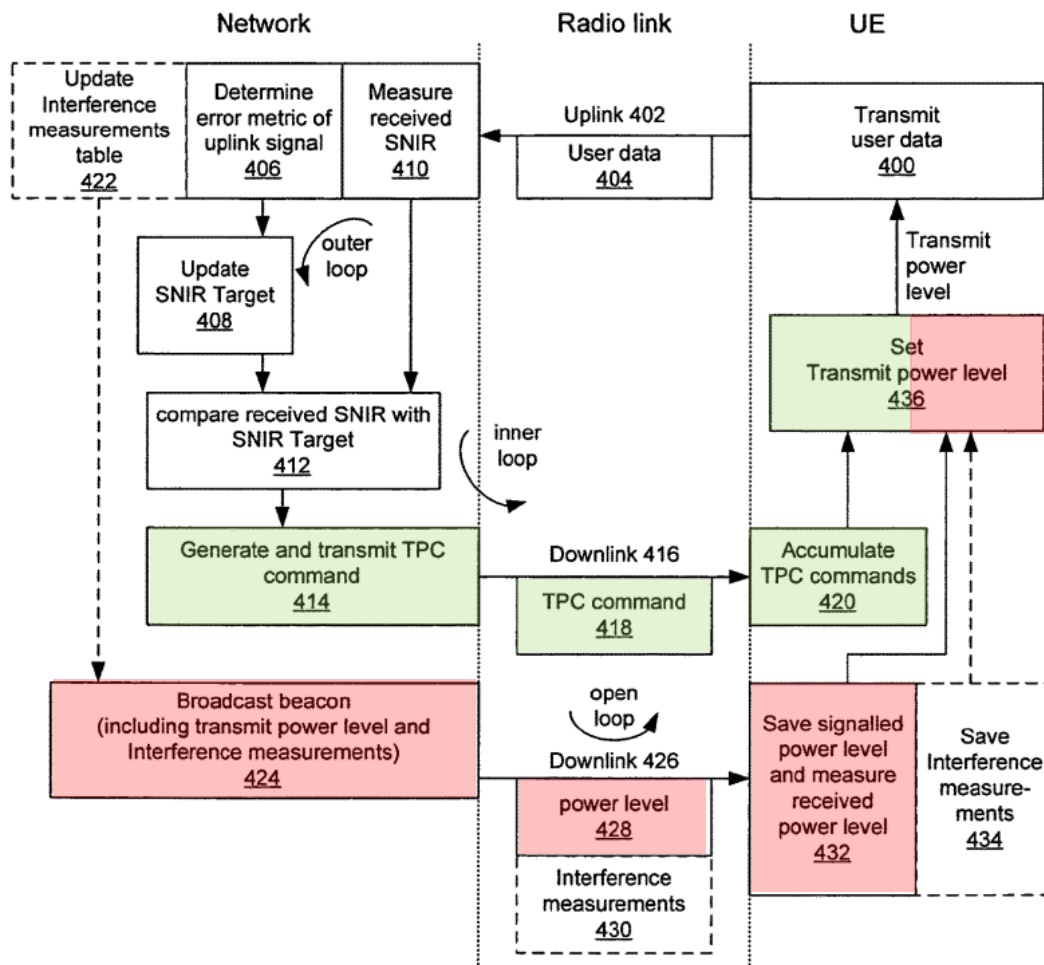
is the “difference between the actual transmit power level and the received signal power level.” *Id.*, 5:1-4. “Closed loop” power control involves the base station issuing transmit power control (TPC) commands to the UE to increase or decrease the UE’s current transmit power—where the UE’s current transmit power was previously adjusted by the previously-received TPC command. *Id.*, 2:28-36. The process of iteratively adjusting the UE’s transmit power with each received TPC command is called “accumulation” of TPC commands. *Id.*, 10:6-28. For example, the ’500 patent describes:

The closed loop scheme also includes an inner loop in which the network measures 310 the received SNIR of the uplink signal 302. The network compares 312 the measured SNIR with the SNIR Target determined in the outer loop. The inner loop generates and transmits 314 a TPC command based on the comparison 312. A downlink signal 316 carries the TPC command 318 over the radio link. The UE accumulates 320 the TPC commands and uses the accumulated TPC commands to set 322 a transmit power for future uplink transmission 300.

’500 patent, 7:29-38. In some cases, “[b]inary signalling may be used, such that the TPC command indicates a change in transmission power by a fixed amount either up or down.” *Id.*, 9:7-9. The ’500 patent notes, without further explanation, that

“[a]lternately, a multi-level TPC command may be used.” *Id.*, 9:9-10.

48. The '500 patent's purported novelty lies in a power control method in which “aspects of both an open loop scheme and a closed loop scheme are strategically combined to form a power control method.” '500 patent, 8:16-19. This purported novelty is illustrated by, for example, Fig. 4, below, with open loop aspects highlighted in red and closed loop aspects highlighted in green. '500 patent, 9:44-46.



'500 patent, Fig. 4 (annotated)

49. As seen above in Fig. 4, the “network generates and transmits 414 a TPC command” and “downlink signal 416 carries the TPC command 418 over the radio link.” *Id.*, Fig. 4, 10:7-12. The UE uses both a path loss calculation and “accumulates 420 the TPC commands and uses the accumulated TPC commands ... to set 436 the transmit power for future uplink transmissions 400.” *Id.*, Fig. 4, 10:11-14, 10:21-33.

50. The ’500 patent explains that in its system “a new physical channel on the downlink may be used to carry fast allocation and scheduling information to a user, thereby informing the UE of the uplink resources that it may use.” ’500 patent, 12:65-13:1. This new physical channel may also “carry TPC commands.” *Id.*, 13:2-5.

51. Despite the specification describing the above combined open loop and closed loop power control scheme, the claims of the ’500 patent do not. Instead, the claims recite a collection of well-known and conventional power control elements: (i) receiving an indication that TPC accumulation is enabled; (ii) receiving scheduling information and a multi-level TPC command on a single physical channel; and (iii) transmitting an uplink signal based on (ii).

VI. CLAIM CONSTRUCTION

52. It is my understanding that in order to properly evaluate the ’500

patent, the terms of the claims must first be interpreted. It is my understanding that for the purposes of this *inter partes* review, the claims are to be given their ordinary and customary meaning as would be understood by one of ordinary skill in the art in light of the specification and prosecution history, unless the inventor has set forth a special meaning for a term.

53. It is my opinion that none of the claim terms require a specific construction for the purposes of my analysis in this declaration, and all will be given their ordinary and customary meaning.

VII. IDENTIFICATION OF HOW THE CLAIMS ARE UNPATENTABLE

54. I have been asked to provide my opinion as to whether the Challenged Claims of the '500 patent would have been obvious in view of the prior art. The discussion below provides a detailed analysis of how the prior art references identified below teach the limitations of the Challenged Claims of the '500 patent.

55. As part of my analysis, I have considered the scope and content of the prior art and any differences between the alleged invention and the prior art. I describe in detail below the scope and content of the prior art, as well as any differences between the alleged invention and the prior art, on an element-by-element basis for each Challenged Claim of the '500 patent.

56. As described in detail below, the alleged invention of the Challenged Claims would have been obvious in view of the teachings of the identified prior art

references as well as the knowledge of a POSITA. I apply the prior art as follows:

Grounds	Claims	Basis (pre-AIA)
#1	11, 15-16, 17, 21-22	35 U.S.C. §103 over Andersson in view of Khan
#2	12-13, 18-19	§103 over Andersson in view of Khan and Baker
#3	14, 20	§103 over Andersson in view of Khan and Dick
#4	11, 15-16, 17, 21-22	§103 over Zeira in view of Khan and Tong
#5	12-13, 18-19	§103 over Zeira in view of Khan, Tong, and Baker
#6	14, 20	§103 over Zeira in view of Khan, Tong, and Dick

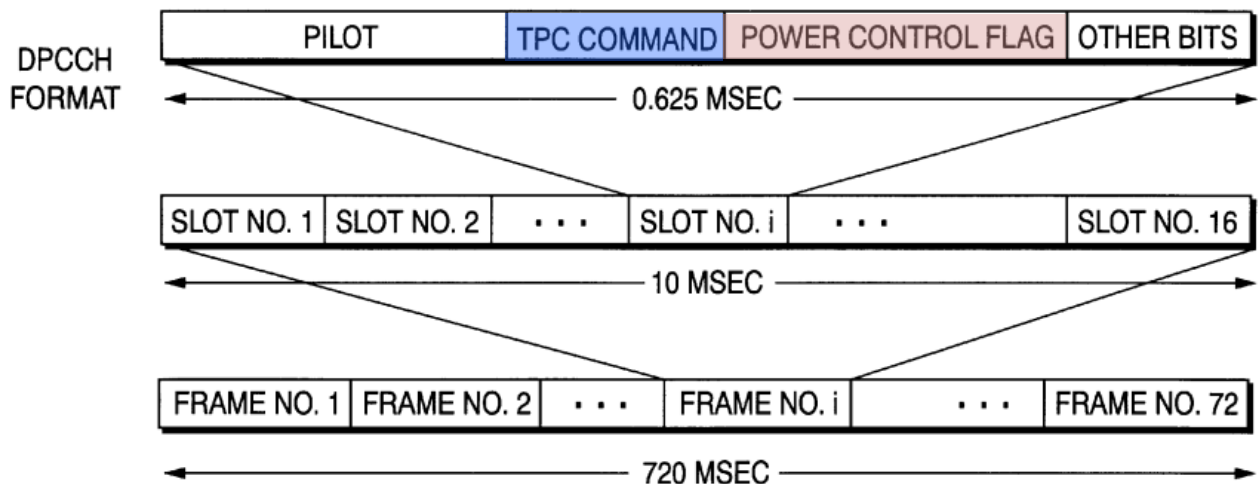
A. Ground 1: Claims 11, 15-16, 17, and 21-22 are obvious over Andersson in view of Khan

1. Andersson

57. Like the '500 patent, Andersson relates to the field of “radio transmission power control” in a CDMA radio communications system. Andersson, 1:6-8. Also like the '500 patent, Andersson recognizes that UE transmit power may be controlled using “open loop power control in combination with a closed loop power control.” Andersson, 3:65-67. Andersson improves upon such combined systems with more efficient power control signaling, including the indication of which power control scheme a UE should employ (where a known

scheme is TPC command accumulation). Andersson, Abstract. Andersson further teaches a UE receiving multi-level TPC commands and controlling uplink transmission power based on such commands. Andersson, 9:33-50, 11:26-28.

58. For example, Andersson teaches using TPC commands with different “bit patterns” to signal different power control adjustment “step sizes”—where the “first step size might be a typical step size change such as plus or minus 1 dB” and the “second step size might correspond to a larger amount, e.g., 8 dB.” Andersson, 9:33-50. Andersson also teaches transmitting to the UE “power control indicator” flag bits along with the TPC command that “indicat[e] which type of power control adjustment should be used by the radio transceiver.” Andersson, 5:50-54, 6:21-27. Andersson’s power control message format is illustrated in Fig. 5, below:



Andersson, Fig. 5 (annotated)

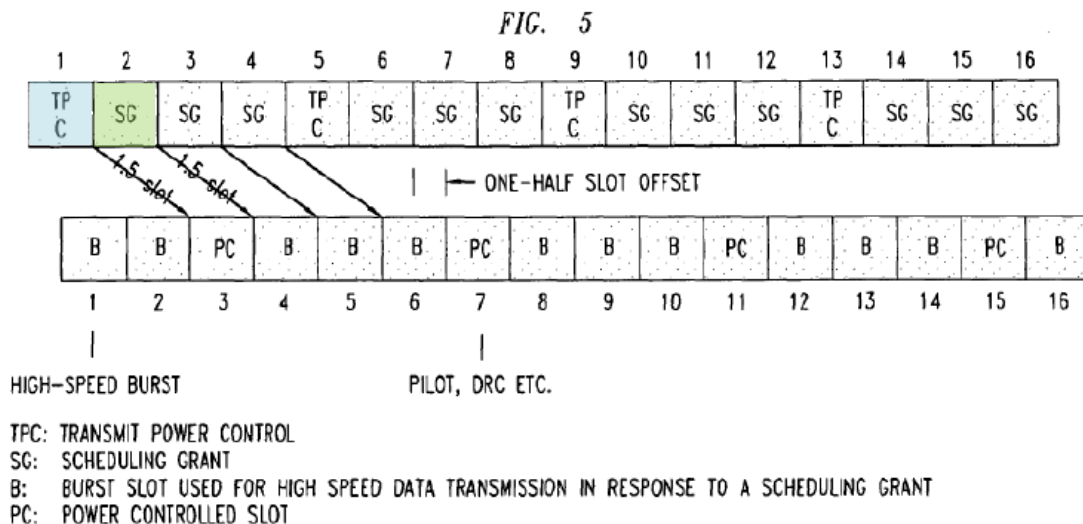
2. Khan

59. Khan discloses, in the context of a CDMA system, a single physical channel over which an allocation of an uplink resource (i.e., a scheduling grant) and a TPC command are transmitted from a base station to a wireless device. *See* Khan, [0003], [0005], [0043], Fig. 5. Thus, Khan improves on power control and scheduling of UE transmissions by teaching a UE that receives scheduling information and TPC commands on a single physical channel.

60. Khan teaches a method of “transmitting control information for reverse link packet access transmission,” which determines how users (e.g., UEs) use uplink resources. Khan, [0012]. The control information transmitted on the forward link (i.e., the downlink) to control reverse link (i.e., uplink) packet access transmission includes both “scheduling grant(s)” and “transport power control (TPC) information.” Khan, [0043]. A scheduling grant would necessarily be an allocation of an uplink resource because the scheduling grant is a resource allocated by a base station to the UE to schedule its uplink transmissions.

61. Khan discloses that this control information may be transmitted from a base station to a UE over the same Walsh channel, which a POSITA would understand is a physical channel. Khan, [0040], [0047]. Khan explains that channels such as the Forward Medium Access Control Channel (“MAC Channel”),

which is a logical channel, “can be composed of Walsh channels that are orthogonally covered and BPSK modulated on a particular phase of the carrier (e.g., either in-phase or quadrature phase).” Khan, [0040]. Khan teaches that “[e]ach Walsh channel is identified by a MACIndex value that is between 0 and 63....” Khan, [0040]. The MACIndex, which identifies the 16 slots in a **single physical channel**, “may, for example, carry the TPC bits in some slots and the **scheduling grant in one or more of the remaining slots**, as shown in FIG. 5.” Khan, [0047]. Khan does this “[i]n order to support both the TPC bits and the scheduling grant dedicated MACIndex transmission simultaneously....” Khan, [0047].



Khan, Fig. 5 (annotated)

3. Reasons to combine Andersson with Khan

a) Analogous art

62. It is my opinion that a POSITA when considering the teachings of Andersson would have naturally considered the teachings of Khan, as Khan is also analogous prior art pertaining to the same field of endeavor as both the '500 patent and Andersson, namely, "mobile radio system or wireless communication system." '500 patent, 1:23-26; Andersson, 1:6-8, 1:12-13; Khan, Abstract. Both Andersson and Khan, like the '500 patent, describe TPC commands sent to a mobile station by a base station in a CDMA radio communications system. '500 patent, Fig. 4; Andersson, 7:16-18, 7:38-41; Khan, [0012], Fig. 5. Furthermore, Andersson and Khan are reasonably pertinent to the problems that arise "[b]ecause all users of a CDMA communications system transmit information using the same frequency band at the same time, each user's communication interferes with the communications of the other users." Andersson, 1:62-65. Both Khan and Andersson seek to solve this problem. Khan, [0011]; Andersson, 5:28-31.

b) Motivation to combine

63. It is my opinion that a POSITA would have been motivated to transmit on Andersson's "dedicated physical control channel (DPCCH)" both the TPC command and an uplink scheduling grant, as taught by Khan, because it would improve Andersson in the same way and require nothing more than the

predictable use of prior art elements according to their established functions.

Andersson discloses both (i) receiving TPC commands from a base station and (ii) transmitting an uplink communication to the base station. Andersson, 9:18-24, 7:5-8. This disclosure would have motivated a POSITA to seek out and utilize the teachings of Khan, which discloses such signaling techniques used by a base station for allocating uplink resources in a spread-spectrum communication system that similarly transmits TPC commands. Khan, Abstract.

64. Several benefits may be obtained by transmitting TPC commands and allocation of an uplink resource over Andersson's "dedicated physical control channel (DPCCH)" (Andersson, 9:18-24), i.e., *single physical channel*, including allowing for a larger number of active wireless units. Khan, [0043], [0047]. Moreover, by combining TPC commands and uplink allocation of an uplink resource in the same control channel (as opposed to provisioning a separate control channel for the allocation of the uplink resource) complexity (and thus power usage) is reduced. Latency is similarly reduced because the UE receiving the control information must process fewer protocol layers and channels to obtain needed uplink control information. Further, a POSITA evaluating how Andersson's UE receives uplink resources would understand that allocation of an uplink resource is control information and naturally belongs within a control channel, such as Andersson's "dedicated physical **control** channel (DPCCH)".

Consequently, a POSITA would only need the technique, not the entire structure, from Khan that TPC commands and allocation of an uplink resource could be communicated in the same channel to implement the technique in Andersson. Thus, a POSITA would have naturally found it obvious to utilize Khan's technique that results in efficient use of channel resources within Andersson's system to achieve the same benefits.

c) Reasonable expectation of success

65. Not only would utilizing Khan's technique in Andersson's system have been advantageous, but a POSITA would have also found the combination predictable and would have had a reasonable expectation of success. First, Andersson notes that "detailed descriptions of well-known methods, interfaces, devices, and **signaling techniques** are omitted so as not to obscure the description of the present invention." Andersson, 7:12-15, 9:18-22. The details of how Andersson's system signals uplink scheduling grants is one of the well-known techniques not described. But both Andersson and Khan utilize CDMA techniques, so techniques in one would be beneficial and applicable in the other, as described above in V.A.2. As mentioned, there is a high degree of commonality in techniques and functions in the technologies used for different air interfaces. A POSITA would naturally look to similar related CDMA systems for possible improvements and methods that could be imported to achieve improved performance and

capabilities. A POSITA would have thus naturally expected to be successful applying well-known signaling techniques such as Khan's—especially in view of Andersson's statement that it utilizes “*well-known CDMA techniques* [] to distinguish between the various mobile station and base station communications.” Andersson, 7:46-54. For example, with respect to an example implementation of the combination, Andersson recognizes that “other bits” may be transmitted along with the TPC command and power control indicator in the dedicated physical control channel (DPCCH). Andersson, 9:14-21. A POSITA would have found it obvious that those other bits may include a scheduling grant as described by Khan. Furthermore, a POSITA would have understood the benefit of applying Khan's teaching of TPC commands and allocation of uplink resources communicated on the same channel in Andersson.

4. Claim 11

[11.0] *A user equipment (UE) comprising:*

66. Andersson discloses a “mobile radio cellular communications system 10” that includes “mobile stations” (*user equipment*) in communication with base stations, as illustrated in Fig. 1. Andersson, 7:16-17, 7:38-41, Fig. 1.

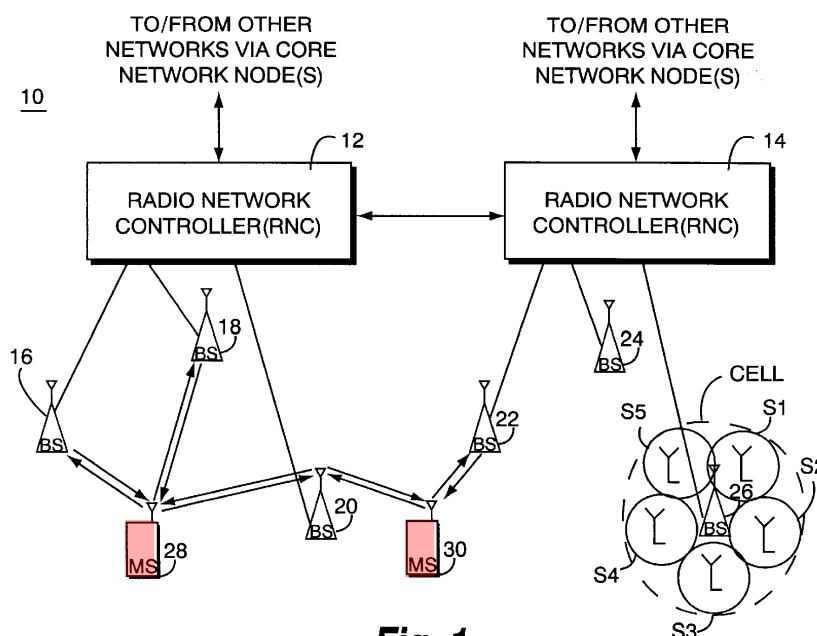


Fig. 1

Andersson, Fig. 1 (annotated)

67. The '500 patent recognizes that a “**mobile radio** ... may also be referred to as a ... *user equipment (UE)*.” ‘500 patent, 1:56-59. Thus, Andersson teaches a *user equipment*.

[11.1] a transmitter; a receiver; a processor operatively coupled to the transmitter and the receiver,

68. As illustrated in Fig. 3, annotated below, Andersson teaches that its *UE* includes a *transmitter* 90 (red), a *RAKE receiver* 82 (green), and a controller 80 (*processor*) (blue). Ex.1009, 8:23-28. The controller 80 is “**connected to**” the *RAKE receiver* 82, and the *transmitter* 90.” Andersson, 8:23-26.

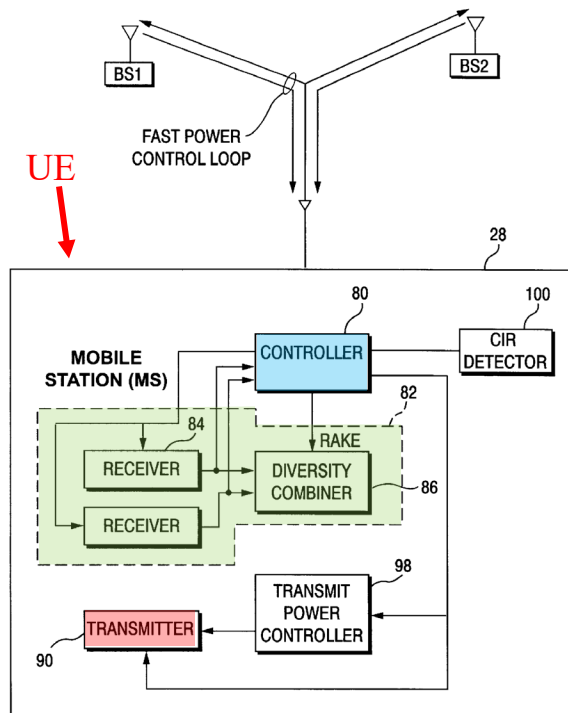


Fig. 3

Andersson, Fig. 3 (annotated)

69. With respect to the controller 80 (*processor*), Andersson explains that a controller is so-named because it controls the overall operation of wireless equipment, including the establishment and release of radio connections. *See* Andersson, 8:6-8 (describing that the purpose of the equivalent “controller” of the base station is to “control[] the overall operation of the base station as well as the establishment, maintenance, and release of radio connections”). This description of a controller controlling the operation of the receiver and transmitter of the base station, including the establishment and release of radio connections, is consistent with the operation of a UE’s controller, as well documented in the prior art. For

example, the substantially similar UE controller 223 described in US 6,351,460 “contains all the functionality required to control both receiver 230 and transmitter 202.” ’460 patent, 7:17-18.

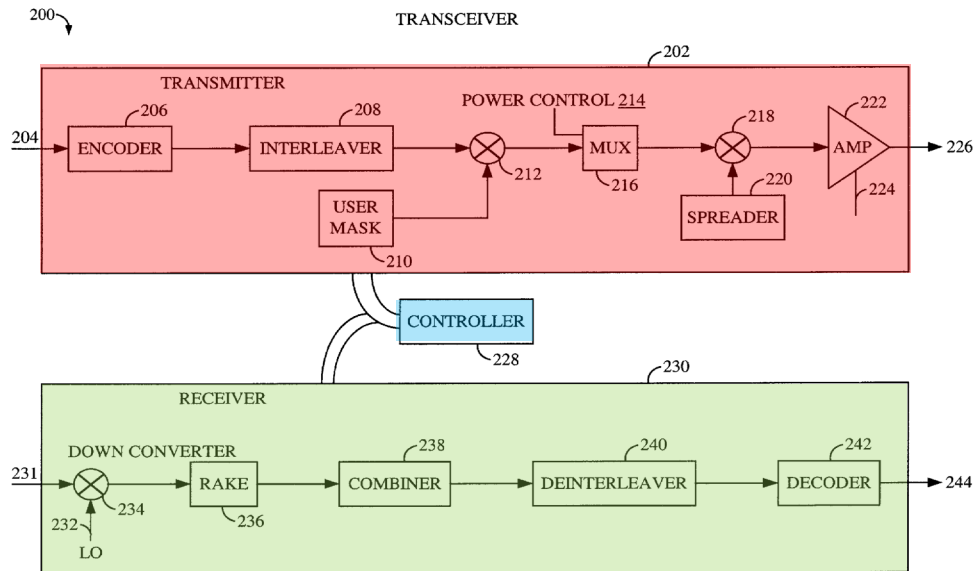


FIG. 2

’460 patent, Fig. 2 (annotated)

70. Accordingly, a POSITA would have at least found it obvious that the controller 80 meets the claimed *processor* because the *processor* is “*configured to have the transmitter transmit*”—i.e., the *processor* controls the *transmitter*, which is the function of controller 80. I note that this is especially true given that the ’500 specification does not describe or mention a “processor.”

71. In addition to the above, a POSITA would have found it obvious that

the controller 80, CIR detector 100, and transmit power controller 98 together form a baseband *processor* (in blue).

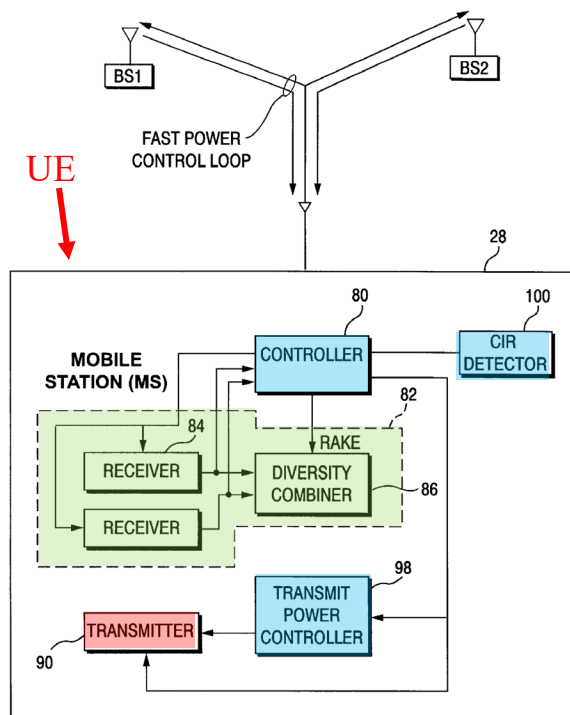
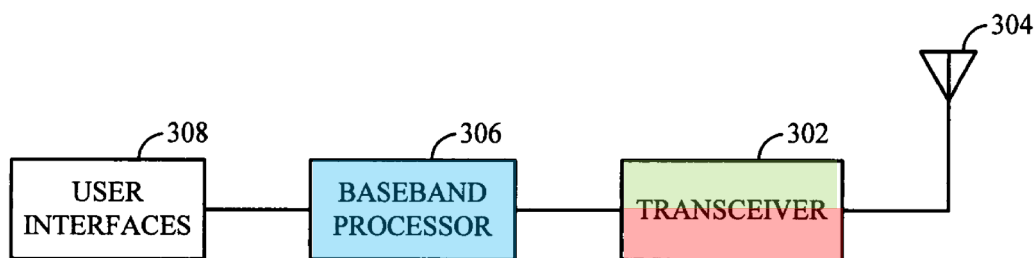


Fig. 3

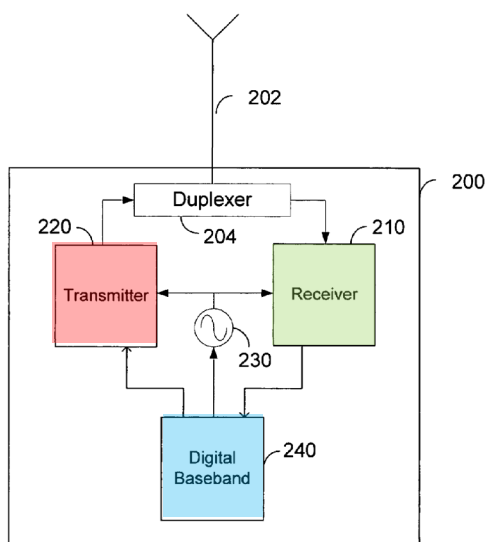
Andersson, Fig. 3 (annotated)

72. In general, to participate in wireless communication, devices, such as UEs, include some means of receiving signals (i.e., a *receiver*), some means of processing the data and/or control information in the received signals and preparing other data and/or control information for transmission (i.e., a *processor*) and means of transmitting signals (i.e., a *transmitter*). A POSITA at the priority date of the '500 patent would understand that a mobile phone includes a

transmitter, an RF interface, and a processor in communication with the RF interface as they are basic and fundamental components of a mobile phone that are necessary to communicate over a telecommunications network. It is also well known that a processor / controller is required to interact via connections to and from the receiver and transmitter to enable a UEs overall desired functionality. Such control is often provided by use of a microcomputer, microcontroller or microprocessor and is often simply called a processor. Such a processor provides a multitude of functions, including analyzing data that is received, deciding what should be transmitted, controlling the transmission power, sequencing through the various UE states, just to name a few. Thus, it was well known in the art that a standard UE (like Andersson's) includes a baseband processor to process the signals received and transmitted via the receiver and transmitter, as illustrated in contemporaneous literature. Krishnan, 6:1-2 (received and transmitted signals "processed" by the baseband processor); '390 patent, 7:1-20 (same).



Ex.1006, Fig. 3 (annotated)



'390 patent , Fig. 2 (annotated)

73. A baseband processor typically includes multiple functional elements, like Andersson's, that are implemented as hardware or software with microprocessors and/or digital signal processors to carry out the various signaling processing. Krishnan, 5:34-55; '390 patent, 4:28-31, 15:35-38.

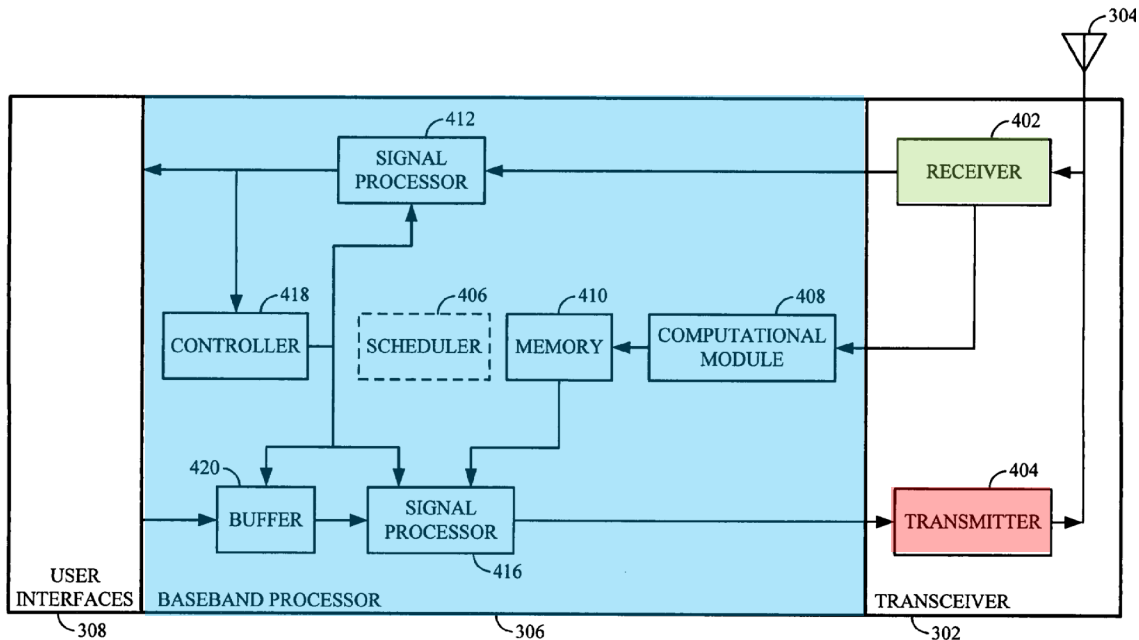


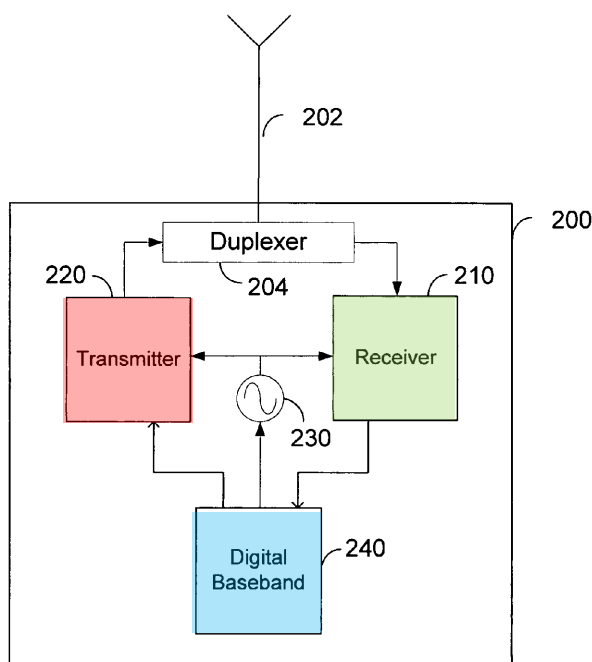
FIG. 5

Krishnan, Fig. 5 (annotated)

74. Andersson's controller 80, CIR detector 100 and transmit power controller 98 together process the signals received from the RAKE receiver 82 and transmitted by the transmitter 90 in the manner recited in the remaining limitations of claim 11. *See, infra*, elements [11.2]-[11.5]. Accordingly, consistent with the well-understood configuration of a UE, Andersson's controller 80 and/or controller 80, CIR detector 100 and transmit power controller 98 render obvious the recited processor.

75. A similar structure is shown in Fig. 2 of the '390 patent, annotated below, where a receiver 210 (green) and transmitter 220 (red) are coupled to a digital baseband portion 240 (blue). "The **output of the receiver can be coupled**

to a **digital baseband portion**. The digital baseband portion can include **one or more baseband processors** on one or more integrated circuits.” ’390 patent, 4:28-31. “The digital baseband portion 240 can **perform the majority of the signal processing** on the received signal.” ’390 patent, 7:1-2. With the received signals, the digital baseband portion can “recover the underlying information bits that **can be used within the transceiver**.” ’390 patent, 7:6-9.



’390 patent , Fig. 2 (annotated)

76. Yet another similar structure is shown in Fig. 2 of the ’460 patent, annotated below, where a “[c]ontroller 228 [blue] contains all the functionality required to control both receiver 230 [green] and transmitter [red] 202. ’460 patent,

7:17-18. In one example, an amplifier's 222 "power output level 226 is controlled by controller by way of power control signal input 224." '460 patent, 6:51-53.

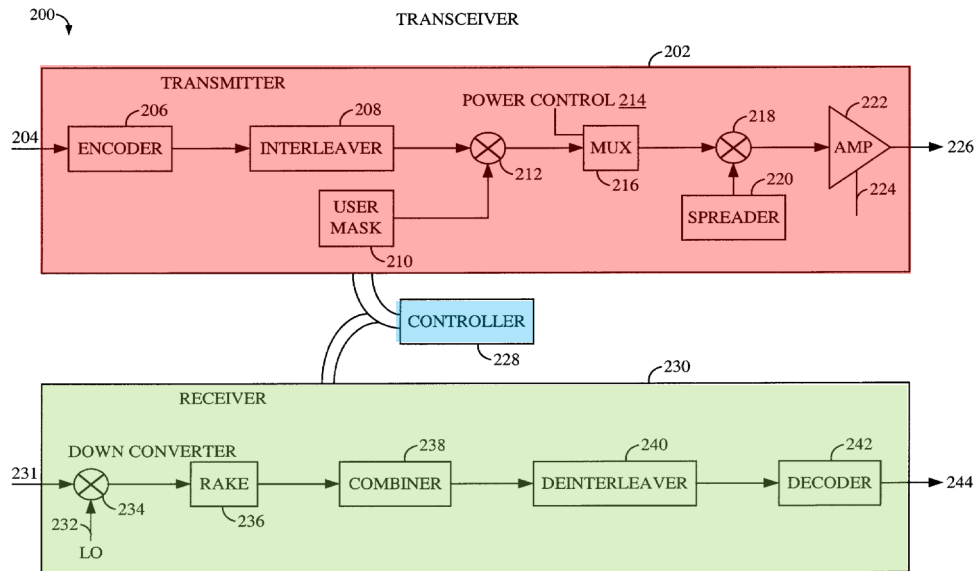


FIG. 2

'460 patent , Fig. 2 (annotated)

77. Thus, Andersson renders obvious *a transmitter* (transmitter 90), *a receiver* (receiver 82), and a *processor* (controller 80, etc.) connected (*operatively coupled*) to the transmitter and the receiver.

[11.2] the processor and the receiver are configured to receive, on a single physical channel, an allocation of an uplink resource and a multi-level transmit power control (TPC) command;

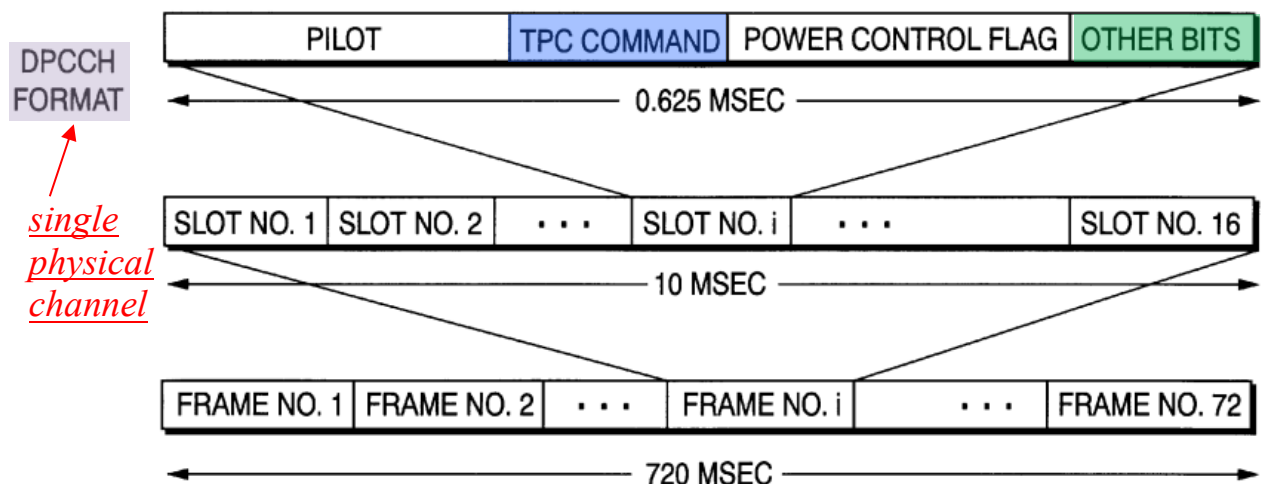
78. The combination of Andersson and Khan renders obvious limitation [11.2]. As discussed in [11.1], Andersson's controller 80 (*processor*) controls the receiver 82 and transmitter 90. Ex.1009, 8:6-8. Consequently, signals with control

information, such as an *allocation of an uplink resource and a multi-level transmit power control (TPC) command*, received by the receiver would be communicated to the controller 80, so that controller may control the UE based on the information in the control signal.

79. As an initial matter, I note that Andersson’s UE controller 80 (part of the UE’s baseband *processor*) controls the overall operation of the UE, including the establishment and release of radio connections. *See* Andersson, 8:6-8 (describing that the purpose of the equivalent “controller” of the base station is to “control[] the overall operation of the base station as well as the establishment, maintenance, and release of radio connections”). A controller in a UE would, similar to the controller of a base station, control the overall operation of the UE including the establishment, maintenance, and release of radio connections. Furthermore, these actions of the controller are the actions of a baseband *processor*, as described above with respect to Krishnan. A POSITA would thus find it obvious that the UE’s controller 80 is *configured to receive* (element [11.2]), *determine* (element [11.3]), and *have the transmitter transmit* (element [11.5]).

80. Andersson’s Fig. 5 (below) illustrates a “**dedicated physical control channel (DPCCH)**” (*single physical channel*) received by the UE that includes “a **traffic power control (TPC) command** which may include a **command to**

increase, decrease, or maintain transmit power, a power control indicator or flag, and other bits.” Andersson, 9:11-24, Fig. 5. The basic characteristics of the different channel types in W-CDMA, for example, would be well understood by a POSITA at the ’500 priority date. A POSITA would understand the DPCCH is a single channel because it can be described to reside on a specific carrier frequency, use specific scrambling and channelization codes, and be transmitted with known temporal characteristics.



Andersson, Fig. 5 (annotated)

81. Andersson explains that the receivers with the RAKE receiver 82 receive “transmissions from base stations” (such as the DPCCH), which are then “processed” by the other components of the UE. Ex.1009, 8:31-34. For example, the “controller [*processor*]...receiv[es] from the radio network transmit power

control commands.” Ex.1009, 14:49-51.

82. Andersson teaches that the “TPC commands may include one or more bits which indicate a desired increase in transmit power, a desired decrease in transmit power, or in some cases no change in transmit power.” Andersson, 8:45-48. In one embodiment, the TPC command is a *multi-level TPC command* with different “bit patterns” to signal different power control adjustment “step sizes.” Andersson, 9:33-50. For example, the “first step size might be a typical step size change such as plus or minus 1 dB” and the “second step size might correspond to a larger amount, e.g., 8 dB.” Andersson, 9:33-50.

83. Andersson’s Table 1 illustrates the difference between this type of variable step size scheme (“Second Scheme”) and a fixed scheme in which “the power adjustment is a change of 1 dB each time slot” (“First Scheme”). Andersson, Table 1, 10:40-57.

Power control scheme	Slot 1	Slot 2	Slot 3	Slot 4	Slot 5	Slot 6	Slot 7	Slot 8
First scheme	1 dB	1 dB	1 dB	1 dB	1 dB	1 dB	1 dB	1 dB
Second scheme	2 dB	2 db	4 db	4 db	8 dB	8 dB	4 dB	4 dB

Andersson, Table 1.

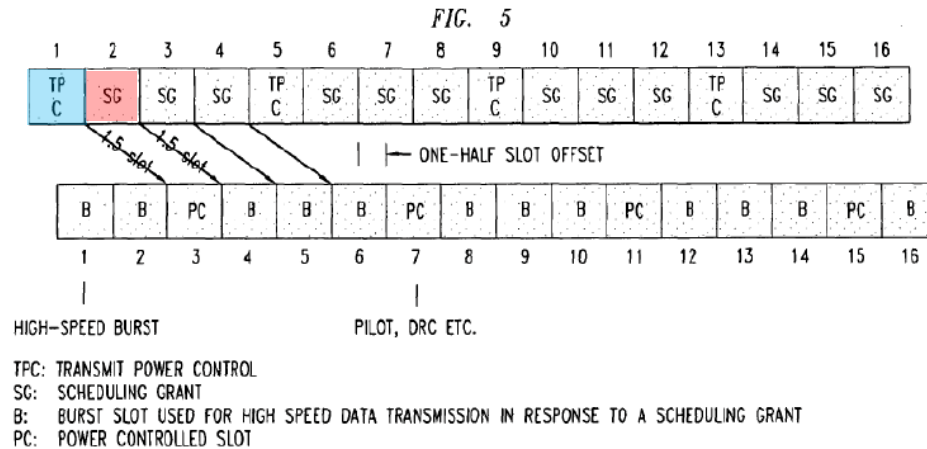
84. Accordingly, Andersson’s multi-bit TPC command—with different bit patterns indicating different power step sizes—is at least an example of the

recited *multi-level TPC command* for multiple reasons, at least including that (i) the multi-bit command indicates more than a binary change (up or down), (ii) the indicated power step size is not fixed, and (iii) the step size may be greater than 1 dB. See ‘500 patent, 9:7-10 (stating only that a multi-level TPC command can be an alternative to “[b]inary signalling...such that TPC command indicates a change in transmission power by a fixed amount either up or down”).

85. Thus, Andersson teaches a UE’s receiver and controller receiving from a base station, on the DPCCH, a multi-level TPC command. Consequently, Andersson renders obvious “*the processor and the receiver are configured to receive, on a single physical channel, ... a multi-level transmit power control (TPC) command.*”

86. To the extent Andersson does not explicitly teach receiving “*an allocation of an uplink resource*” on the same single physical channel as its multi-level TPC command, it would have been obvious to a POSITA for Andersson’s “other bits” in the DPCCH (*single physical channel*) to include an uplink resource, as discussed above in Section VII.A.3. Indeed, these aspects were well known to POSITAs as illustrated by Khan, for example. *For example*, Khan’s Fig. 5, reproduced below, shows scheduling grants (“SG”; example annotated in red) multiplexed on the same Walsh channel (physical channel) as TPC bits (“TPC”;

example annotated in blue).



Khan, Fig. 5 (annotated)

87. Khan discloses “a method for transmitting control information, including [] at least one scheduling grant(s), and/or transmit power control (‘TPC’) information, for reverse link [(uplink)] packet transmission...” Khan, [0043], [0003], [0032]. A POSITA would recognize that “scheduling grants” are the claimed *allocation of an uplink resource* because they designate a particular time or rate at which a UE may transmit on the uplink. Khan, [0033], [0035].

88. Khan further illustrates that it was known for scheduling grants for uplink resources and TPC commands to be sent to the UE on the same *single physical channel*. Specifically, Khan discloses, in the context of a Walsh channel (physical channel):

In order to support both the TPC bits and the scheduling grant dedicated MACIndex transmission simultaneously,

orthogonal Walsh covers may be needed. However, it may also be possible to time-multiplex the TPC bits and the scheduling grant MACIndex or MACIndex may, for example, **carry the TPC bit in some slots and the scheduling grant in one or more of the remaining slots**, as shown in FIG. 5.

Khan, [0047]. As explained above, it would have been obvious to similarly transmit Andersson's multi-level TPC command and a scheduling grant on Andersson's DPCCH (*single physical channel*).

89. Thus, Andersson's teaching of its UE receiving from the base station on the DPCCH (*single physical channel*) a *multi-level TPC command* and other bits in view of Khan's teaching of its UE receiving a scheduling grant (*allocation of an uplink resource*) and TPC command on a single physical channel, renders obvious "*the processor and the receiver are configured to receive, on a single physical channel, an allocation of an uplink resource and a multi-level transmit power control (TPC) command.*"

[11.3] wherein the processor is further configured to determine a transmission power level based on a value of the multi-level TPC command out of a plurality of potential values for the multi-level TPC command;

90. The combination of Andersson and Khan renders obvious limitation [11.3].

91. As described above in [11.2], Andersson teaches a multi-level TPC

command with “different power control command bit patterns” that correspond to pre-defined step sizes: “[t]he first step size might be a typical step size change such as plus or minus 1 dB. The second step size may correspond to a larger amount, e.g., 8 dB.” Andersson, 9:33-50. Thus, Andersson’s multi-level TPC command could potentially have four different values, one of which is included in the multi-level TPC command received at the UE.

92. Andersson describes “controlling the transmit power level of a mobile station transmitting in the uplink direction.” Andersson, 11:26-28. Specifically, the mobile station receives and detects the TPC command and power control indicator **and makes the appropriate adjustment to its transmit power based thereon.**” Andersson, 12:45-48. The controller in the mobile station makes this adjustment: “wherein the controller is configured to adjust the transmit power level of the transmitter.” Andersson, 14:56-57. Adjusting the transmit power level would require the controller to use the TPC command and power control indicator to calculate the target transmission power level to make the appropriate adjustment. Andersson further teaches that the “base station” selects one of these values to indicate a “desired” power change. Andersson, 8:42-48; 9:50-54 (a mobile station may be “commanded to change its transmit power by the larger step size amount”). Therefore, Andersson teaches “*the processor is further configured to determine a transmission power level based on a value of the multi-level TPC command out of*

a plurality of potential values for the multi-level TPC command.”

[11.4] wherein the plurality of potential values for the multi-level TPC command includes at least two values up or at least two values down;

93. As described above in [11.2] and [11.3], Andersson teaches a multi-level TPC command with bit patterns corresponding to *at least two values up and at least two values down*: “plus or minus 1 dB” and plus or minus “8 dB.”

Andersson, 9:33-50.

[11.5] wherein the processor is configured to have the transmitter transmit an uplink signal on the allocated uplink resource at the determined transmission power level.

94. The combination of Andersson and Khan renders obvious limitation [11.5]. As discussed in [11.1], Andersson’s controller 80 (*processor*) controls the transmitter 90. Andersson, 8:6-8.

95. As described above in [11.3], Andersson teaches “controlling the transmit power level of a mobile station transmitting in the uplink direction.” Andersson, 11:26-28. The mobile station receives and detects the TPC command and power control indicator **and makes the appropriate adjustment to its transmit power based thereon.** Andersson, 12:45-48. The controller (*processor*) in the mobile station makes this adjustment: “wherein the controller is configured to adjust the transmit power level of the transmitter.” Andersson, 14:56-57.

96. Further, Andersson’s mobile stations would transmit *an uplink signal*

on the allocated uplink resource because “[i]n a cellular communications system, a mobile radio station communicates over an **assigned** radio channel with a radio base station.” Andersson, 1:12-14. Indeed, these aspects were well known to POSITAs as taught by Khan, for example, Khan describes “a wireless unit transmit[ting] a packet in the R-SCH frame on the RL [(reverse link)],” where “the **transmission of the packet is performed in response to a scheduling grant** message on the FL [(forward link)].” Khan, [0036], [0003].

97. Thus, Andersson’s teaching of transmitting an uplink signal over an assigned radio channel based on the multi-level TPC command in view of Khan’s teaching of transmitting an uplink signal based on the received scheduling grant renders obvious “*wherein the processor is configured to have the transmitter transmit an uplink signal on the allocated uplink resource at the determined transmission power level.*”

5. Claim 17

[17.1] A method comprising: receiving, by a user equipment (UE) on a single physical channel, an allocation of an uplink resource and a multi-level transmit power control (TPC) command;

98. Claim 17 is a substantially similar method version of claim 11. This limitation is substantially similar to the limitation of [11.2], and for the same reasons, the prior art renders this limitation obvious.

[17.2] determining, by the UE, a transmission power level based on a value of the

multi-level TPC command out of a plurality of potential values for the multi-level TPC command;

99. This limitation is substantially similar to the limitation of [11.3], and for the same reasons, the prior art renders this limitation obvious.

[17.3] wherein the plurality of potential values for the multi-level TPC command that includes at least two values up or at least two values down;

100. This limitation is substantially similar to the limitation of [11.4], and for the same reasons, the prior art renders this limitation obvious.

[17.4] transmitting, by the UE, an uplink signal on the allocated uplink resource at the determined transmission power level.

101. This limitation is substantially similar to the limitation of [11.5], and for the same reasons, the prior art renders this limitation obvious.

6. Claims 15 and 21

The [UE of claim 11]/[method of claim 17], wherein the UE is one of a code division multiple access (CDMA) UE or a time division duplex (TDD) UE.

102. Andersson teaches that its “mobile stations 28 and 30” (UEs) are part of a “radio transmission power control in a **code division multiple access cellular radio communications system**,” thus rendering claim 15 obvious. Andersson, 1:6-8, 7:16-18.

7. Claims 16 and 22

The [UE of claim 11]/[method of claim 17], wherein the single physical channel is associated with a spreading factor or a code division multiple access (CDMA) code.

103. As discussed in [11.2], Andersson describes receiving the power control message on a “dedicated physical control channel (DPCCH)”—i.e., a *single physical channel*. Andersson, 9:14-24. Andersson explains that in its “example embodiment, **the term ‘channel’ refers to a CDMA channel which, for any mobile station, is defined in terms of an RF frequency and a particular code sequence,**” thus rendering claim 16 obvious. Andersson, 7:47-54. See section V.A.1 for a general discussion of CDMA.

B. Ground 2: Claims 12-13 and 18-19 are obvious over Andersson in view of Khan and Baker

1. Baker

104. Like Andersson (and the ’500 patent), Baker describes a CDMA communication system in which the base station indicates to a UE which power control scheme to utilize via signaling. Baker, [0002], [0006]. Specifically, a power control algorithm (PCA) bit received by the UE indicates whether TPC command accumulation is enabled—i.e., the UE’s transmit power is updated with each received TPC command. Baker, [0021]-[0023]. If accumulation is not enable, the UE will instead analyze the last five TPC commands, and if all five are “1”, transmission power is increased by 1 dB and if all five a “0”, power is decreased by 1. Baker, [0022]-[0023].

2. Reasons to combine Andersson and Baker

105. It is my opinion that a POSITA would have been motivated to combine the teachings of Andersson with Baker. Before the priority date of the '500 patent, it would have been obvious, beneficial, and predictable to utilize in Andersson's system the technique of Baker of indicating to the UE whether TPC accumulation is enabled. Andersson's system already contemplates receiving a power control scheme selection flag in addition to a TPC command, and Baker provides a specific implementation of that flag.

a) Analogous art

106. It is my opinion that a POSITA when considering the teachings of Andersson would have naturally considered the teachings of Baker, as Baker is also analogous prior art pertaining to the same field of endeavor as both the '500 patent and Andersson, namely, "mobile radio systems or wireless communication systems." '500 patent, 1:23-26.

The present invention relates radio transmission power control in a **code division multiple access cellular radio communications system**.

Andersson, 1:6-8.

The present invention relates to a **radio communication system** and further relates to a secondary station for use in such a system and to a method of operating such a system.

While the present specification describes a system with particular reference to the emerging Universal Mobile Telecommunication System (UMTS), **it is to be understood that such techniques are equally applicable to use in other mobile radio systems.**

Baker, [0001].

107. Both Andersson and Baker, like the '500 patent, describe power control of user equipment by a base station in a radio communications system. '500 patent, Fig. 4; Andersson, 7:16-18; Baker, [0008]-[0013]. Andersson and Baker are also pertinent to a particular problem of the '500 patent, such as “reducing errors in a received signal while also reducing interference imposed on signals received at other receivers.” '500 patent, 2:45-49; Andersson, 5:35-38; Baker, [0003].

b) Motivation to combine Andersson with Baker

108. It is my opinion that a POSITA would have been motivated to incorporate Baker's teachings regarding a specific power control algorithm into Andersson's system due to the compatibility and similarity of their teachings. Specifically, Baker implements the general framework of Andersson that contemplates the UE receiving a power control flag in addition to the TPC command that selects which power control scheme the UE should utilize. A POSITA would have applied the known technique of Baker to the general system

of Andersson to yield predictable results. Also, the technique of Baker is the simple substitution of one known element for another to obtain predictable results.

109. As discussed above, Andersson describes a general framework for communicating power control adjustments to a UE through a TPC command and a “power control indicator.” Andersson, 5:50-54, 9:33-50, Fig. 5.

Associated with the transmit power control command is a **power control indicator** indicating which type of power control adjustment should be used by the radio transceiver depending upon the determined difference.

Andersson, 5:50-54.

One alternative example mechanism is to **use different power control command bit patterns** to be employed. **One pattern might correspond to a first type of power control adjustment and another pattern might correspond to another type of power control adjustment.** Different power control adjustment type messages may also be conveyed along with other, non-power related control Signaling messages that are typically frequently exchanged between the base and mobile radio Stations. Indeed, a power control adjustment type indicator may be sent with any message transmitted in the normal operation and/or control of the radio receiver without significantly adding to the signaling overhead.

Andersson, 9:33-50, Fig. 5.

110. Andersson, however, describes this power control indicator as a generic indicator that may be utilized to indicate “whether a first type or a second type of power control adjustment should be used.” Andersson, 9:9-11. To that end, Baker provides a specific implementation, or alternatively, a simple substitution, for Andersson’s power control indicator—a power control algorithm (PCA) bit received by the UE that indicates whether TPC command accumulation is enabled or disabled. Baker, [0021]-[0023]. Baker’s PCA indicator indicates whether the UE is to (i) iteratively adjust the current transmission power by the most recently received TPC command (i.e., TPC command accumulation) or (ii) analyze the last five TPC commands, and if all five are “1,” increase transmission power by 1 dB, and if all five a “0,” decrease power by 1. Baker, [0022]-[0023]. Baker explains that this second power control scheme effectively emulates the use of a power control step size of approximately 0.2 dB, thereby providing the UE with an alternative and beneficial, smaller power adjustment option. Baker, [0023].

111. In particular, Baker explains that a step size of less than 1 dB is desirable “[w]hen the channel changes very slowly..., since such values are sufficient to track changes in the channel while giving minimal tracking error.” Baker, [0005]. Andersson similarly explains that “it may be better to use small size

power steps” in the case of a “fast moving mobile user.” Andersson, 5:10-14. “In that case, a 1 dB power step size may be too large or will only serve to increase power fluctuations.” Andersson, 5:10-14. Thus, a POSITA would have been motivated to incorporate Baker’s non-accumulation scheme that provides a smaller, beneficial power adjustment option into Andersson’s system to improve Andersson in the same way.

c) Reasonable expectation of success

112. Not only would utilizing Baker’s Power Control Algorithm (PCA) parameter in Andersson’s system have been advantageous, but a POSITA also would have found the combination predictable and would have had a reasonable expectation of success for several reasons. First, as discussed above, Baker provides a specific implementation for Andersson’s generic “power control indicator” that “indicat[es] which type of power control adjustment should be used by the radio transceiver.” Andersson, 5:50-54. Indeed, Baker is explicit that its technique “is suited for use in a range of other systems” and, in particular, “can be used in any system in which there is a variable power control step size,” such as Andersson’s system. Baker, [0043]. Similarly, Andersson is designed to accommodate different implementations, such as Baker’s. Andersson, 5:54-57 (“Depending on a number of indicator bits employed, many different power control adjustments may be employed.”). Thus, the combination is nothing more

than the predictable use of prior art elements according to their established functions.

113. Second, Andersson itself contemplates collecting TPC commands over a period of time, like Baker for reliability purposes. Andersson explains that “to further increase the reliability, TPC bits may be collected over a number of consecutive slots.” Andersson, 11:2-4. Similarly, as an example, Baker explains that when the PCA parameter has been set to 2, the UE combines five TPC commands. The UE will increase its transmission power only if all five commands are 1, the UE will decrease its transmission power only if all five commands are 0, and the UE will not change its transmission power for any other configuration of the five commands:

When the value of PCA is 2, Δ_{TPC} can only take the value of 1 and the MS 110 combines TPC commands in groups of five. **If all five TPC commands are “1” the transmission power is increased by Δ_{TPC} dB, if all five TPC commands are “0” the transmission power is decreased by Δ_{TPC} dB, otherwise the transmission power is unchanged.** This method effectively emulates the use of a power control step size of approximately 0.2 dB, as disclosed in UK patent application 9915571.5 (our reference PHB 34358)

Baker, [0023]. Andersson, 11:2-4. In the proposed Andersson-Baker combination,

when Andersson's power control indicator (corresponding to Baker's PCA), indicates that typical TPC command accumulation is not enabled, Andersson will instead collect and compare TPC commands over consecutive time slots, e.g., five time slots, rather than adjust the current transmit power by each received TPC command value. This is the behavior of the UE describes in Baker, when Baker's PCA value is set to two, as described above. Baker, [0022]-[0023].

114. Accordingly, a POSITA would have been motivated and found it predictable to combine Andersson with Baker.

3. Claim 12

[12.0] The UE of claim 11, wherein the processor is further configured to receive an indication as to whether accumulation of TPC commands is enabled.

115. The combination of Andersson and Baker renders obvious limitation [12.0]. As described in [11.1] and [11.3], Andersson's controller 80 (*processor*) controls the operation of the UE, including adjusting the transmission power level based on received TPC commands. Andersson, 14:56-57, 12:45-48. Consequently, a change in the power control scheme, e.g., *accumulation of TPC commands*, would be communicated to the controller. For example, Andersson teaches that "controller [*processor*]...receiv[es] from the radio network transmit power control commands." Ex.1009, 14:49-51.

116. With respect to the claimed *accumulation of TPC commands*,

Andersson teaches that its “mobile station receives and detects the TPC command and power control indicator and **makes the appropriate adjustment to its transmit power based thereon,**” where the adjustment is “to **either raise, lower, or make no change to the transceiver’s current transmit power.**” Andersson, 12:45-48, 9:4-6. That is, each received TPC command iteratively “adjust[s]” the “current transmit power”—i.e., TPC command accumulation. Andersson, 9:4-6, 9:18-24, 3:39-56. Relatedly, Zeira, described below in VII.D.3., element [11.3], describes and formalizes TPC command accumulation as equations which Andersson describes in words. *See* Zeira, 5:67-6:30 (explaining how the transmission power of the UE is calculated).

117. Further, the “power control indicator” sent with the TPC command may “indicate[] whether a first type or a second type of power control adjustment should be used depending upon the difference” in a “desired signal quality parameter.” Andersson, 9:1-11. The power control indicator may be communicated through one or more flag bits, allowing two or more power control schemes to be implemented. Andersson, 9:6-7, 10:58-61. Consequently, the power control indicator instructs a mobile station to *enable* one of two or more types of power control adjustment. In other words, the power control “indicator” is an *indication* that a particular type of power control adjustment is *enabled*, and a well-known type of power control adjustment before the ’500 patent was TPC accumulation.

118. To the extent Andersson does not explicitly teach “*accumulation of TPC commands*” as a “type of power control adjustment” that may be indicated by the power control indicator, doing so would have been obvious in view of Baker, as described above in Section VII.B.2.

119. Baker describes a “Power Control Algorithm (PCA)” parameter communicated to the UE that determines which of two power control schemes is used by the UE. Baker, [0021]-[0023]. Specifically, when PCA is 1, TPC command accumulation is enabled because transmission power is updated by the TPC step size (Δ_{TPC}) upon each received TPC command:

When the value of PCA is 1, Δ_{TPC} can take a value of 1 or 2. If a received TPC command is “0” then the MS 110 **reduces its transmission power** by Δ_{TPC} dB, while if the received command is “1” the MS 110 **increases its transmission power** by Δ_{TPC} dB.

Baker, [0022]. When PCA is 2, however, **TPC command accumulation is not enabled** because the UE will not iteratively update the transmission power based on each TPC command. Instead, the UE will compare the last five TPC commands, and if all five are “1”, transmission power is increased by 1 dB and if all five a “0”, power is decreased by 1. Baker, [0023]. Accordingly, Baker’s PCA flag received by the UE is therefore “*an indication as to whether accumulation of TPC*”

commands is enabled,” and a POSITA would have been motivated to utilize such a flag in Andersson, as discussed above in Section VII.B.2.

120. Thus, the combination of Andersson and Baker renders obvious “*wherein the processor is further configured to receive an indication as to whether accumulation of TPC commands is enabled.*”

4. Claim 13

[13.0] *The UE of claim 12, wherein the processor is further configured to accumulate the TPC command with another TPC command in response to enablement of accumulation of TPC commands.*

121. The combination of Andersson and Baker renders obvious claim 13.

122. As described above in [12.0], Andersson describes TPC command accumulation because each received TPC command iteratively “adjust[s]” the “current transmit power.” Andersson, 9:4-6, 9:18-24, 3:39-56. The controller (*processor*) in the mobile station makes this adjustment: “wherein the controller is configured to adjust the transmit power level of the transmitter.” Andersson, 14:56-57. Consequently, when the mobile station receives a TPC command, it adjusts the current transmit power which was previously adjusted based on a previous TPC command. When Baker’s PCA parameter is utilized in Andersson’s system as described above, Andersson’s mobile station will accumulate TPC commands when the PCA parameter is “1,” as taught by Baker. Ex.1010, [0021]-[0023].

123. Thus, the combination of Andersson and Baker renders obvious
*“wherein the processor is further configured to accumulate the TPC command with
another TPC command in response to enablement of accumulation of TPC
commands.”*

5. Claim 18

***[18.0] The method of claim 17 further comprising receiving, by the UE, an
indication as to whether accumulation of TPC commands is enabled.***

124. This claim is substantially similar to claim 12, and for the same
reasons, the prior art renders this limitation obvious.

6. Claim 19

***[19.0] The method of claim 18, further comprising accumulating, by the UE, the
TPC command with another TPC command in response to enablement of
accumulation of TPC commands.***

125. This claim is substantially similar to claim 13, and for the same
reasons, the prior art renders this limitation obvious.

**C. Ground 3: Claims 14 and 20 are obvious over Andersson in view
of Khan and Dick**

1. Dick

126. Like the '500 patent and Andersson, Dick is directed to UE power
control in wireless communication systems. Dick, Abstract, [0002], [0049]-[0050],
[0059], [0070]-[0073]; '500 patent, Fig. 4; Andersson, 1:6-8, 7:16-18, 7:38-41.

127. Dick describes the common 3GPP scenario of “wireless transmit

receive units (WTRUs), known as User Equipments (UEs)” (Dick, [0004])

transmitting uplink signals on an **uplink shared channel** (e.g., UL HS-SICH),

where the power of that uplink signal is controlled. For example,

Where shared channels are utilized, different WTRUs can use the same channel and channel use by a particular WTRU can be sporadic. The inventors have recognized that the metric used for adjusting power control in the conventional manner for a specific shared channel may not be readily available since the relative position of the WTRU may have substantially changed from when it last used the specific shared channel. Accordingly, it is desirable to provide method and apparatus for controlling the power of shared channel where there may be sporadic use of such channels by WTRUs.

For example, **the physical channels specified in 3GPP Release 5 (R5) of UMTS Terrestrial Radio Access Time Division Duplex (UTRA TDD) include a High Speed Shared Information Channel (HS-SICH)** which operates in conjunction with a High Speed Downlink Shared Channel (HS-DSCH). HS-SICH is a fast Uplink (UL) feedback channel used in UTRA TDD R5 for High Speed Down link Packet Access HSDPA operation. The HS-SICH carries a 1-bit Ack-Nack message and a several bit long measurement report from a particular WTRU that received a downlink (DL) transmission on the HS-DSCH.

Dick, [0012]-[0013];

FIG. 6 illustrates a **modified closed loop power control system for a wireless communication system** made in accordance with the teaching of the present invention where like components that correspond to the conventional system shown in FIG. 3 are indicated with like reference numerals. **For the example of an UL shared channel, such as the HS-SICH, the transceiver 50 is a WTRU and the component 70 represents a servicing network, such as a 3GPP R5 UTRAN.**

Dick, [0070]. *See also* Dick, [0011], [0059], [0071]-[0073], Claim 26.

2. Reasons to combine Andersson, Khan, and Dick

128. It is my opinion that a POSITA when considering the teachings of Andersson would have naturally considered the teachings of Dick, as Dick is also analogous prior art pertaining to the same field of endeavor as both Andersson and the '500 patent, namely, "mobile radio system or wireless communication system." '500 patent, 1:23-26; Andersson, 1:6-8; Dick, [0002]. A POSITA would have been motivated to combine the teachings of Dick with Andersson, as modified by Khan. In particular, before the priority date of the '500 patent, it would have been obvious and predictable for Andersson's UE to transmit uplink data on an uplink shared channel, as Dick explains is common in the 3GPP standard. Dick, [0012]-[0013], [0059]. Using the standard 3GPP uplink shared channel in Andersson's

3GPP system is nothing more than the predictable use of prior art elements according to their established functions.

129. Andersson explains that its system “control[s] the transmit power of mobile station transmissions on uplink/reverse direction radio channels,” but does not explicitly describe transmitting the uplink signal over an uplink shared channel. Andersson, 7:38-39, 7:5-8. Dick, however, teaches that its system “provides controlled transmitter power in a wireless communication system in which both dedicated and *shared channels* are utilized.” Dick, [0019]. Dick further explains that power control on uplink shared channels is especially important because “different WTRUs [UEs] can use the same channel and channel use by a particular WTRU can be sporadic.” Dick, [0012]. Thus, “it is desirable to... control[] the power of shared channels where there may be sporadic use of such channels by WTRUs.” Dick, [0012]. Accordingly, in view of the importance of controlling power on an uplink shared channel, a POSITA would have been motivated to ensure Andersson’s system similarly controls the power of its UE’s uplink transmission on uplink shared channels, including a standard 3GPP uplink shared channel (e.g., UL HS-SICH). A POSITA would have had a reasonable expectation of success in incorporating Dick’s teachings into Andersson’s because they are both directed to standardized wireless communication systems. Andersson, 1:6-15, 7:16-20; Dick, [0011], [0013], [0032], [0039]-[0040].

3. Claims 14 and 20

The [UE of claim 11]/[method of claim 17], wherein the uplink signal is transmitted on an uplink shared channel.

130. As discussed in [11.3] and [11.5], Andersson teaches “controlling the transmit power level of a mobile station transmitting in the **uplink** direction.”

Andersson, 11:26-28. Dick further teaches a “UL shared channel, such as the HS-SICH,” where “the UL HS-SICH data signal is provided with a desired power level,” that is adjusted based on “up/down command signals” (i.e., TPC commands). Dick, [0012]-[0013], [0059], [0070]-[0073], Claim 26. Thus, Andersson in view of Dick renders obvious *the uplink signal* (“UL HS-SICH data signal”) *is transmitted on an uplink shared channel* (“UL HS-SICH”).

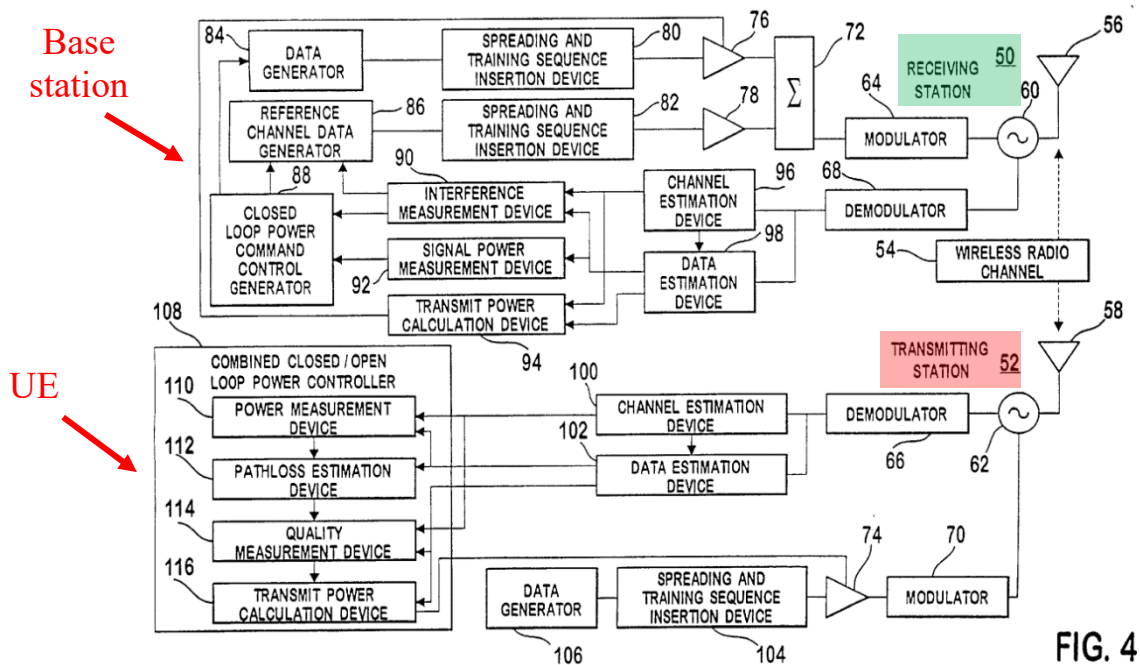
D. Ground 4: Claims 11, 15-16, 17, and 21-22 are obvious over Zeira in view of Khan and Tong

1. Zeira

131. Like the '500 patent, Zeira discloses a combined closed/open loop power control system. Zeira, Abstract. Zeira improves on power control of UE transmissions by teaching a UE that receives an indication that TPC command accumulation is enabled, receives a TPC command on a dedicated physical channel, and transmits an uplink signal based on the TPC command.

132. Specifically, Figure 4 of Zeira, below, illustrates a receiving station 50 (base station) controlling the uplink transmit power of a transmitting station 52

(UE) using a combined scheme:



Zeira, Fig. 4 (annotated)

133. For open loop power control, the transmitting station 52 (UE) includes, for example, pathloss estimation device 112 to estimate pathloss. Zeira, 5:28-32. For closed power control, the receiving station 50 (base station) generates and sends a transmit power control command, b_{TPC} , to the UE “in a dedicated channel.” Zeira, 1:64-2:6, 4:26-30. Zeira describes combining these aspects of open loop power control and closed loop power control: “Using the closed loop power command, b_{TPC} , and the weighted path loss, the transmit power calculation device 116 sets the transmit power level of the receiving station 50....” Zeira, 5:62-65. When operating in a purely closed loop or combined closed

loop/open loop manner, accumulation of TPC commands is enabled because a new TPC command is applied to the UE's prior calculation of transmit power, which was based on previous TPC commands. *See* Zeira, 6:1-20 (Equations 4 and 6). When operating in a purely open loop manner, TPC commands are not used and thus not accumulated. Zeira, 1:51-63 (transmit power based only on pathloss).

134. Zeira further discloses using a **weighting factor, α , (i.e., an “indicator”) set by a “network operator”** to determine whether the UE uses purely closed loop power control (where accumulation is enabled). Zeira, 7:16-22. (“Under certain conditions, **the network operator may desire to use solely open loop or solely closed loop power control.** For example, the operator may use solely closed loop power control by setting α to zero.”).

2. Tong

135. Like the '500 patent, Tong is directed to uplink power control of a UE in a wireless communication system. Tong, Abstract. Tong improves on power control of UE transmissions by teaching a UE receiving a multi-level TPC command. Tong, 1:14-20.

136. Specifically, as shown in the Table reproduced below, Tong discloses using more than one power control bit in the TPC command allows for additional step sizes (i.e., multi-level TPC commands):

One Step Size		Two Step Size	
$\{I,Q\}b_1b_0$		$\{I,Q\}b_1b_0$	
Increase by ΔP_1	+1, +1	Increase by ΔP_1	+1, +1
Decrease by ΔP_1	-1, -1	Decrease by ΔP_1	-1, -1
		Increase by ΔP_2	-1, +1
		Decrease by ΔP_2	+1, -1

Tong, 5:15-32

The combination of Tong and Zeira is discussed in the mapping below.

3. Claim 11

[11.0] *A user equipment (UE) comprising:*

137. To the extent the preamble is deemed limiting, Zeira discloses “user equipments (*UEs*) 32₁–32₃” in a “wireless spread spectrum time division duplex (TDD) communication system.” Zeira, 1:12-15, Fig. 1. Zeira explains that “the communications station having its transmitter’s power controlled is referred to as the transmitting station 52 and the communications station receiving power controlled communications is referred to as the receiving station 50.” Zeira, 3:28-33. Accordingly, Zeira discloses that transmitting station 52 may be a UE 32₁, and the receiving station may be a base station 30₁.

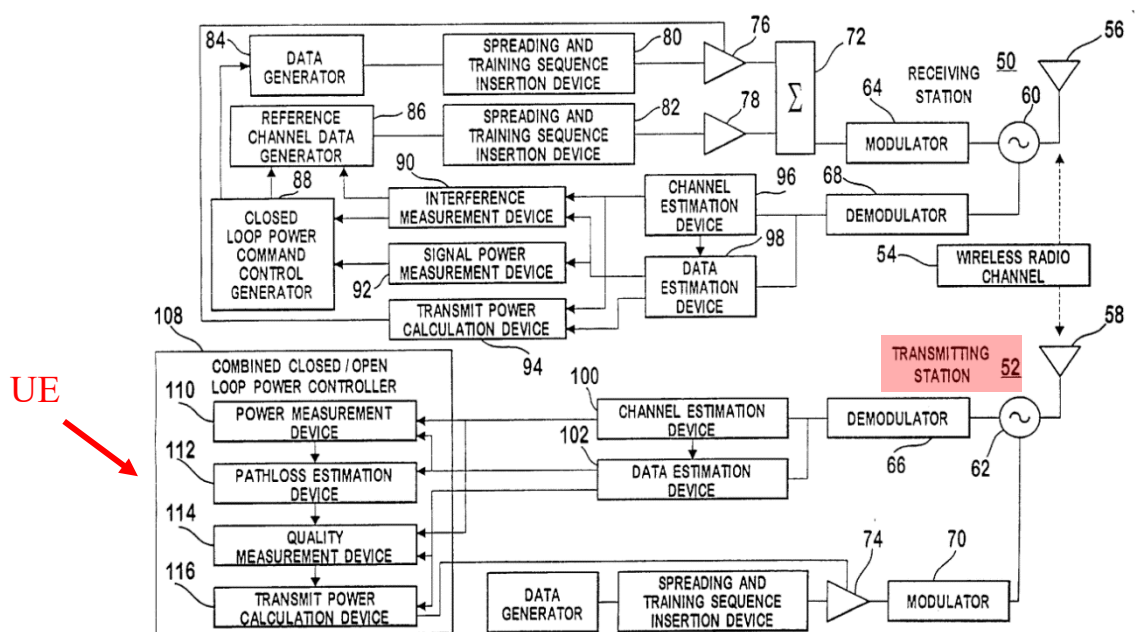
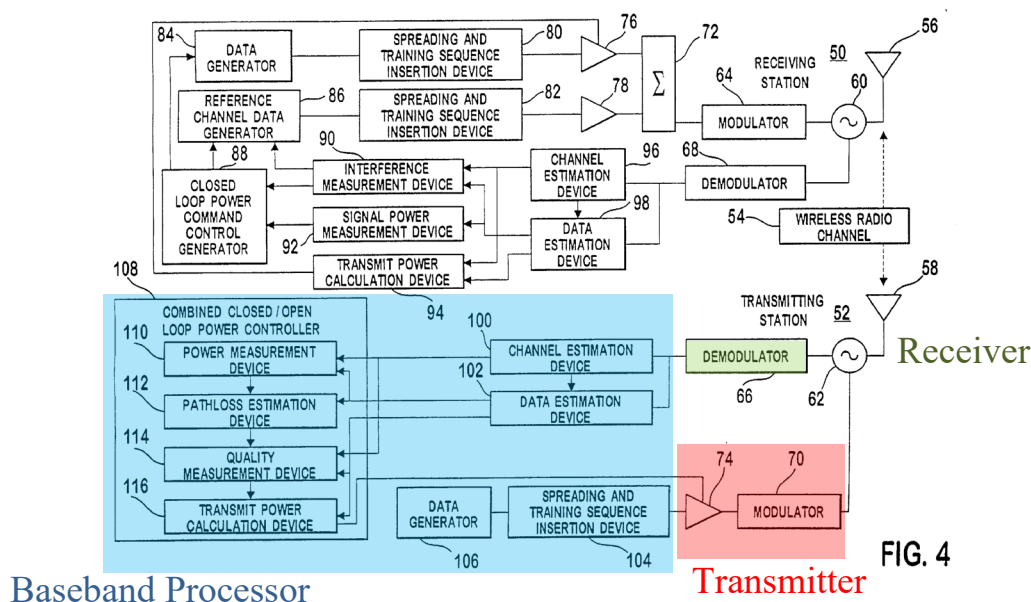


FIG. 4

Zeira, Fig. 4 (annotated)

[11.1] *a transmitter; a receiver; a processor operatively coupled to the transmitter and the receiver,*

138. First, with respect to the *transmitter*, Zeira teaches that its UE (transmitting station 52) includes a “transmitter.” Zeira, 3:29-31 (“the communication station having its **transmitter**’s power controlled is referred to as the transmitting station 52”). As illustrated in Fig. 4 below, the UE’s transmitter (in red) includes at least an “amplifier 74” and “modulator 70.” See Zeira, Fig. 4 (annotated in red below), 7:1-5, 6:59-67 (“Data to be transmitted in a communication from the transmitting station 52” is “amplified by the amplifier 74 and modulated by the modulator 70 to radio frequency.”). Alternatively, the *transmitter* may further include isolator 62 and antenna 58.



Zeira, Fig. 4 (annotated)

139. Second, with respect to the *receiver*, Zeira teaches a “demodulator 66” in transmitting station 52 (*UE*). See Zeira, Fig. 4 (green), 4:54-57. Zeira describes that “[t]he transmitting station 52 receives various radio frequency signals” through an antenna 58, where the “received signals are passed through an isolator 62 to a demodulator 66 to produce a baseband signal.” Zeira, 4:54-57. Zeira also teaches that “an automatic gain control device or amplifier” may also be used to process the received signals. Zeira, Zeira, 5:6-11. Thus, demodulator 66 of Zeira teaches a *receiver* because it prepares the baseband signal to be processed by the processor. Alternatively, the *receiver* may further include isolator 62 and antenna 58.

140. Third, with respect to the *processor*, Zeira’s *UE*, as was typical,

includes a baseband processor, (shown in the blue above in Fig. 4) coupled to its receiver and transmitter that includes combined closed/open loop power controller 108, channel estimation device 100, data estimation device 102, data generator 106, and spreading and training sequence insertion device 104 (collectively, a baseband *processor*). Zeira, Fig. 4. As discussed in §VII.A.4, a baseband processor is the collection of components (typically implemented as software on a microprocessor) that process the signals received by the receiver and transmitted by the transmitter. Krishnan, 5:34-55, 6:1-2; '390 patent, 7:1-20, 4:28-31. Consistent with that conventional understanding, Zeira describes signal processing tasks carried out by the elements of its baseband *processor*. Ex.1004, 4:57-59. For example, “[t]he baseband signal is **processed**, such as by a channel estimation device 100 and a data estimation device 102”), 5:60-62 (“the data estimation device 102 **interprets** the closed loop power command, b_{TPC} ”), 7:1-5 (“combined closed loop/open loop power controller 108 **controls** the gain of the amplifier 74 to achieve the determined transmit power level, P_{TS} , for the communication”).

141. Thus, Zeira renders obvious limitation [11.1].

[11.2] *the processor and the receiver are configured to receive, on a single physical channel, an allocation of an uplink resource and a multi-level transmit power control (TPC) command;*

142. First, the elements in Zeira’s UE’s baseband *processor* causes its receiver to receive intelligible data (such as *an allocation of an uplink resource*

and a multi-level transmit power control (TPC) command) from the receiving station 50 (*network device*) by processing the received baseband signal with the appropriate codes. Ex.1004, 4:57-61 (“The baseband signal is processed, such as by a channel estimation device 100 and a data estimation device 102, in the time slots and with the appropriate codes assigned to the communication burst of the receiving station 50.”). More generally, a POSITA would find it obvious that the hardware (e.g., microprocessor) with which the baseband processor is implemented is configured to control the operation of the UE, including its receiver and transmitter. ’460 patent, 7:17-18; Andersson, 8:6-8.

a) Zeira and Tong render obvious receiving “a multi-level transmit power control (TPC) command”

143. Zeira’s user equipment receives a *transmit power control (TPC) command*: “a closed loop power command ... b_{TPC} , such as a power command bit, b_{TPC} .” Zeira, 4:6-7, Fig. 3, 2:57-63, 2:2-6. As described above in [11.1], Zeira’s *processor* includes a data estimation device 102 that “interprets the closed loop power command, b_{TPC} ” included in received signals received at the *receiver*. Zeira, 5:61-62, 4:54-57.

144. Zeira describes that the step size “ Δ_{TPC} is the change in power level,” appearing in Equations 6 and 10, and “the change in power level is typically 1dB *although other values may be used.*” Zeira, 6:26-28. Because Zeira’s TPC

command may indicate a change in transmission power by different amounts (i.e., not by a fixed amount, and/or by an amount other than 1 dB), it is at least an example of a *multi-level TPC command*. ‘500 patent, 9:7-10.

145. Even if Zeira did not explicitly teach a multi-level TPC command, such a command would be obvious to a POSITA in view of Tong. Tong discloses an uplink power control method in which more than one power control bit (PCB) may be used for a TPC command, where different bit patterns correspond with different power step sizes (i.e., multi-level TPC commands):

FIG. 4b illustrates that a second PCB can be employed to indicate that the remote user should increase or decrease the transmission power by **a larger step size**. While only two bits will be discussed herein, it is possible to employ more than two bits to allow for additional step sizes. In a preferred embodiment, the particular step size is 0.25 dB and the larger step size is 1.5 dB. Those skilled in the art will recognize that these numbers are merely set forth as exemplary (i.e. there are merely design choices) and that other step sizes may be employed for different results. Further, the ratio of the step sizes (i.e. 6 to 1) may also be changed to suit a particular system.

Tong, 4:54-65.

As shown in the table below, Tong describes the configurations of two TPC bits,

b_0 and b_1 , selected to cause changes in transmission power associated with two different step sizes, ΔP_1 and ΔP_2 . Tong, 5:16-32.

One Step Size		Two Step Size	
$\{I,Q\}b_1b_0$		$\{I,Q\}b_1b_0$	
Increase by ΔP_1	+1, +1	Increase by ΔP_1	+1, +1
Decrease by ΔP_1	-1, -1	Decrease by ΔP_1	-1, -1
		Increase by ΔP_2	-1, +1
		Decrease by ΔP_2	+1, -1

Tong, 5:16-25 (annotated)

The base station may communicate this information to the remote unit as shown in the following table:

[see table above]

Those skilled in the art will recognize that while each bit has been provided with a specific meaning (i.e., +1,+1 increases by ΔP_1 , -1,-1 increased by ΔP_2 , etc.) a system could be designed which rearranges the definitions associated with the different bits (i.e., +1,+1 increases by ΔP_2 , -1,+1 increase by ΔP_1 , or any other rearrangement of the meanings) and still fall within the scope of the invention.

Tong, 5:13-31.¹

146. Accordingly, Tong’s multi-bit TPC command—with different bit patterns indicating different power step sizes—is at least an example of the recited *multi-level TPC command* for multiple reasons, at least including that (i) the multi-bit command indicates more than a binary change (up or down), and (ii) the indicated power step size is not fixed, and (iii) the step size may be greater than 1 dB. *See* ‘500 patent, 9:7-10.

147. It is my opinion that a POSITA would have been motivated to combine Zeira with Tong to include multi-level capability to TPC commands. Specifically, a POSITA would have been motivated by Zeira’s teaching with respect to TPC commands that “[t]he change in power level is typically 1 dB although other values may be used.” Zeira, 6:27-29. Tong expressly teaches multiple and variable TPC command step size values. Tong, 4:54-65. Moreover, Tong teaches the benefits of additional step sizes, such as minimizing power

¹ There is a minor typographical error in the quoted material of Tong. The first parenthetical, “(i.e., +1,+1 increases by ΔP_1 , 31 1,+1 increased by ΔP_2 , etc.),” should instead read “(i.e., +1,+1 increases by ΔP_1 , -1,+1 increased by ΔP_2 , etc.),” which is clear from the preceding Table at 5:16-25 in Tong.

overshoot caused by power control command transmission delay, which a POSITA would have been motivated to include in Zeira's system:

Based on the current 3GPP specification, closed loop power control results in a considerable reduction of SNR deviation for small fading frequencies (e.g. in the range of 8-15 Hz). However, the efficiency is greatly decreased when the fading frequency is above 30 Hz. **This is because of the conventional fixed power control steps of 0.25 dB, 0.5 dB and/or 1 dB and the delay (at least one slot of power control bit command) which are not able to track the changes of the signal power in the channel in fast fading environments.** For the same reasons large power overshooting (i.e. too many increases or decreases to the transmission power in the mobile unit) occurs at the BTS [Base Transceiver Subsystem] input for all fading frequencies.

Conventional 3GPP systems operate with a fixed power control step size (e.g. 1 dB) and a fixed power control command transmission delay. When a signal from a mobile unit experiences a deep fade, the BTS sends consecutive power increasing commands to the mobile unit. The mobile unit receives these commands and increases its transmission power to compensate for the deep fading. **However the mobile unit continues to increase its power even after the deep fade period ends,**

due to the power control command transmission delay.

This continued increase in power causes the power overshoot (see FIG. 2). Power overshooting negatively impacts the uplink power control performance by increasing the standard deviation of power control for the particular mobile unit and increasing the overall interference experienced by transmissions to the BTS. Power overshooting has been observed to be as high as 5 dB and has been known to occur at all fading frequencies.

Tong, 2:13-42;

Accordingly, there exists a need for a more reliable power control system which minimizes power overshoot.

There also exists a need for a power control system which maximizes uplink capacity.

There exists a need for a power control system which minimizes standard deviation from the nominal power level.

Accordingly, it is an object of the present invention to provide a more reliable power control system which minimizes power overshoot.

It is another object of the invention to provide a power control system which minimizes the standard deviation from the nominal power level.

It is still another object of the invention to provide a power control system which employs a variable step size.

Tong, 2:53-67.

148. Zeira recognizes that, in dynamic environments, quick efficient adaptation is needed:

Under certain conditions, the performance of these systems degrades. For instance, if communications sent between a UE 32 and a base station 30 are in a highly dynamic environment, such as due to the UE 32 moving, the path loss estimate for open loop severely degrades the overall system's performance. Accordingly, there is a need for alternate approaches to maintain signal quality and low transmission power levels for all environments and scenarios.

Zeira, 2:42-50.

149. For example, it was well known that “[a] variable step size also addresses problems related to rapid fading of a radio channel where a mobile is traveling at high speed.” Andersson, 5:4-7. The benefit of power control in dynamic environments without delay would have motivated a POSITA to implement Tong's teachings regarding multi-level TPC commands in Zeira's system.

150. Further, a POSITA would have had a reasonable expectation to success in combining these interrelated teachings, as the combined system would have predictably resulted in the ability to send multi-level TPC commands, just as described in Tong. Tong's techniques would have predictably enabled a POSITA to minimize power overshoot and compensate for deep fading, as taught by Tong. Thus, the use of multi-level TPC commands in Zeira's system would have been nothing more than the predictable use of prior art elements according to their established functions.

b) Zeira renders obvious receiving a TPC command and information on a "single physical channel"

151. Zeira discloses that "[t]he closed loop power control command, b_{TPC} , is typically sent in a *dedicated channel*." Zeira, 4:27-30. "The dedicated channel is dedicated to the communication between the receiving station 50 and transmitting station 52, step 40." Zeira, 4:27-30. A POSITA would have understood that the "dedicated channel" described by Zeira used for transmitting to the UE is the claimed "*single physical channel*." In particular, the UTRA TDD specifications describe that there is a single dedicated channel (DCH) is mapped onto a single dedicated physical channel (DPCH), as shown in the following diagram:

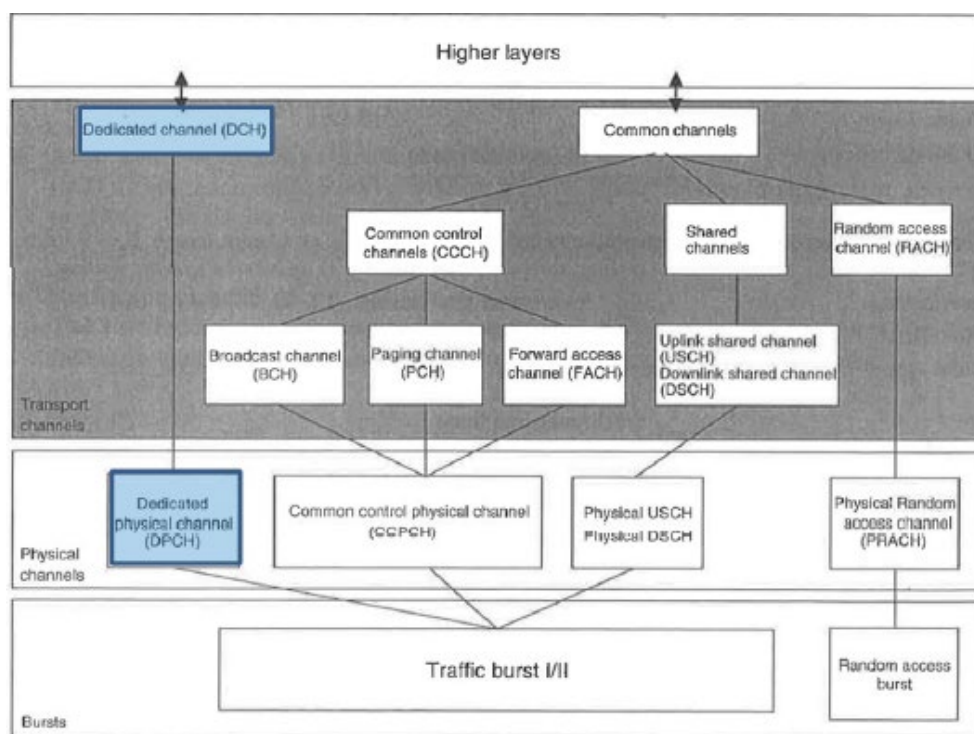


Figure 13.2. Mapping of the UTRA TDD transport channels to physical channels

Holma, at 354, Fig. 13.2 (annotated) (“Each of these transport channels is then mapped to the corresponding physical channel.”). A POSITA would have understood the teachings of Zeira to be applicable to 3GPP UTRA embodiments. For example, other hybrid power control schemes were known to be implementable in UTRA TDD:

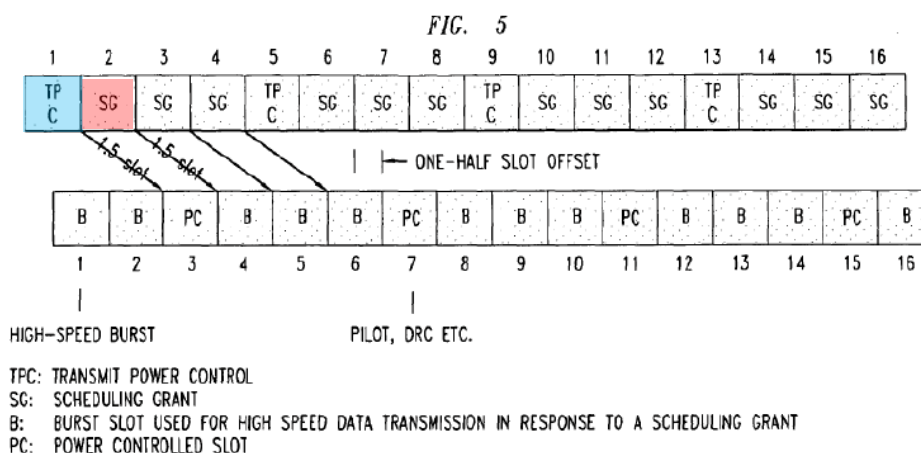
In this paper, we present an enhanced closed inner loop power control technique for the UTRA TDD, called “Pathloss-aided closed loop transmit power control.”

Shin & Zeira, at 2226. It would be apparent to a POSITA that the dedicated channel used to send power control information from the base station to the UE

would be on the same frequency, spread with a single code and transmitted with well-defined temporal characteristics. A POSITA would understand this to be consistent with a single physical channel. Zeira sends power control information over such a dedicated channel. The Zeira specification and Fig. 4 suggest the same criteria for receiving the information - same frequency, code and defined time. Zeira, 1:21-36. Accordingly, Zeira's UE receives the TPC command over a dedicated *single physical channel*. To the extent Zeira does not expressly disclose also receiving *allocation of an uplink resource* over this dedicated *single physical channel*, doing so was well known as discussed below.

c) Zeira and Khan render obvious receiving allocation of an uplink resource and TPC command on a single physical channel

152. As discussed above in Ground 1 (Section VII.A.2), and as illustrated in Khan's Fig. 5, it was well known to POSITAs that scheduling grants ("SG"; red) may be multiplexed on the same physical channel as a TPC command ("TPC"; blue).



Khan, Fig. 5 (annotated)

153. Khan accordingly discloses a wireless unit (e.g., UE) receiving, over a single physical channel (e.g., Walsh channel, as identified by MACIndex value), both an allocation of a scheduled uplink resource (e.g., scheduling grant) and a TPC command (e.g., TPC bit). Khan, [0043].

154. A POSITA would have been motivated and found it obvious to combine Khan's teaching of a dedicated channel (i.e., *single physical channel*) carrying both an allocation of a scheduled uplink resource and TPC commands with the combined power control system of Zeira because it would require nothing more than the predictable use of prior art elements according to their established functions. Both Zeira and Khan utilize CDMA techniques, so techniques in one would be beneficial and applicable in the other, where CDMA techniques are described above in V.A. Zeira discloses both that it receives TPC commands from

a receiving station (e.g., base station) and that it transmits an uplink communication to the receiving station “in the appropriate time slots and codes of the assigned resource units” (Zeira, 2:62-63, 6:63-65), but does not specify how such resource units are assigned to it. Zeira’s reference to “assigned resource units” would indicate to a POSITA that Zeira contemplates some scheduling function located at the receiving station that allocates such resources for uplink transmission. This would have motivated POSITA to seek out Khan, which discloses such a scheduling function in a base station for allocating uplink resources in a spread-spectrum communication system that similarly transmits TPC commands. Khan, Abstract. Having found Khan, a POSITA would have appreciated the benefits of applying Khan’s teaching of TPC commands and scheduling information communicated on the same channel in Zeira. Furthermore, a POSITA would only need the technique, not the entire structure, from Khan that TPC commands and uplink scheduling information could be communicated in the same channel to implement the technique in Zeira.

155. A POSITA would have been motivated to transmit on Zeira’s “dedicated channel” both the TPC command and an uplink scheduling grant, as taught by Khan, because it would improve Zeira’s system in the same way. Similar to the description in Section VII.A.3, there are several advantages of combining TPC commands and uplink scheduling information in the same control channel (as

opposed to provisioning a separate control channel for the scheduling information), including allowing for a larger number of active wireless units. Khan, [0043], [0047]. Moreover, by combining TPC commands and uplink scheduling information in the same channel (as opposed to provisioning a separate channel for the allocation of uplink resource) complexity (and thus power usage) is reduced. Latency is similarly reduced because the UE receiving the control information must process fewer protocol layers and channels to obtain needed uplink control information. Further, a POSITA evaluating how Zeira's UE receives an allocation of an uplink resource would understand that an allocation of uplink resource belongs in a "**dedicated channel**", such as the one in Zeira (Zeira, 4:27-30). Consequently, a POSITA would only need the technique, not the entire structure, from Khan that TPC commands and allocation of uplink resource information could be communicated in the same channel to implement the technique in Zeira. Thus, a POSITA would have naturally found it obvious to utilize Khan's technique that results in efficient use of channel resources within Zeira's system to achieve the same benefits.

156. Accordingly, POSITA would recognize that combining Khan's scheduling grant technique with Zeira's system is nothing more than combining prior art elements according to known methods to yield predictable results—particularly given that Zeira's disclosure is not limited to transmission of TPC

commands over any particular channel:

The closed loop power control command, b_{TPC} , is **typically sent in a dedicated channel**. The dedicated channel is dedicated to the communication between the receive station 50 and transmitting station 52, step 40.

Zeira, 4:27-30. Zeira's only (soft) constraint on the channel is that it is typically a dedicated channel. For example, the power control command could be sent on a dedicated physical control channel, DPCCH, as described in Andersson (see VII.A.1 and VII.A.3 above). A POSITA would have had a reasonable expectation of success in making the combination given the close overlap between the systems and methods of both Zeira and Khan. In particular, Khan's technique was specifically meant to be implemented in wireless communication systems such as Zeira's.

[11.3] wherein the processor is further configured to determine a transmission power level based on a value of the multi-level TPC command out of a plurality of potential values for the multi-level TPC command;

157. The combination of Zeira and Tong renders obvious limitation [11.3].

158. As described above in [11.1], Zeira's baseband *processor* includes a combined closed/open loop power controller 108 that further includes a "transmit power calculation device 116." Zeira, 5:12-17. The "transmit power calculation device 116" determines "a calculated transmit power level, P_{TS} ," with which "the

combined closed loop/open loop power controller 108 sets the transmit power of the transmitted communication.” Zeira, 6:54-58. The transmit power level, P_{TS} , of the UE is determined using Equations 4 and 6, where P_{TS} is the UE’s transmit power (purple), $G(n)$ is the closed loop power control factor, $G(n - 1)$ is the previous closed loop power control factor, b_{TPC} is the TPC command (blue), L is path loss (green):

$$P_{TS}=P_0+G(n)+\alpha L$$

Equation 4

$$G(n)=G(n-1)+b_{TPC}\Delta_{TPC}$$

Equation 6

Zeira, 6:1-20. The TPC command (b_{TPC}) causes an increase or decrease in transmit power by “+1 or -1.” *Id.* at 6:29-31.

159. As discussed above in [11.2], it would have been obvious to utilize the multi-level TPC command of Tong in Zeira’s system for determining the transmit power level, P_{TS} . Tong describes a multi-level TPC command that includes two bits, where each configuration of the bits, e.g., {1,1}, {-1,-1}, {-1,1}, and {1,-1}, indicates a different pre-defined change in the transmission power ($+\Delta P_1$, $+\Delta P_2$, $-\Delta P_1$, or $-\Delta P_2$). Tong, 5:16-32. The base station uses rules to select “step size the base station will request.” Tong, 4:66-67.

160. Thus, Zeira modified by Tong renders obvious a processor (transmit

power calculation device 116) that would determine a transmission power level based on a value of the multi-level TPC command out of a plurality of potential values for the multi-level TPC command.

[11.4] wherein the plurality of potential values for the multi-level TPC command includes at least two values up or at least two values down;

161. As described above in [11.3], Tong's two-bit multi-level TPC command includes *two values up*, $+\Delta P_1$, $+\Delta P_2$, and *two values down*, $-\Delta P_1$, $-\Delta P_2$. Tong, 5:16-25.

[11.5] wherein the processor is configured to have the transmitter transmit an uplink signal on the allocated uplink resource at the determined transmission power level.

162. Zeira in view of Khan and Tong render obvious this limitation.

163. As discussed above in [11.1], Zeira teaches that the transmitting station's (UE's) transmitter transmits uplink data to the receiving station. Zeira, 3:29-31, 6:59-7:4, Fig. 4. Zeira's baseband processor determines the power level of the uplink transmission and also the transmission time slot. Zeira, 4:56-61, 5:52-65.

164. First, Zeira teaches that the transmission power of the uplink signal is based upon the received TPC command. For example, the power level, " P_{TS} ," at which the transmitting station transmits signals to the receiving station is calculated "[u]sing the closed loop power command, b_{TPC} " by the "transmit

power calculation device 116” of the transmitting station.² Zeira, 5:62-65. Then, “[t]he combined closed loop/open loop power controller 108 controls the gain of the amplifier 74 to achieve the determined transmit power level, P_{TS} , for the communication.” Zeira, 7:1-4. As discussed above in limitation [11.3], it would have been obvious to utilize a multi-level TPC command to determine the transmission power, such as taught by Tong, in Zeira’s system. When doing so, Zeira’s uplink signal would be transmitted based on the multi-level TPC command.

165. Second, Zeira’s uplink signal is transmitted in “appropriate **time slots**.” Zeira, 6:61-63. As is well-known, the particular time slot is based upon a received scheduling grant, as discussed above with respect to Khan in [11.2]. For example, Khan describes “transmitting a packet in response to receiving at least one scheduling grant.” Khan, [0015].

166. Thus, Zeira’s teaching of its UE transmitting an uplink signal to the

² Zeira’s specification erroneously states “the transmit power calculation device 116 sets the transmit power level of the **receiving station** [sic] 50, step 48.” Zeira, 5:64-65. However, both Figure 3 and Figure 4 make it clear that the transmit power calculation device 116 is contained in the transmitting station 52 and sets the transmission power level of the transmitting station 52.

base station in time slots at a power level based on a TPC command in view of Tong's teaching of a multi-level TPC command, and further in view of Khan's teaching of transmitting an uplink signal based on the received scheduling grant renders obvious "*wherein the processor is configured to have the transmitter transmit an uplink signal on the allocated uplink resource at the determined transmission power level.*"

4. Claim 17

[17.1] *A method comprising: receiving, by a user equipment (UE) on a single physical channel, an allocation of an uplink resource and a multi-level transmit power control (TPC) command;*

167. Claim 17 is a substantially similar method version of claim 11. This limitation is substantially similar to the limitation of [11.2], and for the same reasons, the prior art renders this limitation obvious.

[17.2] *determining, by the UE, a transmission power level based on a value of the multi-level TPC command out of a plurality of potential values for the multi-level TPC command;*

168. This limitation is substantially similar to the limitation of [11.3], and for the same reasons, the prior art renders this limitation obvious.

[17.3] *wherein the plurality of potential values for the multi-level TPC command that includes at least two values up or at least two values down;*

169. This limitation is substantially similar to the limitation of [11.4], and for the same reasons, the prior art renders this limitation obvious.

[17.4] transmitting, by the UE, an uplink signal on the allocated uplink resource at the determined transmission power level.

170. This limitation is substantially similar to the limitation of [11.5], and for the same reasons, the prior art renders this limitation obvious.

5. Claims 15 and 21

The [UE of claim 11]/[method of claim 17], wherein the UE is one of a code division multiple access (CDMA) UE or a time division duplex (TDD) UE.

171. Zeira teaches “combined closed loop/open loop power control” for UEs in a “spread spectrum time division duplex (TDD) communication system[.]”

Zeira, Title, 1:7-20. Furthermore, Zeira uses CDMA codes for its UEs:

In addition to communicating over different frequency spectrums, spread spectrum TDD systems carry multiple communications over the same spectrum. **The multiple signals are distinguished by their respective chip code sequences (codes).** Also, to more efficiently use the spread spectrum, TDD systems as illustrated in FIG. 2 use repeating frames 34 divided into a number of time slots 36₁-36_n, such as fifteen time slots. **In such systems, a communication is sent in selected time slots 36₁-36_n using selected codes.** Accordingly, one frame 34 is capable of carrying multiple communications distinguished by both time slot 36₁-36_n and code. The combination of a single code in a single time slot is referred to as a resource unit. Based on the bandwidth

required to support a communication, one or more multiple resource units are assigned to that communication.

Zeira, 1:21-36. CDMA and TDD are not mutually exclusive as the claim language implies. For example, in Zeira, CDMA is used to multiplex between multiple UEs using “chip code sequences,” so the UE in Zeira is a CDMA UE, and TDD to duplex between uplink and downlink signals using the selection of “time slots.”

Zeira, 1:21-26. Thus, Zeira renders obvious this claim.

6. Claims 16 and 22

The [UE of claim 11]/[method of claim 17], wherein the single physical channel is associated with a spreading factor or a code division multiple access (CDMA) code.

172. As discussed in [11.2], Zeira describes receiving the power control command, b_{TPC} , on a “dedicated channel”—i.e., a *single physical channel*. Zeira, 4:27-30. Zeira further describes that its “spread spectrum TDD system carr[ies] multiple communications over the same spectrum,” where the “multiple signals are distinguished by their respective **chip code sequences**.” Zeira, 1:21-26. I note that a “chip code sequence” refers to a *code division multiple access (CDMA) code*. Consequently, Zeira’s description of chip code sequences shows they operate as codes in a CDMA system (described in section V.A.1-2). In addition, Zeira describes a “**spreading factor** of sixteen was used for both the uplink and

downlink channels.” 7:23-32. The *single physical channel* is a downlink channel since signals are sent to a UE over it, so it would have the spreading factor described in Zeira. Thus, Zeira renders obvious this claim in either case.

E. Ground 5: Claims 12-13 and 18-19 are obvious over Zeira in view of Khan, Tong, and Baker

1. Claim 12

[12.0] The UE of claim 11, wherein the processor is further configured to receive an indication as to whether accumulation of TPC commands is enabled.

173. Zeira alone or Zeira in view of Baker renders obvious this limitation.

a) Zeira’s UE receives an indication that accumulation of TPC commands is enabled

174. Zeira renders obvious a UE receiving an indication that TPC command accumulation is enabled because it discloses a network operator controlling whether closed loop power control, which includes TPC command accumulation, is enabled in the UE.

175. In more detail, during Zeira’s closed loop power control mode and combined closed/open loop mode, accumulation of TPC commands is enabled. *See* Zeira, 6:1-20. Specifically, the TPC commands are “accumulated” because Zeira teaches an iterative algorithm in which the TPC command to adjust transmit power is applied to the UE’s prior calculation of transmit power, which would have also been calculated based on previous TPC commands. *See* Zeira, 6:1-20. This is

illustrated in Equations 4 and 6, where P_{TS} is the UE's transmit power (purple), $G(n)$ is the closed loop power control factor (blue), $G(n - 1)$ is the previous closed loop power control factor (blue), b_{TPC} is the TPC command (blue), L is path loss (green):

$$P_{TS} = P_0 + G(n) + \alpha L \quad \text{Equation 4}$$

$$G(n) = G(n-1) + b_{TPC} \Delta_{TPC} \quad \text{Equation 6}$$

Zeira, 6:1-20. The TPC command (b_{TPC}) causes an increase or decrease in transmit power by “+1 or -1.” Zeira, 6:22-31. A POSITA would have understood that the closed loop control factor $G(n)$ is a function of previous closed loop control factors $G(n - 1)$ (and therefore previous TPC commands), which results in successive TPC commands being “accumulated” with previous commands in the calculation of transmit power P_{TS} —i.e., transmit power is iteratively updated by each TPC command.

176. Zeira also discloses a conventional open loop scheme, in which accumulation of power control commands is not enabled. Zeira, 1:51-63. In open loop mode, the UE calculates transmission power based on path loss and does not use TPC commands. Zeira, 1:56-59 (“To determine a transmission power for the uplink, the downlink pathloss is added to a desired received power level at the base

station.”).

177. Zeira teaches the recited *indication that accumulation of TPC commands is enabled* by a weighting factor α —set via the network—that determines whether the UE uses purely open loop (where accumulation is not enabled), purely closed loop (accumulation is enabled), or the combined scheme (accumulation is enabled). Zeira, 7:12-22. In the example Equation 4, annotated below, the weighting factor α (red) is applied to the open loop path loss variable, and setting it to zero would disable open loop mode and enable closed loop mode (thereby enabling TPC command accumulation):

$$P_{TS}=P_0+G(n)+\alpha L$$

Equation 4

Zeira, 6:1-20, 7:16-22. As another example, Zeira explains that the weighting factor α “may be applied to the closed loop factor” $G(n)$. Zeira, 7:16-22. In that example, if the weighting factor was set to any other value than zero, closed loop mode would be enabled and thus TPC accumulation would also be enabled.

178. Zeira further explains that the UE receives the weighting factor α (*indication of...accumulation*) from a “network operator.” Zeira, 7:16-22. Specifically, the network operator sets α within the UE to control which power control technique the UE utilizes:

Although the two above algorithms only weighted the open loop factor, **the weighting may be applied to the closed loop factor** or both the open and closed loop factors. Under certain conditions, **the network operator may desire to use solely open loop or solely closed loop power control. For example, the operator may use solely closed loop power control by setting α to zero.**

Zeira, 7:16-22. Zeira describes that “each base station 30₁ communicates with user equipments (UEs) 32₁-32₃ in its **operating** area.” Zeira, 1:14-16. Thus, the “network operator” would be Zeira’s base station which is a *network device*. Accordingly, Zeira’s UE receiving from the network operator the weighting factor α indicating that closed loop power control (and thus TPC command accumulation) is enabled, renders obvious “*the processor is further configured to receive an indication as to whether accumulation of TPC commands is enabled.*”

b) Baker illustrates it was known for a UE to receive power control parameters

179. To the extent Zeira does not explicitly describe its UE receiving the α parameter to indicate which power control mode is enabled, such communication between a base station and UE was well known and conventional in wireless communications, and thus obvious. For example, Baker explains that “[t]here are two basic types of communication required between a Base Station (BS) and a Mobile Station (MS) in a radio communication system.” Baker, [0002]. “The first

is user traffic, for example speech or packet data. The **second is control information, required to set and monitor various parameters** of the transmission channel to enable the BS and MS to exchange the required user traffic.” Baker, [0002]. One of the functions of such control information “is **to enable power control.**” Baker, [0003]. Consistent with this conventional understanding, in Baker’s method of “adjusting power control parameters” the “**BS 100 transmits power control commands separately from instructions to the MS 110.**” Baker, [0019], [0043]; *see also id.* at [0037] (“The BS 100 then, at step 406, determines ... appropriate settings for the PCA and Δ_{TPC} parameters, which settings are communicated to the MS 110...”). Accordingly, a UE receiving power control parameters from a base station is a “basic” type of communication, and thus well understood by a POSITA reading Zeira.

180. It is my opinion that a POSITA therefore would have found it obvious, in view of this conventional understanding, that Zeira’s “network operator” sets the α power control parameter on a UE by transmitting an indication of the desired setting from a network device (e.g., base station) to the UE. Zeira, 7:16-22. Thus, Zeira alone or Zeira in view of Baker renders obvious “*the processor is further configured to receive an indication as to whether accumulation of TPC commands is enabled.*”

2. Claim 13

[13.0] *The UE of claim 12, wherein the processor is further configured to accumulate the TPC command with another TPC command in response to enablement of accumulation of TPC commands.*

181. Zeira discloses or at least renders this claim obvious.

182. As described above in [11.3] and [12.0], Zeira's transmit power calculation device 116 determines the "transmit power level, P_{TS} ," by adding a previous TPC command (included in previous closed loop factor, $G(n - 1)$) to the current TPC command. Zeira, Equations 4 and 6, 6:1-20. This accumulation of TPC commands, however, is only enabled when the weighting parameter α associated with the closed-loop factor is non-zero. Zeira, 7:16-22 (explaining that "the weighting factor may be applied to the closed loop factor or both the open and closed loop factors").

3. Claim 18

[18.0] *The method of claim 17 further comprising receiving, by the UE, an indication as to whether accumulation of TPC commands is enabled.*

183. This claim is substantially similar to claim 12, and for the same reasons, the prior art renders this limitation obvious.

4. Claim 19

[19.0] *The method of claim 18, further comprising accumulating, by the UE, the TPC command with another TPC command in response to enablement of accumulation of TPC commands.*

184. This claim is substantially similar to claim 13, and for the same reasons, the prior art renders this limitation obvious.

F. Ground 6: Claims 14 and 20 are obvious over Zeira in view of Khan, Tong, and Dick

1. Reasons to combine Zeira, Khan, Tong, and Dick

185. It is my opinion that a POSITA when considering the teachings of Zeira would have naturally considered the teachings of Dick, as Dick is also analogous prior art pertaining to the same field of endeavor as both Zeira and the '500 patent, namely, "mobile radio system or wireless communication system." '500 patent, 1:23-26; Zeira, 1:7-13; Dick, [0002].

186. A POSITA would have been motivated to combine the teachings of Zeira with Dick, as modified by Khan and Tong. In particular, before the priority date of the '500 patent, it would have been obvious and predictable for Zeira's UE to transmit uplink data on an uplink shared channel, as Dick explains is common in the 3GPP standard. For example, Dick describes:

Where shared channels are utilized, different WTRUs can use the same channel and channel use by a particular WTRU can be sporadic. The inventors have recognized that the metric used for adjusting power control in the conventional manner for a specific shared channel may not be readily available since the relative position of the WTRU may have substantially changed from when it last

used the specific shared channel. Accordingly, it is desirable to provide method and apparatus for controlling the power of shared channel where there may be sporadic use of such channels by WTRUs.

For example, the physical channels specified in 3GPP Release 5 (R5) of UMTS Terrestrial Radio Access Time Division Duplex (UTRA TDD) include a High Speed Shared Information Channel (HS-SICH) which operates in conjunction with a High Speed Downlink Shared Channel (HS-DSCH). HS-SICH is a fast Uplink (UL) feedback channel used in UTRA TDD R5 for High Speed Downlink Packet Access HSDPA operation. The HS-SICH carries a 1-bit Ack-Nack message and a several bit long measurement report from a particular WTRU that received a downlink (DL) transmission on the HS-DSCH.

Dick, [0012]-[0013]; *see also* Dick [0059]. Using the standard 3GPP uplink shared channel in Zeira's 3GPP system is nothing more than the predictable use of prior art elements according to their established functions.

187. Zeira explains that in its UE “[t]he power controlled communication is passed through the isolator 62 and radiated by the antenna 58,” thus the UE transmits an uplink signal to the base station. Zeira, 7:4-5. Zeira does not explicitly describe transmitting the uplink signal over an uplink shared channel. Dick, however, teaches that its system “provides controlled transmitter power in a

wireless communication system in which both dedicated and *shared channels* are utilized.” Dick, [0019]. Dick further explains that power control on uplink shared channels is important because “different WTRUs [UEs] can use the same channel and channel use by a particular WTRU can be sporadic.” Dick, [0012]. Thus, “it is desirable to... control[] the power of shared channels where there may be sporadic use of such channels by WTRUs.” Dick, [0012]. Accordingly, in view of the importance of controlling power on an uplink shared channel, a POSITA would have been motivated and found it obvious for Zeira’s UE to similarly control the power of its uplink transmission on uplink shared channels, including a standard 3GPP uplink shared channel (UL HS-SICH). A POSITA would have had a reasonable expectation of success in incorporating Dick’s teachings into Zeira’s because they are both directed to standardized power-controlled wireless communication systems. Zeira, 1:7-20, 1:36-38, 4:14-16, 5:40-43, 6:25-27; Dick, [0011], [0013], [0032], [0039]-[0040].

2. Claims 14 and 20

The [UE of claim 11]/[method of claim 17], wherein the uplink signal is transmitted on an uplink shared channel.

188. As discussed in [11.5], Zeira teaches the UE transmitting uplink data to a base station, where a baseband processor in the UE determines the power level of the uplink transmission. Zeira, 6:59-7:4, 4:56-61, 5:52-65. Dick further teaches

a “UL shared channel, such as the HS-SICH,” where “the UL HS-SICH data signal is provided with a desired power level” that is adjusted based on “up/down command signals” (i.e., TPC commands). Dick, [0012], [0013], [0059], [0070]-[0073], Claim 26. Thus Zeira in view of Dick render obvious *the uplink signal* (“UL HS-SICH data signal”) *is transmitted on an uplink shared channel* (“UL HS-SICH”).

VIII. CONCLUSION

189. This declaration and my opinions herein are made to the best of my knowledge and understanding, and based on the material available to me, at the time of signing this declaration. I declare that all statements made herein on my own knowledge are true and that all statements made on information and belief are believed to be true, and further, that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 or Title 18 of the United States Code.

Date: November 26, 2024



Michael Kotzin