

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

TESLA, INC.,

Petitioner,

v.

INTELLECTUAL VENTURES II LLC,

Patent Owner.

Case No. IPR2025-00217
U.S. Patent No. 10,952,153

**DECLARATION OF DR. GARY LOMP IN SUPPORT OF
PATENT OWNER'S PRELIMINARY RESPONSE**

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I, Dr. Gary Lomp, do hereby declare:

I. INTRODUCTION

1. I am making this declaration at the request of Intellectual Ventures II, LLC (“Intellectual Ventures”) in the matter of the *Inter Partes* Review (“IPR”) proceedings before the United States Patent and Trademark Office (“USPTO”) of U.S. Patent No. 10,136,153 (“the ‘153 Patent”) to provide expert technical opinions with respect to the ‘153 Patent.

2. I am being compensated for my work in this matter at my standard hourly rate of \$450 for such consulting services. My compensation in no way depends on the outcome of this case, and I have no financial interest in the outcome.

3. In preparing this Declaration, I considered the following materials, the subject matter of which are all within the scope of my education and professional experience:

- The ‘153 Patent, Ex. 1001;
- The Petition for *Inter Partes* Review of U.S. Patent No. 10,136,153 (“Pet.”);
- the Declaration of Dr. Kotzin;
- U.S. Patent No. 6,334,047 (Ex. 1009)(“Andersson”);
- U.S. Patent Appln. Pub. No. 2004/0190485 (Ex. 1005)(“Khan”);
- U.S. Patent Appln. Pub. No. 2001/0036238 (Ex. 1010)(“Baker”); and
- U.S. Patent No. 6,600,772 (Ex. 1004)(“Zeira”).

- Harri Holma & Antti Toskala, WCDMA for UMTS: Radio Access for Third Generation Mobile Communications (2d ed. 2002)(Ex. 1012)

II. PROFESSIONAL BACKGROUND

4. Based on my qualifications, education, knowledge, expertise, experience, and work background, I believe I am qualified to offer opinions relating to the technology described in the '153 Patent. Exhibit 2002 is a copy of my current *curriculum vitae* ("CV"), detailing my education and experience. Additionally, the following overview of my background pertains to my qualifications for providing expert testimony in this matter.

5. I am currently an Adjunct Professor in Wireless Communications at the NYU Tandon School of Engineering and President of TekTaktiks, a research and expert consulting company. My job duties include directing and performing research in, and technical evaluation of, advanced communication system design, especially new cellular technologies. I have over 45 years of experience in the field of wireless telecommunications, including advanced military communications systems, commercial satellite, WiFi and cellular systems research and development. I have over 20 years of experience in providing expert services in the field of wireless telecommunications. I hold Ph.D., Master's and Bachelor's degrees in Electrical Engineering, all from the Polytechnic Institute of New York (now part of NYU Tandon School of Engineering).

6. I am a named inventor on over 100 issued U.S. Patents in the field of wireless telecommunications. Most of these patents pertain to wireless communication, including communication system architecture, communication system signal processing and communication system protocols.

7. In addition to my technical experience in the field of wireless communications systems, I have been a principal and executive in multiple wireless technology corporations. In the late 1980s and early 1990s, I was Vice President and Chief Scientist at SCS Mobilecom, a wireless company that developed new technology based on spread spectrum technologies and advanced signal processing (DSP) techniques. Following the acquisition of SCS Mobilecom by InterDigital Communications, Corporation in 1992, I held various leadership roles at InterDigital, including General Manager of the Wireless Products Business Unit and Executive Vice President and Chief Technology Officer, where I helped develop 2G and 3G technologies. After InterDigital, I served in leadership positions at several wireless startups, including Symbol Technologies (where I led the Wide Area Wireless technology division), LayerOne Wireless Technologies Inc. (where I served as CEO) and incNetworks (where I served as CTO). I am also the Founder and President of The TekTacktics Group, Inc. a private company that has provided expert services and telecommunications consulting in the Telecommunications industry for the past 15 years.

8. In terms of commercial research and development (R&D) experience, I have worked extensively on the design and optimization of radio frequency (RF) communications systems for enhanced capacity and service coverage. A further object of my work has been to realize systems that are “converged” or are ingredients in a converged network concept. Convergence means the technical integration of heterogeneous services (such as voice, data, and multimedia) and heterogeneous radio technologies (macrocellular, microcellular, WiFi, cordless phone) into a seamless operating unit. This work requires cross functional design in which the respective heterogeneous technologies are made to interoperate.

9. During this career activity, I have had first-hand knowledge and exposure to numerous discussions, and debates in support of the advancement of new wireless technologies and paradigms. These new technologies addressed various air interface methods, including orthogonal frequency division multiplexing (OFDM) and Orthogonal Frequency Division Multiple Access (OFDMA), a closely related method of utilizing the OFDM format to provide shared access. My current research includes the presently evolving 5G cellular concept, which incorporates, among other things, MIMO-OFDM/OFDMA processing. As outlined above, my involvement in wireless R&D has also drawn me to fundamental system architecture issues and philosophies including the functional portioning of the overall wireless network. I have had the benefit of collaboration and debate with numerous top tier innovators,

from many industry-leading organizations in the field. In particular, I have detailed knowledge and recollection of the atmosphere surrounding the ongoing wireless technology revolution that began in the late 1980s and continues to the present day, including the period surrounding the present invention, and also including attempts by interested parties across the globe to promulgate and protect preferred ideas and intellectual property.

10. With respect to the technologies relevant to the '153 Patent, my experience includes over 20 years of research and development in the area of CDMA cellular telephone technology and systems, beginning at the very start of the commercialization of previously classified spread spectrum techniques, with which I had also a decade of prior experience. During that period of my career I had roles ranging from Senior Member of Technical Staff and Senior Principal Engineer to Chief Scientist and Chief Technology Officer heading a team of over 100 engineers in the development of the earliest WCDMA prototypes. I am a named inventor on 7 US Patents pertaining specifically to power control techniques in wireless systems, as well as many additional patents that cover all aspects of CDMA and post-CDMA wireless technology and systems. In addition to direct application to power control in cellular systems, in which numerous challenges and tradeoff analyses are required (as exemplified by the scope and depth of research and invention of concern in the current matter), I also had the benefit (earlier in my career) of 2 years of intensive study and

optimization of Delta Modulation for voice digitization, a project for which I was recognized for creating “the best 16 kilobit per second voice coder yet to be heard”. Many of the core issues that occur in power control of a wireless transmission over a randomly and often drastically varying radio channel are found in the application of delta modulation to voice encoding. An example is the well-known problem of choosing a step size and optimally varying the step size in order to cope with the dichotomous nature of the quantity being controlled (received radio frequency power level) or tracked (voice). In both applications, as dissimilar as they seem, the quantity of interest undergoes changes from near quiescence to rapid variation with large swings of level that challenge any algorithm attempting to stabilize or track said quantity.

11. To place the experience I have in the context of innovation and invention, I have been involved throughout my career in the evolution of many other basic radio communication technologies since their inception, such as MIMO, Multiuser Detection, and FEC coding advances, such as Turbo and LDPC, and soft output decoders such as the Soft Output Viterbi Algorithm (SOVA). A significant portion of the engineering design work I have performed has entailed the introduction of new techniques to provide capabilities that had not existed previously, such as a recently deployed novel baseband processor capable of robust demodulation and combining of signal components received on two antennas,

respectively, at very low signal to noise ratios. Most recently, I have designed an advanced form of OFDM in which the impairments due to channel dispersion are mitigated in both the time domain (as in conventional OFDM) and the frequency domain (which is an Achilles heel of OFDM). This achievement is the result of many years of perseverance culminating in the discovery of a mathematical tool of broad applicability (*to wit*, Simultaneous Approximate Singular Value Decomposition). Previously, a similar tenacity-fueled accomplishment produced the first and only complete closed-form theory of equalization of offset modulation formats (e.g. O-QPSK) in multipath channels, again a result of a persistent creative attack on the problem. In a word, I am well versed and well aware of the nuances of innovation and the toils of invention.

12. My CV contains further details on my education, experience, publications, and other qualifications to render an expert opinion in this case, Ex. 2006.

III. RELEVANT LEGAL STANDARDS

13. I have been asked to provide my opinion as to whether certain claims of the '153 Patent are obvious over US Patent No. 6,334,047 to Andersson et al. (hereinafter "Andersson"), U.S. Patent Appln. Pub. No. 2001/0036238 to Baker et al. (hereinafter "Baker") and U.S. Patent Appln. Pub. No. 2004/0190485 to Khan (hereinafter "Khan"). In addition, I have been asked to review whether the claims are

allegedly obvious over U.S. Patent No. 6,600,772 to Zeira et al. (U.S. Patent Appln. Pub. No. 6,600,772), Baker, Khan and U.S. Patent No. 6,529,741 to Tong et al. (hereinafter “Tong”).

14. The opinions I am expressing in this report involve the application of my knowledge and experience to the evaluation of certain references with respect to the ‘153 patent. My formal knowledge of patent law is no different than that of any lay person. Therefore, I have requested the attorneys from Volpe Koenig, who represent Intellectual Ventures, to provide me with guidance as to the applicable patent law in this matter. The paragraphs below express my understanding of how I must apply current principles related to patent validity to my analysis.

15. I understand that an IPR is a proceeding before the USPTO for evaluating the patentability of an issued patent’s claims based on prior-art patents and printed publications.

16. I understand that the claims of a patent are reviewed from the point of view of a hypothetical person of ordinary skill in the art (“POSITA”) at the time of the filing of the patent. The “art” is the field of technology to which a patent relates.

17. I understand that in determining whether a patent claim is anticipated or obvious in view of the prior art, the Patent Office must apply the *Phillips* standard to construe the claims.

18. I understand that, in this proceeding, Petitioners have the burden of proving that the challenged claims of the '153 Patent are unpatentable by a preponderance of the evidence. I understand that "preponderance of the evidence" means that a fact or conclusion is more likely true than not true.

19. I understand that there are two ways in which prior art may render a patent claim unpatentable. First, the prior art can "anticipate" the claim. Second, the prior art can render the claim "obvious" to a POSITA. I understand that for an invention claimed in a patent to be patentable, it must not be anticipated and must not be obvious based on what was known before the invention was made. For purposes of this Declaration only, I have applied the definition of a POSITA proposed in the Petition.

20. I understand that a patent claim may be invalid as "anticipated" under 35 U.S.C. § 102 if each and every limitation of the claim as construed by the court is found, either expressly or inherently, in a single prior art reference, such as a publication or patent, that predates the claimed subject matter. I also understand that a patent claim may be invalid as obvious under 35 U.S.C. § 103 if the differences between the subject matter claimed and the prior art are such that the claimed subject matter as a whole would have been obvious to a POSITA at the time the invention was made. I also understand that several factual inquiries underlie a determination of obviousness. These inquiries include (1) the scope and content of the prior art, (2) the

level of ordinary skill in the field of the invention, (3) the differences between the claimed invention and the prior art, and (4) any objective evidence of non-obviousness (i.e., “secondary considerations”).

21. I also understand that, when a party alleges obviousness based on a combination of references, that party should identify a reason why a POSITA would have been motivated to combine the asserted references in the manner recited in the claims and to explain why a POSITA would have had a reasonable expectation of success in making such combinations.

22. I understand that an obviousness analysis permits the application of “common sense” in examining whether a claimed invention would have been obvious to a POSITA. For example, I understand that combining familiar elements according to known methods and in a predictable way may suggest obviousness when such a combination would yield nothing more than predictable results. And I understand a party asserting obviousness should still provide a specific motivation to combine the references as recited in the claims and explain why one would have reasonably expected to succeed in doing so.

23. I understand that one indicator of non-obviousness is when a prior art reference leads in a different direction or discourages that combination, recommends steps that would not likely lead to the patent’s result, or otherwise indicates that a seemingly inoperative device would be produced.

IV. SPECIFICATION OF ‘153 PATENT

A. Overview

24. U.S. Patent No. 10,952,153, titled “Power Control in a Wireless Network” and assigned to Intellectual Ventures II LLC, discloses an innovative hybrid power control architecture designed to improve uplink power control performance in wireless communication systems, with particular applicability to CDMA-based technologies such as UTRA TDD. Ex. 1001, 1:28-31, 13:3-9.

24. The patent addresses fundamental limitations of conventional power control schemes—namely, open-loop and closed-loop approaches—which have long been used to manage uplink transmit power in mobile networks. Ex. 1001, 2:20-60, 6:9-8:31. Open-loop power control schemes enable user equipment (UE) to estimate path loss based on the received strength of a known downlink beacon. Ex. 1001, 2:24-35. While this method offers rapid responsiveness to short-term variations in the channel (e.g., fast fading), it fails to account for interference seen at the base station and assumes a symmetry between uplink and downlink channels that may not exist in real-world conditions. Ex. 1001, 2:33-35, 7:59-8:5.

25. In contrast, closed-loop power control schemes operate by having the network monitor uplink signal quality—typically measured in terms of signal-to-noise-and-interference ratio (SNIR)—and issue binary transmit power control (TPC) commands (e.g., ± 1 dB) to incrementally adjust the UE's transmit power. Ex. 1001,

2:36-44, 7:30-46. These schemes offer precise adjustment capabilities that reflect actual interference conditions at the receiver but suffer from delayed convergence in dynamic environments, where many sequential commands are required to effect significant power changes. Ex. 1001, 2:44-51 8:6-23.

26. The invention disclosed in the '153 Patent proposes a hybrid control mechanism that intelligently combines open-loop estimation with closed-loop feedback. Ex. 1001, 2:51-59, 8:24-31. In the open-loop component, the UE determines uplink path loss by measuring a downlink beacon signal transmitted at a known power level and calculating a “partial power” based on the measured path loss. Ex. 1001, 8:59-9:8. In parallel, the closed-loop component allows the network to measure uplink SNIR, compare it against a dynamically updated SNIR target (managed by an outer loop using observed error metrics such as block error rate), and transmit TPC commands to the UE. Ex. 1001, 10:23-33. The UE accumulates the TPC commands over a frame. Ex. 1001, 9:28-33, 10:23-30. In the combined closed-open-loop method, the UE determines its transmit power by essentially integrating the accumulated TPC commands with the calculated partial power for the current frame and adding in “adjustment factors.” Ex. 1001, 9:28-42, 10:23-33.

27. An advancement of the patented invention is the use of multi-level TPC commands in the closed-loop feedback. Ex. 1001, 9:17-18. Traditional systems utilize binary (up/down) TPC instructions with fixed step sizes, typically ± 1 dB. Ex.

1001, 8:8-1. This binary limitation restricts responsiveness in fast-changing environments. The patented system, by contrast, allows the network to transmit TPC commands that represent a range of predefined adjustment magnitudes—enabling larger or more nuanced transmit power changes in a single command. Ex. 1001. 8:6-16 This substantially improves convergence speed and controls granularity, particularly under fast fading or sudden path loss conditions.

28. Another important enhancement disclosed in the ‘153 Patent is the integration of TPC commands with uplink resource allocation data on a single channel, improving signaling efficiency and reducing latency. 12:66-13:9. This design ensures that the UE receives consistent, timely control instructions, which is essential in environments where rapid adaptation to changing interference or fading conditions is required.

29. The ‘153 Patent further introduces an accumulation mechanism within the UE, wherein the device maintains a running total of TPC commands over an entire frame. Once per frame, the UE integrates the total of the TPC commands with the results of a partial power calculation to determine an adjusted uplink transmit power level for UE transmissions. Ex. 1001, 9:28-42, 10:23-30. In the ‘153 Patent, this functionality can be both enabled and disabled using a “new parameter” that “instructs the UE to enable or disable the setting of uplink transmit power level based on both the path loss estimation and the TPC commands.” Ex. 1001, 13:18-20. Accumulation

can be disabled, for example, “when a UE passes a threshold value indicative of mobile speed.” Ex. 1001, 11:60-64.

30. In sum, the ’153 Patent discloses a robust and adaptive uplink power control methodology that overcomes the respective shortcomings of open- and closed-loop control schemes. Ex. 1001, 2:52-59, 8:24-31. By integrating fast, beacon-based path loss estimation with fine-grained, multi-level feedback control—and further optimizing command delivery via a unified signaling channel—the invention provides a significant improvement in managing uplink SNIR, reducing interference, and enhancing overall system performance, particularly in mobile and interference-prone wireless environments. Ex. 1001, 2:30-33, 9:17-18, 28-42, 12:66-13:9. Additionally, the ’153 Patent teaches that TPC command accumulation can be enabled or disabled, for example based on the UE speed, which may reduce the amount of processing and signaling required by both the UE and the base station in the event that the UE is traveling either slow enough, such that fast channel fading is not an issue, or fast enough, such that fast channel fading is a concern. Ex. 1001, 13:18-20, 11:60-64.

B. Terminology

1. Fading and Fast Fading

31. In the context of wireless communications, and specifically’153 Patent, the term “fading” refers to the fluctuation in the strength of a radio signal as it propagates through the environment from the transmitter (such as user equipment, or

UE) to the receiver (typically a base station), or vice versa. Ex. 1001, 4:43-53. These fluctuations are primarily the result of the signal taking multiple paths through the environment due to reflection, diffraction, and scattering caused by obstacles such as buildings, vehicles, trees, and terrain. *Id.* As the various versions of the signal travel different paths, they arrive at the receiver at slightly different times and with different phases. Depending on how these signal components align when they arrive, they can interfere either constructively—resulting in a stronger signal—or destructively—weakening or even canceling the signal. This interference pattern causes the amplitude, phase, and sometimes the frequency of the received signal to vary, a phenomenon referred to as fading.

32. Fading can be broadly categorized into several types, but in the context of this patent, the most relevant form is fast fading, also known as small-scale fading. Fast fading refers to rapid changes in signal strength that occur over very short time intervals (often milliseconds or less) or small physical distances, typically due to user mobility or dynamic changes in the propagation environment. *Id.* This contrasts with slow fading (also called shadowing), which occurs more gradually and is caused by large-scale obstructions like buildings blocking the line-of-sight path. Fading can also be classified as flat fading, where the entire signal bandwidth is affected equally, or frequency-selective fading, where only portions of the bandwidth are impacted depending on the multipath delay spread.

33. The patent focuses on the challenges that fast fading poses for power control in uplink transmissions. Ex. 1001, 8:6-11. Because the channel conditions can change rapidly due to user movement or environmental shifts, the transmit power must be adapted quickly to maintain an acceptable signal-to-noise-and-interference ratio (SNIR) at the receiver. Ex. 1001, 7:50-53, 8:12-16. This is particularly difficult for closed-loop power control schemes, which depend on the network measuring the uplink SNIR and sending transmit power control (TPC) commands back to the UE—typically in fixed increments such as 1 dB. *Id.* Since these adjustments are limited in size and subject to transmission delay, closed-loop control often cannot respond fast enough to compensate for deep fades or sudden increases in path loss. In contrast, open-loop power control—which allows the UE to estimate the path loss independently based on beacon signals transmitted at known power levels from the base station—can react more quickly to fast fading, since it does not rely on delayed network feedback. *Id.*

2. Accumulation

34. “Accumulation” of TPC command increments is fundamental to closed loop power control. The underlying concept, common to all closed-loop power control schemes, is known as “Delta Modulation.” Delta Modulation was developed in 1952. Ex. 2010. It was presented as a simple method of analog-to-digital conversion with a serial output. The primary application was encoding voice.

35. The analogy between voice encoding and power control is as follows: The input voice represents the quantity that is to be matched by the accumulated delta-modulation increments. *Id.* at 450-451. Here the accumulator is equivalent to an integrator. The encoder compares the input voice level (amplitude) to the current (encoder local) integrator output. If it is larger the integrator receives an “up” increment (a predefined step). *Id.* Conversely, if it is smaller the integrator receives a “down” increment at its input. In some cases, if the difference is negligible, the integrator may receive “no change” increment at its input. In this way, the integrator is always within 1 step of matching the voice level – assuming the update is frequent enough and the step size is large enough. This aspect will be addressed further in what follows.

36. The input increments to the local integrator may obviously be mapped to information bits. These bits are transmitted to the remote end of a communication link, where they are fed into another integrator. Assuming no bit errors, the remote integrator will match the local integrator, and the voice is thereby reproduced at the remote location. Errors in transmission can, of course, cause problems, as they, too, accumulate. This may be solved, for example, by employing a “leaky integrator” in both the local encoder loop and the remote reconstruction loop.

37. The use of delta modulation for voice communication is incidental to the basic tracking loop functionality. The entire power control analogy (except for errors,

which can again be handled by utilizing a leaky integrator in the UE) can be found in the local encoder.

38. It soon became evident that DM was limited by two factors: the coarseness of the quantization if the step size is too large and the inability to follow (“failure to follow” distortion) large changes in amplitude if the step size is too small (known as slope overload).

39. In a radio channel, the fading and interference environment causes radio signal levels to vary in a manner very similar to a random voice signal’s amplitude variations. There is a small variation during a voice sound (called a phoneme) that creates the sound (which may have buzz, hiss, or tone quality), and a superimposed larger, phoneme-by-phoneme, or syllable-by-syllable, variation in voice intensity. The latter may be compared to slow fading or shadowing of a radio signal as a mobile device moves.

40. Since a single step size cannot meet all conditions at low update rates, new approaches were invented. There is long history and large literature of Adaptive Delta Modulation (ADM) in which the step size is allowed to vary. A very successful method was known as “Continuously Variable Slope Delta-Modulation”, or CVSD. In CVSD the step value is stored in an auxiliary integrator (accumulator register or an analog integrator, as was well known in the time frame of the 70’s and later). If the encoder produced consecutive commands of the same polarity (say 3 or 4 in a row), a

“coincidence detector” would generate a pulse that fed the step size integrator, causing the step size to increase. If the step size integrator is leaky, the step size will naturally relax back to a smaller level if coincidences (which are slope overload indications) subside.

41. Not all of the speech-encoding aspects of ADM are relevant to radio signal power control, but they could well be mimicked. The fundamental principle is the use of stepped adjustments that need to be able to respond to two kinds of change (slow and rapid) of level of the quantity being tracked. Importantly, in both applications it is desirable to keep the required update rate low to conserve signal communication bandwidth.

42. As used in the patent, “accumulation” refers to the process by which user equipment (UE) tracks and sums the history of transmit power control (TPC) commands received from the network as part of a closed-loop power control scheme. In such a system, the base station continuously monitors the signal-to-noise-and-interference ratio (SNIR) of the uplink transmission from the UE and compares it to a predefined SNIR target. If the measured SNIR is too low or too high, the network sends a TPC command instructing the UE to increase or decrease its transmit power—typically by a small, fixed step size, such as ± 1 dB. Rather than adjusting the transmit power immediately and independently in response to each TPC command, the UE

keeps a running tally of all the "up" and "down" commands. This process of summing these incremental adjustments over time is what the patent refers to as accumulation.

43. Accumulation is particularly valuable because it enables the UE to determine the net power adjustment required, especially when many small commands are issued in rapid succession. It helps smooth out the power control process by avoiding constant back-and-forth swings in transmit power, which could occur if each TPC command were acted upon in isolation. Additionally, accumulation provides a measure of resilience against noise and temporary fluctuations in SNIR, as it prevents the UE from overreacting to transient conditions. In the hybrid power control scheme described in the patent, accumulation also plays a key role in supporting multi-level TPC commands—where the magnitude of the final power adjustment is derived from the total number of steps accumulated over a period of time.

44. A helpful analogy for understanding accumulation is to think of a thermostat controlling the temperature in a room. Suppose the thermostat detects that the room is slightly too cold and sends a signal to turn up the heat by one degree. If the room remains cold, the thermostat keeps sending more “turn up” signals. Instead of reacting to each individual signal by tapping the thermostat every time, you could simply count the number of “heat up” signals and then raise the temperature by the total amount all at once. This is the idea behind accumulation: tracking a series of small, incremental instructions to inform a more stable and controlled adjustment in

transmit power. By using accumulation, the system balances responsiveness with stability, enabling more precise and efficient power control in dynamic wireless environments.

45. In the context of the ‘153 Patent, an “accumulator”/“integrator” is a functional component within the user equipment (UE) that stores and tracks the history of transmit power control (TPC) commands received from the network—specifically, from the base station (Node-B). Ex. 1001, 3:39-43, 7:15-29, 9:27-42. It plays a key role in the closed-loop power control mechanism and is particularly important in the combined open-loop and closed-loop scheme described in the ‘153 patent.

46. In closed-loop power control, the base station periodically sends TPC commands to the UE, instructing it to increase or decrease its transmit power—typically by a fixed amount. Ex. 1001, 6:66-7:2. These instructions are meant to adjust the UE’s transmit power so that the SNIR at the base station aligns with a predefined SNIR target. *Id.* In the combined closed-open-loop scheme, the TPC commands are accumulated over a frame and then integrated with the partial power calculated based on pathloss, as indicated by $P_{TX}(k)$, although integration can occur less than every frame period (e.g., every time a new TPC command is received), or less frequently (e.g., only when a new power level is received from the network). Ex. 1001, 9:28-42.

3. Channel

47. In the context of the ‘153 Patent, the term “channel” refers to the communication path over which radio signals are transmitted between a network entity, such as a base station, and a UE, such as a mobile phone or other wireless device. A wireless channel can be thought of as the radio link between the transmitter and receiver. In the ‘153 Patent, channels are discussed in the context of both the uplink (from UE to base station) and the downlink (from base station to UE). Ex. 1001, 1:35-41, 1:60-63, 4:33-40. Further, the ‘153 Patent specifically discloses, for the combined open-closed loop scheme, “a new physical channel on downlink [that] may be used to carry fast allocation and scheduling information to a user: Ex. 1001, 12:66-13:2. This channel may also be used to carry TPC commands. Ex. 1001, 13:3-7. Alternatively, instead of a new channel, “the combined scheme may be applied to existing channel types (dedicated or shared uplink physical channels) for UTRA TDD as well as to other TDD systems.” Ex. 1001, 13:6-9.

C. Accumulation in combined open- and closed-loop power control scheme

48. In a combined open- and closed-loop uplink power control scheme, the user equipment (UE) accumulates transmit power control (TPC) commands using the following expression:

$$\sum_{k-K}^k TPC^i, \quad (\text{Equation 1})$$

where k represents the current frame, K is the first frame after accumulation is reset (or the first frame in general), and i denotes the current time slot. See, e.g., Ex. 1001, 9:28–30, 10:23–33.

49. The full transmit power equation for the combined scheme, which incorporates the TPC accumulation shown above (Equation 1, highlighted in red), is given by:

$$P_{Tx}(k) = P_{open}(k) + step \cdot \sum_{k-K}^k TPC^i + \gamma_{SF} + \beta_{TFC} \quad (\text{Equation 2})$$

Ex. 1001, 9:28-42.

50. The transmit power $P_{Tx}(k)$ may be updated every frame period, each time a new TPC command is received (i.e., once per slot, ii), or only when either a TPC command or a new power level is received from the network. See Ex. 1001, 9:34–40. In other words, when the system is configured to operate in the combined open-closed-loop scheme (as indicated by a corresponding parameter—see sub-heading 1 *supra*), the UE accumulates TPC commands received in each slot either once per slot or over one or more frames. Ex. 1001, 9:28-42.

51. As described in the specification, “[t]he UE accumulates 420 the TPC commands and uses the accumulated TPC commands in part to set 436 the transmit power level for future uplink transmissions 400.” Ex. 1001, 10:14–17. The resulting transmit power level $P_{Tx}(k)$ may then be used to set the uplink power of transmitted user data. See Ex. 1001, 10:33–35;. This process is illustrated in FIGURE 4 of the

'153 Patent, a block diagram in which the relevant components cited above are highlighted in red below for ease of reference.

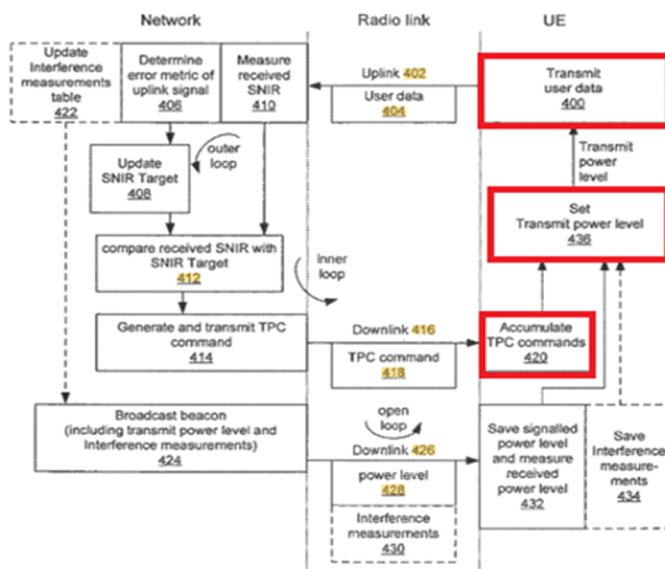


FIGURE 4

52. Regarding Open Loop control, it can be stated that in the case of perfect channel reciprocity, there is no need for closed loop control. For, with reciprocity, knowledge of the received power and the transmitted power in one direction (the downlink, for example), determines exactly the uplink path loss and therefore the required power to transmit to produce the desired received signal power (or SNR).

53. In my opinion, there are two problems with the open loop method. First, perfect reciprocity is not guaranteed, especially if there are distinct uplink and downlink radio frequencies. Even in TDD, when the frequencies are the same, there is a small time difference between transmissions, so that conditions may not be the same in the uplink transmission interval as they were in the reference downlink

interval. Second, other factors, especially external or other users' signals interference, can be different in the two link directions. Open loop control does not measure this passively (i.e., by simply measuring received signal level in one direction). A means of informing the transmitter of the need to overcome interference is required. Over the air closed loop can handle this. Local closed loop requires "side information" to handle the asymmetry in the two link directions.

54. One may regard closed loop control as a means of correcting for the inaccuracy of open loop control. This is a beneficial point of view. The overall variation of signal level in a wireless system can be 100 dB. That is, ten orders of magnitude. If open loop control can eliminate 80 dB of that variation, then closed loop control can be applied to handle the remaining 20 dB of variation. Moreover, the open loop control may be adjusted such that the residual variation (say 20 dB) may have a smaller rate of change than the uncompensated variation.

V. CHALLENGED CLAIMS OF THE '153 PATENT

55. Petitioner challenges independent Claims 1 and 11, and dependent claims 2-5, 10-15 and 20 of the '153 Patent. Independent Claim 1 is representative, and recites:

1. A user equipment (UE) comprising:
 - a transmitter;
 - a receiver; and

a processor, operatively coupled to the transmitter and the receiver,

wherein the processor is configured to cause:

the receiver to receive, from a network device, an indication that transmit power control (TPC) command accumulation is enabled,

the receiver to receive, from the network device, on a single physical channel, scheduling information and power control information that includes a multi-level TPC command, and

the transmitter to transmit, to the network device, an uplink signal based on the received scheduling information and the multi-level TPC command.

VI. A PERSON HAVING ORDINARY SKILL IN THE ART

56. For purposes of the institution decision only, I do not contest the definition of a person of ordinary skill in the art (“POSITA”) proposed in the Petition. Petition, 15. I reserve the right to contest Petitioner’s proposed definition of a POSITA if a trial is instituted.

VII. PRIOR ART RELIED ON IN PETITION

57. In Ground 1, Petitioner challenges independent claims 1 and 11, and certain dependent claims, as allegedly obvious over US Patent No. 6,334,047 to Andersson et al. (hereinafter “Andersson”), U.S. Patent Appln. Pub. No. 2001/0036238 to Baker et al. (hereinafter “Baker”) and U.S. Patent Appln. Pub. No. 2004/0190485 to Khan (hereinafter “Khan”). In Ground 3, Petitioner challenges independent claims 1 and 11, and certain dependent claims, as allegedly obvious over

U.S. Patent No. 6,600,772 to Zeira et al. (U.S. Patent Appln. Pub. No. 6,600,772), Baker, Khan and U.S. Patent No. 6,529,741 to Tong et al. (hereinafter “Tong”). The remainder of the grounds address dependent claims only. Dependent claims 6-9 and 16-19 are not challenged.

A. Andersson

58. Andersson describes a technique for enabling fast and efficient adaptation of transmit power control in wireless systems. The reference is particularly focused on varying the step size and type of power control scheme used based on changing radio conditions, while minimizing signaling overhead. Ex. 1009, 10:27–31. This is achieved by “transmitting a single bit value with the transmit power control command,” which I understand to refer to a power control indicator (PCI) that signals which of multiple predefined power control behaviors the UE should follow. Ex. 1009, 10:27–31. From a wireless systems perspective, this approach enables the network to signal a “very fast power control type adjustment” to the UE “without much increase in overhead,” which is important in environments where fast fading or rapid mobility demand quick adaptation. Ex. 1009,10:31-39

1. Power Control Routine

59. Andersson sets forth a power control routine that may be implemented by a wireless network. This routine is illustrated in the flow chart of FIG. 4 (reproduced below with relevant steps highlighted in red), which outlines how the

network computes and sends power control instructions to the UE. Specifically, as shown in block 206, the network transmits a “transmit power control command” to the UE instructing it “to either raise, lower, or make no change to the transceiver’s current transmit power level.” Ex. 1009, 9:4–6.

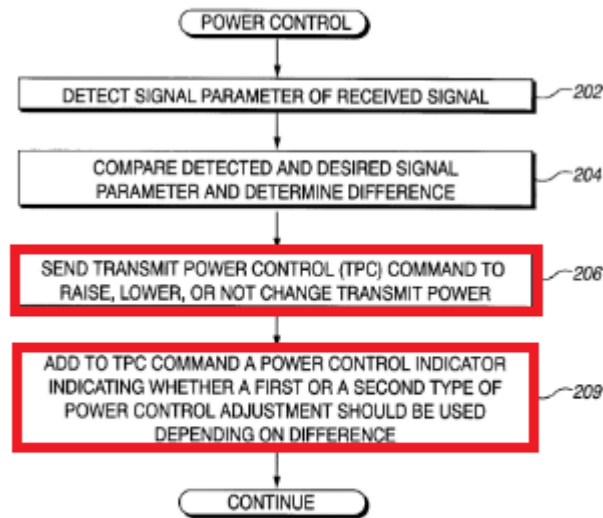


Fig. 4

60. In block 209, a power control indicator is added to this TPC command. This indicator, which “in its simplest form, may be a single flag bit,” tells the UE whether it should apply a first or second type of power control adjustment. Ex. 1009, 9:6–11. In other words, Andersson discloses that, for uplink power control, the UE receives both: (1) a TPC bit indicating whether to raise, lower, or maintain power, and (2) a power control indicator bit instructing whether to use one of multiple power control schemes, which may be as simple as using a small or large step size (e.g., 1

dB or 8 db), or using the same step size in each slot or varying step sizes per slot. Ex. 1009, 9:45-50, 10:41-59.

2. Dedicated Physical Control Channel (DPCCH)

61. Andersson also describes the transmission format used to deliver the TPC and power control indicator bits to the UE. These values are transmitted on the Dedicated Physical Control Channel (DPCCH), a channel uniquely assigned to an individual UE. Ex. 1009, 9:12–16. In my experience, such a dedicated channel enables the network to issue frequent, per-UE-specific commands, including fast power control signaling without delay or contention.

62. As a general matter, regarding dedicated channels, etc., it is well-known in the art, at least as far back as 2G Digital Cellular, and even in Analog Cellular, to use **separate channels**, both at the Physical Layer (PHY) and Higher Layers (e.g., Logical Channels such as RLC Link Control Layer, RRC, etc.) to support signaling and control transmission between individual users (UE's) and the Access Network (**dedicated channels**), on the one hand, and between the Access Network and multiple UE's (**shared channels**) on the other hand. In the first case, only the intended UE demodulates and decodes (or transmits) the signal. In the second case, an entire set of UEs (possibly all) can demodulate a shared channel transmitted from the base station or transmit to a base station using a shared channel. In the dedicated case, frequency, time, and code resources are allocated to a single UE, preventing other UE's from

receiving the dedicated channel. In the shared case, additional methods, namely multiplexing methods, must be added to organize the shared channel usage into non-interfering parts. The relevant aspect of the dichotomy is that only single UE's can receive a DCH signal. When a dedicated channel is used to transmit information to the UE, that information is packaged into a data payload carried within the physical "container" of a well-defined discrete transmission. Thus, two time slots are not a single discrete transmission; they comprise two such transmissions, even when intended/transmitted for a single UE. Another distinguishing characteristic of a dedicated channel is that it is allocated for a specific user and is deallocated when that user no longer requires it. In more picturesque language, the channel is "nailed up" during the time it is allocated to the user, and the resources are unavailable to other users. Note, however, that two dedicated channels may be assigned to the same user, at least in principle. They may carry different information at different times and have frequencies (recurrence rates, not radio frequencies) of transmission. It is also logically possible to opportunistically, or conditionally, based on user operational state, utilize a dedicated channel to convey signaling information to a user when such information is ready for transmission. Such opportunistic use of a dedicated channel may decrease the need for the user to access shared resources (channels that are shared and that, therefore, have variable demand and load). Such use of a dedicated channel does not change the nature of the channel from "dedicated" to some other type.

63. The format of the DPCCH is illustrated in FIG. 5 of Andersson (reproduced below). As shown, the DPCCH is divided into 72 frames spanning 720 ms, with each 10 ms frame consisting of 16 time slots of 0.625 ms duration. Each time slot includes a pilot field, a TPC field (increase, decrease, or maintain), a power control indicator, and other bits. Ex. 1009, 9:16–22. Andersson does not define the “other bits” nor does even hint at what those bits could be. It is important to note that Andersson also teaches a common channel over which the base station transmits “common signaling.” Ex. 1009, 8:10.

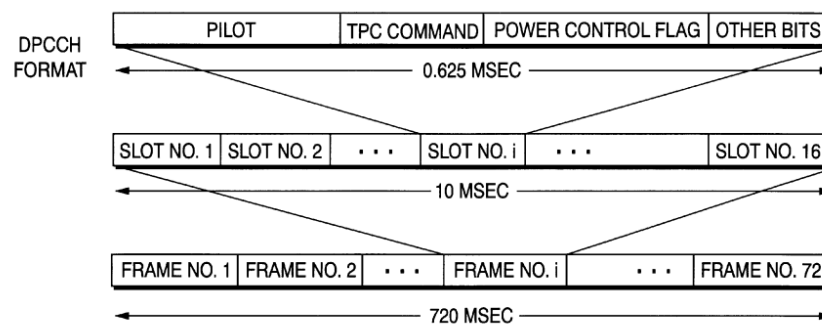


Fig. 5

B. Baker

64. Baker is directed to uplink power control in a wireless communication system, specifically within a UMTS framework, utilizing two-state Transmit Power Control (TPC) commands that are transmitted once per timeslot. See Baker, ¶ 21. In addition to the TPC command bit itself, the system behavior is governed by two parameters: the Power Control Algorithm (PCA) and the uplink Transmit Power

Control step size (ΔTPC). These parameters define the power control step size applied by the user equipment (UE), enabling three effective step size configurations. *Id.*

65. Table 1 below summarizes the relevant combinations of PCA, TPC command, and ΔTPC , as well as the resulting transmit power adjustment at the UE. When PCA is set to 1, ΔTPC may be either 1 dB or 2 dB. Under these conditions, a received TPC command of 0 causes the UE to reduce its transmit power by ΔTPC dB, while a command of 1 causes the UE to increase its transmit power by the same amount. See Baker, ¶ 22.

TABLE 1

PCA	TPC Command	ΔTPC	UE Action
1	0	1 or 2	Reduce Transmit Power by ΔTPC
	1	1 or 2	Increase Transmit Power by ΔTPC
2	0	1	Combine TPCs in groups of 5. If all 5 TPCS are 1, increase transmit power by ΔTPC ; if all 5 TPCs are 0, decrease transmit power by ΔTPC ; otherwise, do not change Transmit Power.

66. When PCA is set to 2, ΔTPC is fixed at 1 dB. In this case, the UE does not respond to individual TPC commands. Instead, it evaluates the commands in

groups of five. If all five commands are equal to 1, the UE increases its transmit power by ΔTPC dB; if all five commands are 0, the UE decreases its power by ΔTPC dB; otherwise, no adjustment is made. See Baker, ¶ 23.

67. While Baker does not explicitly disclose the use of an accumulator, it is evident that the described logic enables the accumulation of power adjustments over time. Depending on the sequence of received TPC commands and the selected PCA and ΔTPC parameters, the effective net adjustment to transmit power may be +1, -1, +2, -2, or 0 dB. These outcomes reflect behavior consistent with an accumulation process, even though that term is not expressly used in the reference.

C. Khan

68. Khan is directed to mechanisms for delivering control information—such as scheduling grants—for reverse link (i.e., uplink) packet access in a wireless communication system. See Ex. 1005, ¶ 11. Unlike systems such as described by Andersson, which rely on dedicated control channels (such as the Dedicated Physical Control Channel, or DPCCH) to transmit Power Control (TPC) commands to user equipment (UE), Khan focuses on architectures that leverage shared control channels to perform this function.

69. Khan explains that legacy voice-based systems traditionally used dedicated links between a base station and individual wireless units. See Ex. 1005, ¶ 4. However, as wireless networks evolved to accommodate bursty and delay-tolerant

data traffic—such as Internet applications—resource management in the uplink has become a significant design consideration. In this context, Khan observes that dedicated links may no longer be necessary, and that both uplink and downlink control channels can instead be shared among multiple UEs. See Ex. 1005, ¶ 5. Under this model, UEs contend for access to shared resources, with base stations managing uplink scheduling based on system-wide constraints, including received signal power and inter-cell interference. *Id.*

70. Khan identifies a specific problem that arises in time-multiplexed systems supporting reverse link packet access. In such systems, the forward link (FL) may use a time-slot structure that makes it difficult to allocate persistent or code-multiplexed channels for control signaling. See Ex. 1005, ¶¶ 11, 43. Consequently, Khan proposes mechanisms to transmit control information—including scheduling grants and TPC bits—over shared channels that align with the slot-based nature of the system. See Ex. 1005, ¶ 43.

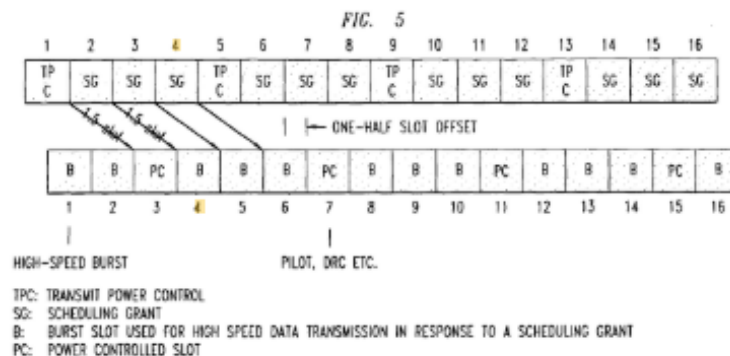
71. The detailed description of Khan presents two exemplary embodiments for delivering such control information to UEs:

- Using Orthogonal Walsh Covers (Ex. 1005, ¶¶ 45–47):

In this approach, each active UE is assigned a unique MAC index. These MAC indices are transmitted in bursts of 64 chips and can convey up to 6 bits of control information. To simultaneously support scheduling grants and TPC

bits, orthogonal Walsh codes are used to separate the information streams. In practical terms, this embodiment treats TPC and scheduling grant information as being transmitted over separate physical channels. See Ex. 1005, ¶¶ 37–41, 47.

- Using a TDD Channel Structure (Ex. 1005, ¶ 47 and FIG. 5):
In this embodiment, the forward link uses a time-division multiplexed structure where control information is distributed across different timeslots. For example, as illustrated in FIG. 5, TPC bits are transmitted in slots 1, 5, 9, and 13, whereas scheduling grants are sent in the intervening slots. In this manner, although both types of control information are sent over the same shared physical channel, they are separated in time rather than by code. The UE responds by transmitting in designated slots that are tied to its received scheduling grant. See Ex. 1005, FIG. 5.



72. Thus, Khan distinguishes itself by enabling TPC and scheduling control over shared media, rather than relying on dedicated physical control channels. This

design allows for scalable and efficient use of limited radio resources, particularly in environments characterized by dynamic user activity and asymmetric data demands.

D. Zeira

73. Zeira describes combined open loop and closed loop power control in a wireless TDD (Time Division Duplex) communication network. *See* Ex. 1004, FIG. 4; 3:25–26. The combined closed/open loop power controller 108 resides in a "transmitting station" 52, which can be either a user equipment (UE) or a network-side entity, such as a base station. Ex. 1004, FIG. 1004, 3:22-39.

74. Zeira's power control mechanism determines the transmit power level based on both closed loop and open loop control components. Specifically, a transmit power calculation device (element 116) within the controller 108 sets the transmit power level of the transmitting station adjusting target power control to account for a closed loop power control factor, $G(n)$, and a weighted open loop power control factor αL , using Equation 4 in Zeira (referred to herein as Equation 3):

$$P_{TS} = P_0 + G(n) + \alpha L \quad (\text{Equation 3})$$

75. Here, P_0 is the target received power at the base station, which may be derived from the desired SIR and interference level. Ex. 1004, 6:5-6. $G(n)$ is the closed loop power control factor, defined by the recursive relation (Equation 6 in Zeira, referred to herein as Equation 4):

$$G(n) = G(n - 1) + b_{TPC} \Delta_{TPC} \quad (\text{Equation 4})$$

76. In this equation, $G(n-1)$ represents the previous closed loop power control factor, b_{TPC} , is a binary power control command sent from the base station (either +1 or -1), and ΔTPC is the power step size, typically 1 dB. Ex. 1004, 6:21–27. Accordingly, each power control command either increases or decreases the accumulated closed loop term by ΔTPC . Zeira states that b_{TPC} is transmitted by the network to the UE over a dedicated channel. See Ex. 1004, 4:27–30.

77. The term L in Equation 3 represents the estimated pathloss, which is calculated at the UE based on measurements of a received downlink signal and the known or signaled transmit power of that signal. Ex. 1004, 5:18-36. The weight α is a scalar quality factor applied to the pathloss estimate and reflects the system's confidence in the accuracy of the open loop component. Zeira describes α as a measure of pathloss quality and notes that it is determined by the UE. Ex. 1004, 6:32–33.

78. Zeira also contemplates scenarios where the network operator may choose to rely solely on closed loop control. To achieve solely open loop power control, α may be set to zero. See Ex. 1004, 7:18–22. In Zeira, α is typically determined by the transmitting station (i.e., the station whose transmit power is being controlled or the UE in the alleged combination), and the specification does not explain how the network can set α to zero in this limited circumstance. Ex. 1004, 6:32-33.

79. With respect to the transmission of control information, Zeira, like Andersson, relies on dedicated control channels. Zeira explicitly states that the closed loop power control command b_{TPC} is typically transmitted via a dedicated channel established between the receiving station and the transmitting station. See Zeira, 4:27–30; 7:28–30. Thus, each UE is assigned a dedicated control channel for receiving power control commands from the base station, consistent with legacy UMTS architectures that prioritize link-specific reliability and latency. See Section A.2. *supra*.

80. In sum, Zeira teaches a flexible power control mechanism that dynamically combines open and closed loop elements, with the ability to fall back to closed loop-only operation as needed. However, the transmission of power control information remains tied to dedicated channels, like Andersson, distinguishing Zeira from later systems that leverage shared channels for improved scalability and efficiency.

VIII. GROUND 1 FAILS TO DEMONSTRATE A REASONABLE LIKELIHOOD OF SUCCESS ON THE MERITS

A. The Petition’s Proposed Combination of Andersson, Baker, and Khan Fails to Disclose or Suggest Key Claim 1 Limitations and Would Require Impermissible System-Level Redesigns Incompatible with Obviousness Principles.

81. In Ground 1, Petitioner asserts that Claims 1, 2, 4, 5, 11, 12, 14, and 15 are obvious under 35 U.S.C. § 103 based on a purported combination of Andersson,

Baker, and Khan. In my opinion, the asserted ground is deficient for several technical reasons.

82. First, Andersson does not disclose, or suggest, any indication sent to a user equipment (UE) that transmit power control (TPC) command accumulation is enabled. Second, Petitioner has failed to establish a sound technical motivation to combine Andersson with Khan. The two references operate on fundamentally different control architectures, and integrating their teachings would require a substantial reengineering of Andersson's system—far beyond what is permissible under obviousness jurisprudence. Third, Petitioner relies heavily on conclusory assertions by its expert, Dr. Kotzin, both to fill in gaps where the cited references are silent and to justify the combination, rather than pointing to specific disclosures in the prior art.

1. Andersson and Baker, Alone or in Combination, Fail to Disclose or Suggest “an Indication that TPC Accumulation is Enabled,” as Recited in Claim 1

83. Petitioner argues that Andersson discloses a UE that “receives, from a network device, an indication that TPC command accumulation is enabled.” Petition, 34:7 – 35:4. The basis for this assertion is the “power control indicator” disclosed in Andersson at 9:6–11, which Petitioner characterizes as an indication that a particular type of power control adjustment is enabled.

84. This interpretation is technically incorrect. In Andersson, the TPC command causes the UE to increase, decrease, or maintain its transmit power. While the concept of “accumulation” is not expressly described, to the extent that the TPC commands are integrated with the transmit power response to successive TPC commands, the effect is similar to accumulation. That said, this accumulation behavior—whether implicit or not—is always enabled in Andersson’s system. There is no disclosure or suggestion that the network ever disables accumulation or sends an indication to enable it.

85. The power control indicator bit in Andersson merely modulates the magnitude of the TPC adjustment—for example, specifying whether the adjustment is 1 dB or 8 dB. See Ex. 1009, 9:45–50. In other embodiments, the power control indicator varies the adjustment based on slot number. *See id.*, 10:40–58. In all cases, the TPC command continues to effect a power change – the magnitude of the change may vary, but the TPC is always applied.

86. Thus, the power control indicator does not serve as an enable/disable flag for accumulation. Rather, it modifies how the accumulation (i.e., the integration of power adjustments over time) is performed. Therefore, Petitioner’s characterization of this indicator as an “indication that TPC accumulation is enabled” is inaccurate.

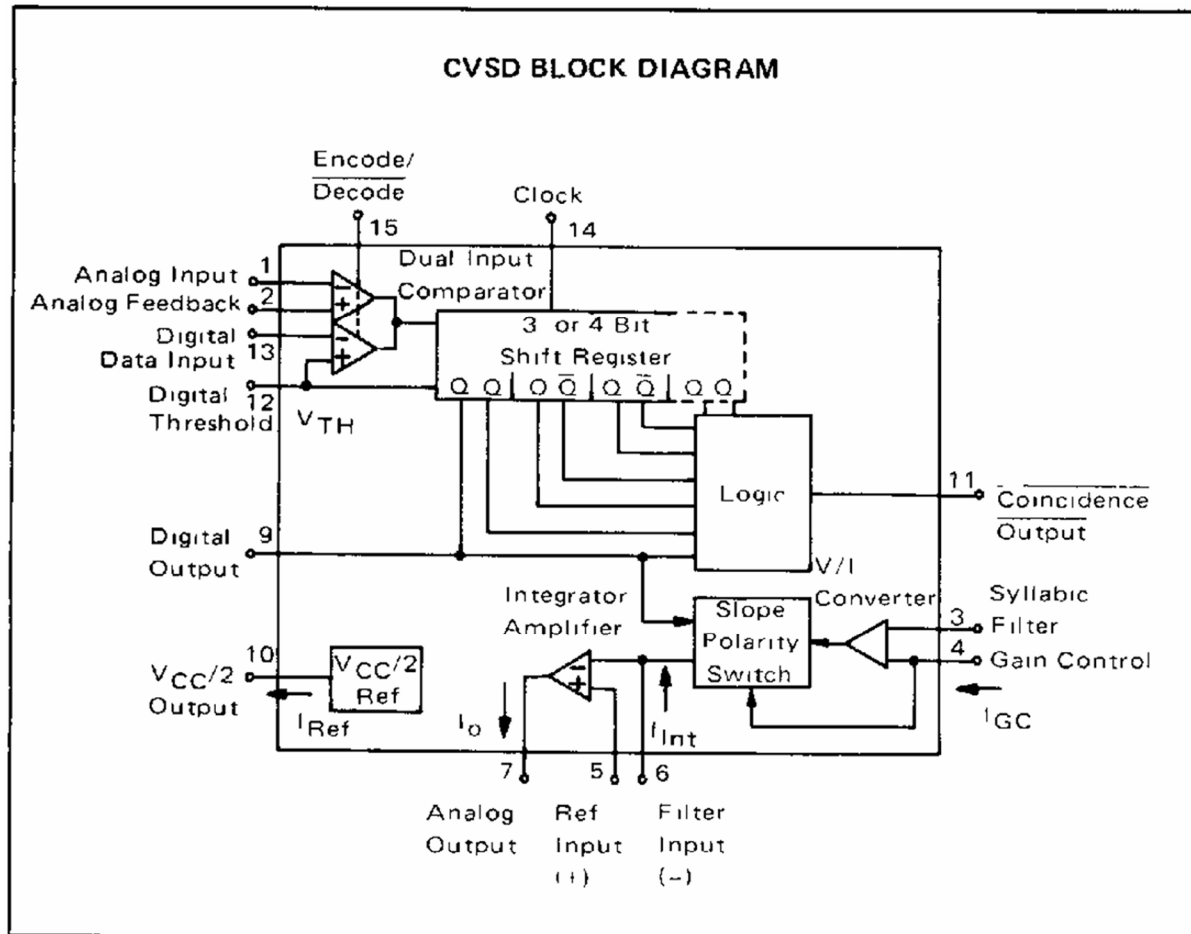
87. Petitioner also posits that, since TPC accumulation was a “well-known type of power control adjustment” prior to the ’153 patent, Andersson’s indication

must include that functionality. Petition, Paper 20, Line 18 through Paper 21, Line 3. However, this interpretation is inconsistent with the actual disclosure. In Andersson, there is no indication that the power control indicator disables the TPC command or bypasses integration with the accumulated transmit power level. On the contrary, if the goal were to transmit a null adjustment, that could be achieved simply by sending a TPC command indicating no change. Ex. 1004, 45-48. There is no reason to use the indicator for that purpose. See Ex. 1009, 9:4-6.

88. From a purely technical perspective, it is my opinion that Andersson's power control indicator is distinct from the power control bit and merely informs how the latter is to be applied. It is not providing any other information. It is superfluous in the role, since the ability to turn off adjustments is subsumed in the TPC command (viz, zero change to power). Moreover, as explained in Section B.2 *supra* in the context of adaptive delta modulation, there is no need to provide explicit step size adjustment because the need for such adjustment is inherent in the bit stream. It can be inferred from the observation of an imbalance in the up-down adjustments. Such imbalance, measured on a running basis, is sometimes referred to as the "charge" carried by the bit stream. When a delta modulation process is tracking, the "charge" is near zero. When it starts to fall behind (failure to follow) the charge accumulates. Measuring this charge obviates the need for a separate bit. POSITA would regard Andersson's indicator to be an indicator of a separate aspect of the algorithm.

Andersson appears to leave that aspect to the imagination. Regarding the sensing of the need for a step size change,

Data sheets for the Motorola part MC3417 and MC3418 go back to at least the 90's. Ex. 2011 and Ex. 2012. These chips implemented the algorithm I outlined in the earlier discussion. Using the technique known and used by this chip would obviate the need for Andersson's Indicator. A replica of the data sheet is shown below. Ex 2011, page (2-)101.



The relevant excerpt from the Exhibit is shown below.

CIRCUIT DESCRIPTION

The continuously variable slope delta modulator (CVSD) is a simple alternative to more complex conventional conversion techniques in systems requiring digital communication of analog signals. The human voice is analog, but digital transmission of any signal over great distance is attractive. Signal/noise ratios do not vary with distance in digital transmission and multiplexing, switching and repeating hardware is more economical and easier to design. However, instrumentation A to D converters do not meet the communications requirements. The CVSD A to D is well suited to the requirements of digital communications and is an economically efficient means of digitizing analog inputs for transmission.

The Delta Modulator

The innermost control loop of a CVSD converter is a simple delta modulator. A block diagram CVSD Encoder is shown in Figure 11. A delta modulator consists of a comparator in the forward path and an integrator in the feedback path of a simple control loop. The inputs to the comparator are the input analog signal and the integrator output. The comparator output reflects the

sign of the difference between the input voltage and the integrator output. That sign bit is the digital output and also controls the direction of ramp in the integrator. The comparator is normally clocked so as to produce a synchronous and band limited digital bit stream.

If the clocked serial bit stream is transmitted, received, and delivered to a similar integrator at a remote point, the remote integrator output is a copy of the transmitting control loop integrator output. To the extent that the integrator at the transmitting location tracks the input signal, the remote receiver reproduces the input signal. Low pass filtering at the receiver output will eliminate most of the quantizing noise, if the clock rate of the bit stream is an octave or more above the bandwidth of the input signal. Voice bandwidth is 4 kHz and clock rates from 8 k and up are possible. Thus the delta modulator digitizes and transmits the analog input to a remote receiver. The serial, unframed nature of the data is ideal for communications networks. With no input at the transmitter, a continuous one zero alternation is transmitted. If the two integrators are made leaky, then during any loss of contact the receiver output decays to

CIRCUIT DESCRIPTION (continued)

zero and receive restart begins without framing when the receiver reacquires. Similarly a delta modulator is tolerant of sporadic bit errors. Figure 12 shows the delta modulator waveforms while Figure 13 shows the corresponding CVSD decoder block diagram.

The Companding Algorithm

The fundamental advantages of the delta modulator are its simplicity and the serial format of its output. Its limitations are its ability to accurately convert the input within a limited digital bit rate. The analog input must be band limited and amplitude limited. The frequency limitations are governed by the nyquist rate while the amplitude capabilities are set by the gain of the integrator.

The frequency limits are bounded on the upper end; that is, for any input bandwidth there exists a clock frequency larger than that bandwidth which will transmit the signal with a specific noise level. However, the amplitude limits are bounded on both upper and lower ends. For a signal level, one specific gain will achieve an optimum noise level. Unfortunately, the basic delta modulator has a small dynamic range over which the noise level is constant.

The continuously variable slope circuitry provides increased dynamic range by adjusting the gain of the integrator. For a given clock frequency and input bandwidth the additional circuitry increases the delta modulator's dynamic range. External to the basic delta modulator is an algorithm which monitors the past few outputs of the delta modulator in a simple shift register. The register is 3 or 4 bits long depending on the application. The accepted CVSD algorithm simply monitors the contents of the shift register and indicates

if it contains all 1s or 0s. This condition is called coincidence. When it occurs, it indicates that the gain of the integrator is too small. The coincidence output charges a single pole low pass filter. The voltage output of this syllabic filter controls the integrator gain through a pulse amplitude modulator whose other input is the sign bit or up/down control.

The simplicity of the all ones, all zeros algorithm should not be taken lightly. Many other control algorithms using the shift register have been tried. The key to the accepted algorithm is that it provides a measure of the average power or level of the input signal. Other techniques provide more instantaneous information about the shape of the input curve. The purpose of the algorithm is to control the gain of the integrator and to increase the dynamic range. Thus a measure of the average input level is what is needed.

The algorithm is repeated in the receiver and thus the level data is recovered in the receiver. Because the algorithm only operates on the past serial data, it changes the nature of the bit stream without changing the channel bit rate.

The effect of the algorithm is to compand the input signal. If a CVSD encoder is played into a basic delta modulator, the output of the delta modulator will reflect the shape of the input signal but all of the output will be at an equal level. Thus the algorithm at the output is needed to restore the level variations. The bit stream in the channel is as if it were from a standard delta modulator with a constant level input.

The delta modulator encoder with the CVSD algorithm provides an efficient method for digitizing a voice input in a manner which is especially convenient for digital communications requirements.

89. Petitioner's alternative argument—that the use of TPC accumulation as a power control adjustment would have been obvious in light of Baker—also fails.

90. Baker discloses a "Power Control Algorithm" (PCA) parameter that governs how TPCs are interpreted over time. See Ex. 1010, ¶¶ 21–23. If PCA = 1, the UE adjusts power in every slot based on the TPC command and a ΔTPC value of 1 or 2 dB. If PCA = 2, the UE combines TPC commands over groups of five slots and only adjusts power when all five commands are identical. Even in this mode, TPC

commands are still being integrated, albeit over a longer time interval. The adjustment to the UE's transmit power is simply deferred, not disabled. *See id.*

91. There is no teaching in Baker that accumulation can be turned off or that the accumulator can be reset. Indeed, Baker does not describe an accumulator explicitly at all. However, it is apparent from the described behavior that the UE's transmit power is always updated based on a function of one or more prior TPC commands—i.e., accumulation is always implied to be “enabled.” At most, when no change is required, the adjustment is zero, but this is not the same as disabling accumulation. A disabled accumulator would involve suspending integration and potentially resetting or freezing the internal state. Neither scenario is described or even suggested in Baker.

92. Furthermore, Baker's framework does not contemplate sending a network-side indication to the UE that accumulation is enabled. There is no disclosure of a signaling mechanism for such an enable/disable control, and no behavior in Baker is predicated on enabling or disabling accumulation.

93. Finally, the assumption made in the Petition—that the use of grouped TPC commands when $PCA = 2$ implies that accumulation is disabled—is technically incorrect. The UE still modifies its transmit power based on the collective effect of five TPC commands. This is accumulation over a longer window, not its absence. This

is entirely consistent with the '153 patent, which contemplates accumulation on a per-slot or per-frame basis. See Ex. 1001, 9:35–40.

94. From a technical perspective, given the fact that the quantity being tracked and controlled (received signal power) exhibits varying rates of change, from quiescent to rapidly fading, it is natural to consider signaling of adjustments scheduled at a minimal rate necessary. A most adaptive system might only signal an adjustment when the magnitude of the deviation from the setpoint exceeds a threshold. But in order to take advantage of a reduced rate when such is appropriate, it is necessary to coordinate the transmission and reception entities to expect adjustments only as needed. Otherwise, in non-adjustment instances, it would still be necessary to indicate “no adjustment” which spoils the savings in transmission resources. Of course, it is possible in such “quiet conditions” to reduce the step size, which would increase the accuracy of the approximation of the quiescent level. However, that is less important in wireless systems, where transmission capacity is paramount, than reducing transmission rate. The next best thing is to approximate this minimal adjustment arrangement with a less frequent adjustment timing, for example, every 5 frames instead of every frame. This, in turn, entails detecting that the conditions permit the reduced rate, and restoring the higher rate when conditions revert to higher dynamic conditions.

95. Accumulating TPC commands over longer intervals, such as every 5 slots, as disclosed by Baker, or every frame, as disclosed by the ‘153 Patent, is a natural way to conserve transmission capacity when adjustment frequency can be lowered or raised according to the variation of the quantity being tracked. *See* Ex. 2013 at 4.2.1. It was well known, at the time of filing of the application for the ‘153 Patent, to schedule signaling of various periodic repetition intervals.

96. Both Andersson and Baker are completely silent on the concept of disabling accumulation. There is no support in either reference for the notion that accumulation can be toggled on or off via signaling, let alone that such an indication is sent from the network to the UE. Accordingly, there is no disclosure—either express or implied—of “an indication that TPC accumulation is enabled,” as required by Claim 1 of the challenged patent.

97. In summary, while both references may assume or imply that accumulation occurs as part of TPC-based uplink power control, neither reference supports the idea of disabling or re-enabling accumulation or transmitting an indication to the UE regarding its state. The Petition’s attempt to construct such a teaching from Andersson and Baker is unsupported by the references themselves and rests on flawed technical assumptions.

2. Ground 1 Fails Because the Proposed Combination of Andersson and Khan Would Require Impermissible Redesigns Contrary to 35 U.S.C. § 103

98. First, Andersson does not disclose, or suggest, any indication sent to a user equipment (UE) that transmit power control (TPC) command accumulation is enabled. Second, Petitioner has failed to establish a sound technical motivation to combine Andersson with Khan. The two references operate on fundamentally different control architectures, and integrating their teachings would require a substantial reengineering of Andersson's system—far beyond what is permissible under obviousness jurisprudence. Third, Petitioner relies heavily on conclusory assertions by its expert, Dr. Kotzin, both to fill in gaps where the cited references are silent and to justify the combination, rather than pointing to specific disclosures in the prior art.

3. Andersson and Khan, Alone or in Combination, Do Not Disclose or Suggest “Receiv[ing], From the Network Device, on a Single Channel, Scheduling Information and Power Control Information,” as Required by Claim 1

99. The Petition asserts that the combination of Andersson and Khan renders obvious the claim feature requiring the UE to receive, on a single channel, both scheduling information and power control information that includes a multi-level TPC command. *See* Petition, 36:14–16. In my professional opinion, this argument reflects a misunderstanding of the fundamental differences between the channel types and signaling structures disclosed in Andersson and Khan. Moreover, the cited references

are technically incompatible and cannot reasonably be combined to achieve the functionality required by Claim 1 of the '153 Patent.

100. Petitioner argues that a person of ordinary skill in the art (POSITA) would have been motivated to transmit both the TPC command and uplink scheduling grant on Andersson's dedicated physical control channel (DPCCH), using techniques allegedly taught by Khan. Petition, 26:5–15. The rationale advanced is that doing so would represent a predictable use of prior art elements and improve Andersson's system 'in the same way' Khan improves shared-channel systems.

101. This rationale, however, ignores key distinctions in channel architecture between the two references.

a. Andersson's Dedicated Channel Architecture

102. Andersson discloses that TPC commands are transmitted on a dedicated physical control channel (DPCCH) assigned to each UE. As shown in FIG. 5 of Andersson, each 0.625 ms slot of the DPCCH includes several fixed fields: a TPC command, a pilot, a power control indicator bit, and an "other bits" field. See Ex. 1009, 9:12–22; FIG. 5. Andersson does not specify the content of the "other bits."

103. Despite this silence, Petitioner speculates that a POSITA would have understood that the "other bits" could carry scheduling information, citing Khan as support. Petition, 39:3–6. This suggestion, however, is technically unsupported, for the reasons explained below. The only suggestion anywhere that the "other bits"

could be “scheduling information” is the specification of the ‘153 Patent, which is impermissible hindsight under 35 U.S.C. § 103.

b. Khan’s Shared Channel Architecture is Fundamentally Incompatible

104. Khan describes a channel model fundamentally different from that of Andersson. In particular, Khan teaches the use of a shared control channel, where a base station multiplexes control information—including scheduling grants and TPC commands—for multiple UEs. See Ex. 1005, ¶ 5. Khan’s scheduling structure is illustrated in FIG. 5 and comprises a time-multiplexed frame in which different slots are dedicated to different types of control data: some slots carry TPC commands (e.g., slots 1, 5, 9, 13), while others carry scheduling grants (e.g., slots 2–4, 6–8, 10–12, 14–16). Ex. 1005, ¶¶ 11, 43, 47.

105. Each of these control signals is directed to a different UE that listens on the shared channel, and the slots themselves are allocated according to type and timing constraints specific to the shared nature of the channel. For example, a UE that receives a scheduling grant in slot 2 is expected to transmit in slot 3. See Ex. 1005, ¶ 47 and FIG. 5.

106. This is in stark contrast to Andersson’s dedicated DPCCH architecture, in which all control information in a given slot is addressed exclusively to a single UE, and every slot in the DPCCH frame structure carries all control fields (TPC, pilot, power control flag, and “other bits”) simultaneously. See Ex. 1009, FIG. 5.

107. An important distinction is that Andersson teaches both dedicated channels and a common channel. Ex. 1009, 8:1-16. The petition does not explain why it is more likely that the alleged combination of Andersson with Khan would send scheduling information on the dedicated channel as Andersson's "other bits" rather than on Andersson's already established shared channel on which scheduling information is sent in Khan.

108. In general, historically, the dynamics of TPC and resource Scheduling have nothing to do with one another. TPC is only relevant when resources are in active use. What changes from this conventional wisdom, if anything, is that the uplink packet transmission dynamics are sporadic and it would be beneficial to have knowledge of both the resources to use and the power level to use when the uplink packet event occurs. However, the suggestion that these two concepts would naturally be combined on the same channel using Andersson's "other bits" presumes a "magical" sentience in which the system "knows" both the scheduled transmission resources (which it does) and the appropriate power level, which is unlikely unless there is a more specific context in which TPC update along with scheduling information are simultaneously relevant. The notion of on demand resource utilization with on demand power level prescription (without any other context) is fallacious. The transmission of TPC and scheduling together must be predicated on a

context, and that context comes from the 153 Patent, not from any a priori motivation or expectation.

c. Technical Incompatibility Precludes the Proposed Combination

109. Given these architectural differences, a POSITA would not find it technically feasible—or even logical—to incorporate Khan’s shared-channel scheduling mechanisms into Andersson’s dedicated-channel framework without significantly reengineering the frame structure. Khan’s system relies on shared slots and inter-UE coordination, while Andersson’s DPCCH assumes an isolated, per-UE control channel. Simply put, Khan’s control signaling methods are tailored for a shared environment and are not compatible with Andersson’s per-slot, per-user DPCCH design.

110. Any attempt to graft Khan’s shared scheduling grant mechanism into Andersson’s dedicated DPCCH would require a substantial redesign of the DPCCH frame format, its timing, and the way in which control information is addressed and interpreted by the UE. Such a modification goes far beyond a mere “predictable use,” and certainly does not improve Andersson’s system ‘in the same way’ Khan improves shared-channel systems, instead would amount to creating an entirely new system architecture.

111. Andersson’s opportunistic inclusion of “other bits” is not in the spirit of synchronized command/indication and subsequent response/action taught by Khan.

Khan's FIG. 5 shows a deterministic relationship between slot contents in the downlink and uplink that reflects a rigid time offset and explicit signals/commands.

The entire system timing and heartbeat of Khan hinges on the disclosed timing of and location of TPC and Scheduling signals. Anderson does not match this, and to import this structure into Andersson would require redesign of the Andersson system. In addition to the architectural difference between Andersson and Khan's system, there is a difference in the scope of the TPC commands themselves. In Khan, the scope of the TPC is a slot, whereas in Anderson, the scope of a TPC is a frame.

d. Flaws in Dr. Kotzin's Opinion

112. Petitioner's expert, Dr. Kotzin, opines that a POSITA would need only "the technique, not the structure" from Khan to implement the claimed feature in Andersson. See Ex. 1003, ¶ 75. I respectfully disagree with this assessment. The "technique" described in Khan—namely, delivering scheduling grants and TPCs on the same channel—is inseparable from its shared-channel structure. Khan explicitly distinguishes its approach from those that use dedicated links, acknowledging that its methods are motivated by the unique demands of shared-channel access. See Ex. 1005, ¶¶ 4–5. Ignoring this context and selectively borrowing only the outcome (i.e., co-delivery of control information), while discarding the mechanism, is not a sound basis for a 35 U.S.C. § 103 combination.

e. Purported Benefits Do Not Justify the Combination

113. Petitioner also identifies several purported benefits of the proposed combination, such as reduced signaling latency, simplified architecture, and support for a larger number of active UEs. Petition, 26:16-27:10. However, these benefits are predicated on the assumption that the proposed combination is technically feasible, which it is not. For example, Khan's ability to support more active UEs arises specifically from its use of shared channels—not from adding scheduling information to a DPCCH. To realize that benefit, the DPCCH would need to be converted to a shared channel—something not suggested or supported by either reference. Andersson in fact already discloses a common channel, which is more likely to carry the scheduling information than the DPCCH, given that Khan is limited to shared channels.

114. In conclusion, Andersson and Khan operate on fundamentally incompatible architectural models—dedicated versus shared control channels—and no reasonable modification of Andersson using Khan's techniques can produce the functionality required by Claim 1 without a substantial redesign of the system. Neither reference discloses, suggests, nor enables receiving both scheduling information and power control information “on a single channel” in the manner required. Accordingly, the asserted combination cannot support a finding of obviousness.

115. The Petition asserts that “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.” Petition, 27:13–15. In support of this assertion, the Petition cites two general statements from Andersson: (1) that certain signaling techniques are omitted to avoid obscuring the invention, and (2) that Andersson relies on “well-known CDMA techniques to distinguish between the various mobile station and base station communications.” Petition, Paper 27, Line 15 through Paper 28, Line 9.

116. However, in my expert opinion, neither of these statements supports a reasonable expectation of success in combining Andersson’s dedicated control channel framework with Khan’s shared, time-division multiplexed control signaling.

117. First, the Petition fails to account for the fact that Andersson’s DPCCH is inherently a dedicated channel—that is, each instance of the DPCCH is assigned to and serves a single UE only. Thus, distinguishing among multiple users using CDMA techniques (e.g., through orthogonal codes) is unnecessary in this context, because user separation is already handled through dedicated channel allocation. Therefore, the reference to “well-known CDMA techniques” in Andersson is not applicable to the control channel architecture at issue.

118. Second, Khan does not rely on CDMA for distinguishing between UEs on its control channel. Rather, Khan explicitly acknowledges the use of time-domain

multiplexing—not code-domain separation—as the means of organizing its forward link control signaling. As stated in Khan: “A code-multiplexed scheduling grant channel, in some cases, may not be used in the CDMA2000 HRPD. This may be attributed to the realization that the [forward link] may employ a time-multiplexed slot structure.” Ex. 1005, ¶ 5.

119. Khan further explains that this time-division multiplexing is necessary to accommodate its reverse link packet access scheme. See Ex. 1005, ¶¶ 11, 43. The use of time-multiplexed slots allows the system to interleave scheduling grants and TPC commands directed to different UEs within the same shared channel, an approach that is fundamentally distinct from the always-on, per-UE DPCCH structure disclosed in Andersson.

120. Given these architectural and functional differences, there is no basis for a POSITA to expect that Khan’s shared, time-slotted signaling mechanism could be seamlessly integrated into Andersson’s dedicated channel framework without significant system-level redesign. Simply put, Andersson is not designed to support time-multiplexed signaling to multiple UEs on a single control channel, and Khan’s system cannot be adapted to Andersson’s DPCCH without fundamentally altering its structure, timing, and resource allocation logic.

121. Therefore, in addition to failing to provide a proper motivation to combine these references, the Petition also fails to demonstrate that a person of

ordinary skill in the art would have had a reasonable expectation of success in doing so. The combination as proposed is neither straightforward nor predictable, and is not supported by the disclosures of either reference.

B. Independent Claim 1 Is Not Obvious Over the Alleged Combination of Andersson, Baker, and Khan

122. For the reasons discussed above—including the absence of any disclosure or suggestion of an indication that TPC accumulation is enabled, the incompatibility of the channel structures in Andersson and Khan, and the lack of a reasonable expectation of success—Claim 1 is not rendered obvious by the proposed combination of Andersson, Baker, and Khan. Each reference addresses a distinct control signaling framework, and their integration would require substantial modifications not suggested by the cited art.

C. Independent Claim 11 Is Not Obvious Over Andersson, Baker, and Khan for at Least the Same Reasons as Claim 1

123. Although Claim 11 is not identical to Claim 1, it recites similar features and is subject to the same core limitations—most notably, those concerning the receipt of scheduling and power control information on a single channel and the use of TPC accumulation. For the same technical reasons that Claim 1 is not obvious over the combination of Andersson, Baker, and Khan, Claim 11 likewise is not obvious over this combination.

D. Dependent Claims 2, 4, 5, 12, 14, and 15 Are Not Obvious Over Andersson, Baker, and Khan for at Least the Same Reasons as Their Respective Base Claims

124. Claims 2, 4, and 5 depend from Claim 1, and Claims 12, 14, and 15 depend from Claim 11. Because both independent Claims 1 and 11 are not rendered obvious by the alleged combination of Andersson, Baker, and Khan, as explained above, the same conclusion applies to each of these dependent claims. Accordingly, Claims 2, 4, 5, 12, 14, and 15 are not obvious over the alleged combination for at least the same reasons as their respective base claims.

IX. Ground 2 – Claims 3 and 13 Are Not Obvious Over Andersson, Baker, Khan, and Dick Under 35 U.S.C. § 103

125. Claim 3 depends from Claim 1, and Claim 13 depends from Claim 11. As discussed, Claims 1 and 11 are not obvious over the combination of Andersson, Baker, and Khan. The additional reference, Dick, does not cure the fundamental deficiencies in the combination of these references. Dick does not disclose or suggest an indication that enables TPC accumulation, nor does it resolve the incompatibility between the dedicated and shared control channel architectures discussed above. Accordingly, Claims 3 and 13 are also not obvious over the combination of Andersson, Baker, Khan, and Dick.

X. Ground 3 – Claims 1, 2, 4, 5, 10–12, 14, 15, and 20 Are Not Obvious Over Zeira, Baker, Khan, and Tong Under 35 U.S.C. § 103

126. The Petition asserts that Claims 1, 2, 4, 5, 10–12, 14, 15, and 20 are rendered obvious under 35 U.S.C. § 103 based on an alleged combination of Zeira, Baker, Khan, and Tong. In my expert opinion, this assertion is deficient for multiple reasons.

127. First, Zeira does not disclose or suggest an indication, transmitted to the user equipment (UE), that TPC (Transmit Power Control) command accumulation is enabled. Second, the Petition fails to establish an adequate motivation to combine Zeira and Khan – the proposed combination would require a substantial reengineering of Zeira’s system architecture, which is not supported by any teaching in the prior art. Third, the Petition relies heavily on conclusory opinions by Petitioner’s expert, Dr. Kotzin, to fill in substantive gaps in the disclosures of Zeira and to supply reasons to combine the cited references—neither of which are supported by the references themselves.

A. Zeira and Baker, Alone or in Combination, Fail to Disclose or Suggest “The Processor is Configured to Cause: The Receiver to Receive, From a Network Device, an Indication That TPC Command Accumulation Is Enabled,” as Required by Claim 1

128. The Petition argues that Zeira teaches a UE configured to receive “an indication that TPC command accumulation is enabled.” Petition, 77:11–14. More specifically, it contends that the “weighting factor α ” disclosed in Zeira is the claimed

“indication.” *See* Petition, 56:9–13. In my opinion, this interpretation is technically incorrect.

129. Zeira discloses a combined open-loop and closed-loop power control scheme in which the UE’s uplink transmit power is determined according to the equation:

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

130. In this equation, P_0 represents the baseline power level at which the network wishes to receive UE transmission, $G(n)$ is a closed loop control factor that is updated based on the previous closed loop control factor, $G(n - 1)$ and a step size ΔTPC . αL is the weighted open-loop control factor, where α is the weighting factor, typically determined by the transmitting device whose power level is being controlled (the UE according to the assertions in the petition), applied to the pathloss estimate L .

131. The Petition refers to $G(n)$ as representing “TPC command accumulation.” Petition, 55:16-56:2. While Zeira does not explicitly use the term “accumulation,” it is clear that $G(n)$ builds upon previously received TPC commands and is thus always active—regardless of the value of α .

132. Zeira does describe that, under certain network configurations, the operator may choose to use only closed-loop control by setting $\alpha = 0$. *See* Ex. 1004, 7:18–22. In that case, the αL term is effectively removed from the equation, and power control relies solely on $G(n)$:

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

133. However, this does not indicate that $G(n)$ (i.e., the TPC command accumulation logic) is selectively enabled or disabled. In all configurations described in Zeira, $G(n)$ is always present and active. The choice to enable or disable αL affects only the open-loop contribution to the total power output—not the closed-loop accumulation.

134. It is my opinion, in fact, that *enabling* accumulation, and weight L by zero, are entirely different concepts. Weighting L by zero does not affect accumulation (a closed loop process) in any way. Similarly, enabling accumulation does not affect the weight factor applied to L .

135. It is further my opinion that a POSITA would not have to read into the situation data that is not there: If L is weighted to zero, accumulation must be active because, otherwise, there is no power control at all. And conversely, if accumulation is disabled, the weight of L must be positive. But these are only two cases out of four that can be resolved by the weighting of L or the enabling of accumulation. It is still necessary to indicate that both nonzero weight and enabled accumulation are in effect, when it is. Thus, the nonzero weight of L and the enabling of accumulation are not logically equivalent.

136. Accordingly, Zeira does not teach, suggest, or imply any mechanism by which a network device sends an indication to the UE that TPC command

accumulation is enabled. Instead, TPC-based closed-loop control is always applied by default, and there is no concept of disabling it via signaling.

B. Zeira in Combination With Baker Still Fails to Disclose the Claimed Feature

137. In the alternative, the Petition contends that even if Zeira does not expressly describe the UE receiving α from the network, such signaling “was well known and conventional,” and therefore obvious to a POSITA. Petition, Paper 58, Lines 8–15. The Petition then cites Baker as evidence of “implementation details” relating to adjustable power control parameters. *See* Petition, 58:18-59:11.

138. However, neither Zeira nor Baker discloses or suggests that TPC accumulation can be disabled or that a network-sent indication to enable TPC accumulation exists. As discussed earlier, Baker likewise does not describe any scenario in which TPC command accumulation is disabled. While Baker does show that power control behavior varies based on the PCA parameter (e.g., per-slot vs. grouped over five slots), TPC commands are always applied in some form, and accumulation is always implicitly enabled.

139. Moreover, Baker provides no guidance on communicating an “enablement” indication from the network to the UE with respect to accumulation functionality. It therefore cannot cure the deficiencies in Zeira.

140. In sum, neither Zeira alone or in combination with Baker discloses or suggests the claim limitation requiring that “the processor is configured to cause: the

receiver to receive, from a network device, an indication that transmit power control (TPC) accumulation is enabled.” In both references, accumulation is always assumed to be active, and no mechanism is described for enabling or disabling it via signaling. The Petition’s attempt to rely on general knowledge or conclusory expert statements is insufficient to support a finding of obviousness under 35 U.S.C. § 103.

C. Zeira and Khan, Alone or in Combination, Do Not Disclose or Suggest “a Single Physical Channel That Carries Scheduling Information and Power Control Information”

141. The Petition contends that the combination of Zeira and Khan renders obvious the limitation of Claim 1 requiring that a UE receive both scheduling information and TPC commands on a single physical channel. See Petition, 64:7–8. In my expert opinion, this argument reflects a fundamental misreading of the respective channel structures disclosed in Zeira and Khan. It also disregards key disclosures in each reference that affirmatively teach away from the proposed combination. As such, Zeira and Khan cannot be properly combined to teach or suggest this claim limitation.

1. No Motivation to Combine Zeira and Khan

142. Petitioner argues that a person of ordinary skill in the art (POSITA) would have been motivated to apply Khan’s teaching of a “dedicated channel” that carries both a scheduling grant and TPC commands to Zeira’s closed-loop power control framework. *Id.*

143. Petitioner points to Zeira’s reference to “assigned resource units” as an indication that Zeira implicitly contemplates some form of scheduling, and concludes that a POSITA would look to Khan to implement such scheduling functionality. Id.

144. However, this argument is flawed for several reasons.

a. Zeira Teaches a Dedicated Control Channel With No Support for Scheduling Grants

145. Zeira discloses a power control system in which the TPC command, b_{TPC} , is transmitted from a base station to a UE via a dedicated control channel. The relevant disclosure is narrow and states: “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 receiving station 50 and the transmitting station 52.” Ex. 1004, 4:27–30.

146. Zeira does not identify any other type of control information transmitted via this dedicated channel, nor does it describe the structure of the channel beyond this statement. In particular, Zeira is silent with respect to scheduling grants or any additional signaling to assign uplink resources to the UE.

b. Khan Teaches a Shared Time-Multiplexed Control Channel—Not a Dedicated One

147. By contrast, Khan discloses a shared control channel used by multiple UEs and explicitly distinguishes it from dedicated channels. Khan explains: “Data communications, as such, may not require dedicated links on the downlink or the

uplink, but rather enable one or more channels to be shared by a number of wireless units. By this arrangement, each of the wireless units on the uplink competes for available resources.” Ex. 1005, ¶ 5.

148. Khan’s control channel is time-multiplexed and structured such that individual slots are allocated to different types of control information. For example, as shown in Khan’s FIG. 5:

- Slots 1, 5, 9, and 13 carry TPC commands.
- Slots 2–4, 6–8, 10–12, and 14–16 carry scheduling grants. *See* Ex. 1005, ¶ 47.

149. Each slot is intended for different UEs sharing the same channel. The UE transmits in a later slot based on the timing of the received grant, typically a slot and a half later. *See id.*

c. The Petition Uses Ex. 1012 to Map Dedicated Channels (DCHs) to Physical Channels, Which Actually Provides Support For The Proposition that Zeira Would Not Provide “Dynamic Scheduling” On the Same Channel as The TPCs

150. The Petition relies on Ex. 1012, “WCDMA Enhanced Uplink – Principles and Basic Operation,” to show how Zeira’s dedicated channels are mapped to physical channels, to satisfy the limitation of Claim 1 of “a single physical channel.” However, the following excerpts from Petitioner’s Exhibit 1012 also show that dynamic scheduling, at the least to extent it would allegedly be obvious to send it on

Zeira's dedicated channel, is actually sent by the RNC, and not the base station that sends TPCs, "as part of the reconfiguration function of the RRC layer." Ex. 1012 at § 7.3.2. Accordingly, Petitioner's Exhibit 1012, to the extent it also teaches that DCHs are mapped to physical channels, also makes clear that a POSITA would not have incorporated dynamic scheduling via the dedicated channel as it clearly is not part of Zeira's technology foundation, and should, accordingly, not be read into it.

d. Zeira and Khan Operate on Fundamentally Incompatible Channel Architectures

151. Given these distinctions, a POSITA would not seek to "improve" Zeira using Khan's shared, slot-based control structure. Zeira's closed-loop control system is built around a dedicated control channel that exclusively serves a single UE. Khan, on the other hand, is concerned with efficient scheduling for multiple UEs competing for shared access. Petitioner's Ex. 1012 sheds even more uncertainty on the proposed combination, strongly suggesting that, to the extent dynamic scheduling is contemplated by Zeira, it would be sent by the RNC, and not the base station, as part of RRC configuration/reconfiguration.

152. Implementing Khan's scheduling scheme in Zeira's dedicated channel would, therefore, require substantial modifications, including:

- a redesign of Zeira's control channel to support multiplexed signaling;

- reengineering the timing and addressing assumptions that underlie Zeira’s power control feedback loop; and
- the addition of logic and signaling support to interpret shared scheduling grants—none of which are contemplated by Zeira.

153. Therefore, the two systems are not interchangeable, and a POSITA would not reasonably combine them without fundamentally altering Zeira’s architecture.

e. No Teaching or Suggestion That Scheduling Grants Are Transmitted on Zeira’s Dedicated Channel

154. Unlike in Ground 1, where the Petition attempted to rely on “other bits” in Andersson’s DPCCH as a possible vehicle for additional control information, Zeira provides no disclosure whatsoever of additional information (such as scheduling grants) being transmitted on its dedicated control channel. See Ex. 1004, 4:27–30.

155. Instead, Petitioner argues that, because Zeira mentions “assigned resource units,” a POSITA would naturally look to Khan to implement a dynamic scheduling scheme. Petition, 65:7-66:9. However, this argument mischaracterizes the meaning of “resource units” in Zeira and overlooks well-known industry practices at the time.

156. As understood by a POSITA, and as reflected in Zeira, “resource units” refer to a combination of time slots and spreading codes used for transmission. See Ex. 1004, 4:31–39. This is not the same as a scheduling grant as taught by Khan,

which includes identification, rate, and HARQ control information transmitted dynamically by the base station to schedule uplink transmissions. See Ex. 1005, ¶¶ 13–15.

157. At the time the application for the '153 Patent was filed, it was well known in 3G systems—particularly in time-division based systems—that such resource units were assigned statically by the Radio Network Controller (RNC), rather than dynamically by the base station as in Khan's architecture. See Ex. 1012. Thus, there would have been no reason for a POSITA to retrofit Zeira's dedicated-channel, closed-loop system to incorporate a shared, base-station-scheduled control framework such as that of Khan.

158. In conclusion, neither Zeira nor Khan discloses or suggests the use of a single physical channel to carry both scheduling information and power control information. Zeira uses a dedicated channel for TPC commands only, while Khan relies on a shared, time-multiplexed control channel that segments TPCs and scheduling grants into separate slots for different UEs. The two systems are architecturally and functionally incompatible, and the proposed combination is unsupported by either reference. A POSITA would not have been motivated to combine them in the manner suggested by the Petition, nor would they have had a reasonable expectation of success in doing so. Therefore, the cited references fail to teach or suggest the challenged limitation of Claim 1 of the '153 Patent.

2. Purported Benefits of the Proposed Combination Do Not Justify the Structural Incompatibility Between Zeira and Khan

159. The Petition references “several benefits” it claims would result from the proposed combination of Andersson and Khan—such as support for a larger number of active wireless units, reduced system complexity by transmitting scheduling grants and TPC commands on the same control channel, and reduced latency. Although these arguments are originally made in connection with Andersson and Khan, the Petition appears to rely on the same reasoning in support of its combination of Zeira and Khan. See Petition, Paper 26, Line 16 through Paper 27, Line 11 (citing Section X.C.5, which pertains exclusively to Andersson and Khan).

160. Regardless, these purported benefits are inapplicable to the combination of Zeira and Khan for one fundamental reason: the references cannot be properly combined in a manner that would yield those benefits. For example, Khan’s support for a larger number of active wireless units is predicated on the use of a shared control channel, which allows multiple UEs to compete for uplink resources. Zeira, by contrast, teaches the use of a dedicated control channel for transmission of TPC commands to a single UE. See Ex. 1004, 4:27–30. To obtain the benefit cited in the Petition, a POSITA would have to replace Zeira’s dedicated channel structure with Khan’s shared channel—an approach not suggested or supported by either reference. Neither Petitioner nor any of the cited art proposes such a transformation.

3. The Proposed Modification Frustrates the Intended Purpose of Zeira

161. As discussed above, Zeira’s power control architecture is predicated on the use of a dedicated physical channel to transmit closed-loop TPC commands. *See* Ex. 1004, 4:27–30. The Petition proposes to modify Zeira by incorporating scheduling grants of the type taught in Khan, which are explicitly configured for use on a shared time-multiplexed channel. *See* Petition, 26:5–15; Ex. 1005, ¶ 47, FIG. 5. Because the channel structures are fundamentally different and serve different operational principles, there is no technically feasible way to integrate Khan’s scheduling grants into Zeira’s dedicated framework without a complete redesign of Zeira’s control channel architecture.

162. Accordingly, even if the Petition had articulated a sufficient motivation to combine—which it has not—the proposed modification would still fail because it would frustrate the intended operation of Zeira and violate the principle of compatibility required for a valid combination under 35 U.S.C. § 103

4. No Reasonable Expectation of Success

163. The Petition further asserts that a 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,” based on the suggestion that Zeira’s disclosure is not limited to any particular control channel. *See* Petition, 66:18-67:6.

164. This assertion is inaccurate. Zeira is explicit that the TPC command, b_{TPC} , is transmitted over a dedicated channel. *See* Ex. 1004, 4:27–30. The reference provides no disclosure—explicit or implicit—that b_{TPC} may be transmitted over a shared channel or in conjunction with any other control information, such as scheduling grants.

165. Implementing Zeira’s closed-loop control over a shared channel as taught by Khan would not only contradict the structure and assumptions of Zeira’s system, it would introduce timing, interference, and addressing challenges that Zeira does not contemplate or address. In my opinion, this type of fundamental redesign would not yield predictable results, and would pose significant technical uncertainty for a POSITA attempting to merge these two disparate systems.

166. Accordingly, Petitioner has not demonstrated a reasonable expectation of success in combining Zeira and Khan, and the proposed combination must be rejected under § 103.

D. Independent Claim 1 Is Not Obvious Over the Alleged Combination of Zeira, Baker, Khan, and Tong

167. For the reasons set forth above, Claim 1 is not rendered obvious by the proposed combination of Zeira, Baker, and Khan. As discussed, none of these references individually or collectively discloses or suggests an indication sent from a network device that TPC accumulation is enabled, nor do they support receiving scheduling and power control information on a single physical channel. The addition

of Tong does not remedy these fundamental deficiencies. Accordingly, Claim 1 is not obvious over the alleged combination of Zeira, Baker, Khan, and Tong.

E. Independent Claim 11 Is Not Obvious Over Zeira, Baker, Khan, and Tong for at Least the Same Reasons as Claim 1

168. Although Claim 11 differs in form from Claim 1, it recites similar limitations, including those directed to receiving scheduling information and power control information and the handling of TPC command accumulation. For at least the same reasons set forth above with respect to Claim 1, Claim 11 is not obvious over the combination of Zeira, Baker, Khan, and Tong.

F. Dependent Claims 2, 4, 5, 10, 12, 14, 15, and 20 Are Not Obvious Over Zeira, Baker, Khan, and Tong for at Least the Same Reasons as Base Claims 1 and 11

169. Claims 2, 4, 5, and 10 depend from Claim 1, and Claims 12, 14, 15, and 20 depend from Claim 11. As established above, both Claim 1 and Claim 11 are not obvious over the alleged combination of Zeira, Baker, Khan, and Tong. Because the dependent claims necessarily incorporate the limitations of their respective base claims, and because none of the additional references provide any teaching or suggestion that overcomes the deficiencies in the combination, Claims 2, 4, 5, 10, 12, 14, 15, and 20 likewise are not obvious over the same alleged combination.

XI. Ground 4 – Claims 3 and 13 Are Not Obvious Over Zeira, Baker, Khan, Tong, and Dick Under 35 U.S.C. § 103

170. Claim 3 depends from Claim 1, and Claim 13 depends from Claim 11. As discussed above, neither Claim 1 nor Claim 11 is obvious over Zeira, Baker, Khan, and Tong. The additional reference, Dick, does not cure the deficiencies of that combination. Dick does not disclose or suggest any feature that would compensate for the absence of an indication enabling TPC accumulation, nor does it resolve the incompatibility between the dedicated and shared channel structures found in the cited references. Accordingly, Claims 3 and 13 are not obvious over the combination of Zeira, Baker, Khan, Tong, and Dick.

XII. Conclusion

171. Based on my review of the cited prior art and the claim limitations of U.S. Patent No. 10,952,153, it is my professional opinion that none of the grounds asserted in the Petition establishes a reasonable likelihood that the challenged claims are unpatentable under 35 U.S.C. § 103. Specifically, the prior art combinations relied upon in Grounds 1, 2, 3, and 4 fail to disclose or suggest key limitations of independent Claims 1 and 11, including (1) an indication that TPC command accumulation is enabled, and (2) the receipt of scheduling information and power control information on a single physical channel. Moreover, the Petition's proposed combinations would require substantial architectural redesigns of the cited systems, are not supported by

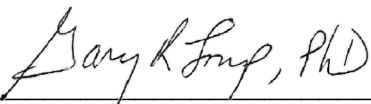
the references themselves, and rest on flawed technical assumptions and conclusory expert opinions.

172. Accordingly, it is my opinion that Claims 1–5, 10–15, and 20 of the '153 Patent are not obvious over the cited references and that the Petition fails to demonstrate a reasonable likelihood of prevailing on any asserted ground.

XIII. DECLARATION

I, Dr. Gary Lomp, 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 of Title 18 of the United States Code.

Date: April 9, 2025

By: 
Dr. Gary Lomp