

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

CISCO SYSTEMS INC.,
Petitioner

U.S. Patent No. 9,271,243

**DECLARATION OF DR. CHRISTOPHER HANSEN,
UNDER 37 C.F.R. § 1.68 IN SUPPORT OF PETITION FOR
INTER PARTES REVIEW**

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I, Christopher Hansen, Ph.D., do hereby declare as follows:

I. INTRODUCTION

1. I am making this declaration at the request of Cisco Systems, Inc. in the matter of the *Inter Partes* Review of U.S. Patent No. 9,271,243 (“the ’243 patent”).

2. I am being compensated for my work in this matter at my standard hourly rate. I am also being reimbursed for reasonable and customary expenses associated with my work and testimony in this proceeding. My compensation is not contingent on the outcome of this matter or the specifics of my testimony.

3. I have been asked to provide my opinions regarding whether the subject matter of claims 1, 2, 4, 5, and 11 (the “Challenged Claims”) of the ’243 patent would have been obvious to a person having ordinary skill in the art (“POSITA”) as of the earliest claimed priority date. It is my opinion that the Challenged Claims would have been obvious to a POSITA after reviewing the prior art, as discussed below.

4. In the preparation of this declaration, I have considered:

- (1) the ’243 patent, Ex.1001;
- (2) the prosecution history of the ’243 patent, Ex.1002;
- (3) U.S. 7,313,113, to Hills et al., Ex.1005;
- (4) CN101626615A_Certified_English_Translation to Wang et al., Ex.1006;
- (5) Sorting Algorithms, Ex.1008;

- (6) Data Communications Basics - A Reference Guide, Ex.1009;
- (7) IEEE 802.11 Standard (2007), Ex.1010;
- (8) U.S. 8,040,861 to Calhoun et al., Ex.1011; and
- (9) Cisco White Paper, Radio Resource Management under Unified Wireless Networks, Document ID 71113, Ex.1012.

5. In forming the opinions expressed below, I have considered: the documents listed above; the relevant legal standards, including the standard for obviousness; and my own knowledge and experience based upon my work in the field of wireless communications as described below, as well as any additional materials cited herein.

6. Unless otherwise noted, all **emphasis** in any quoted material has been added. Claim terms are *italicized*.

II. QUALIFICATIONS AND PROFESSIONAL EXPERIENCE

7. The details of my background and education, and a listing of publications that I have authored, are provided in my *Curriculum Vitae*, a copy of which is submitted as Ex.1004. The following is a brief summary of my relevant qualifications and professional experience.

8. I am currently an independent technical consultant based in Los Altos, California. I work at Covariant Corporation, which is a consulting company that I own. My primary areas of expertise are in the fields of wireless networking, wireless standards development, and signal processing for wireless communications. I received a Bachelor of Science (B.S.) degree in Electrical

Engineering from Rensselaer Polytechnic Institute in 1987, a Master of Science (M.S.) in Electrical Engineering from the University of Massachusetts, Amherst in 1989, and a Ph.D. in Electrical Engineering from the University of California, Los Angeles (“UCLA”) in 1997.

9. I was employed by Broadcom Corporation (“Broadcom”) in Sunnyvale, California from January 2000 to May 2012. From January 2000 to February 2011, I held several titles, including Sr. Staff Scientist, Engineering Manager, and Sr. Principal Scientist. My duties in these roles included, among other things, Institute of Electrical and Electronics Engineers (“IEEE”) 802.11 (i.e., Wi-Fi) physical layer (“PHY”) application-specific integrated circuit (“ASIC”) development. I also participated in Bluetooth standard development during this timeframe. From March 2011 to May 2012, I served as an Associate Technical Director and my duties included, among other things, performing wireless communications technology research and development (“R&D”) as well as standards and intellectual property development.

10. While employed at Broadcom, I regularly attended meetings for the IEEE 802.11 Working Group. I submitted technical contributions to Task Group E (“TGe”), Task Group H (“TGh”), and Task Group N (“TGn”).

11. I served on the Board of Directors of the Wireless Gigabit Alliance (“WiGig Alliance”) from March 2010 to March 2012. Specifically, I served as the

Board's Secretary. The WiGig Alliance was a trade association focused on the development and promotion of high-speed wireless communications technology. The WiGig Alliance collaborated for multiple years with the Wi-Fi Alliance (an industry organization that owns the "Wi-Fi" brand and certifies devices for interoperability and security), and the two organizations eventually merged in 2013.

12. I served as the Vice Chair of the IEEE 802.11ad Task Group ("TGad") from May 2011 to March 2012. TGad developed an amendment to the IEEE 802.11 wireless networking standard focused on directional multi-gigabit (i.e., DMG) technology. In this role, I assisted the task group Chair, Eldad Perahia, and Technical Editor, Carlos Cordeiro, with the operation of the task group meetings and developing the 802.11ad draft standards amendment documents.

13. I was employed as a Senior Wireless System Architect by Apple Inc. ("Apple") in Cupertino, California from June 2012 to July 2013. During my tenure at Apple, I was responsible for, among other things, performing systems engineering for iPhone Operating System ("iOS") Wi-Fi functionality. During this time, I participated in multiple IEEE 802.11 groups, including Task Group AF ("TGaf") and the HEW Study Group, on behalf of Apple.

14. Since August 2013, I have been employed as President of Covariant Corporation in Los Altos, California. In this role, I provide technical consulting services related to wireless communications, IEEE 802.11/Wi-Fi, signal processing

technology, integrated circuits technology, and intellectual property. During the time I have been employed by Covariant, I have submitted multiple technical contributions to Task Group AY (“TGAY”) (responsible for 802.11ay) which led to new mmWave features, Task Group M (“TGM”) (responsible for the 802.11-2020 standard), and the Integrated mmWave Study Group (“IMW SG”) (the precursor for TGBq). I received awards from the IEEE for my contributions to TGAY and TGM.

15. I served as a member of the Board of Directors for the Professional and Technical Consultants Association (“PATCA”) in Silicon Valley, California from March 2017 to March 2024. I was President of the Board of Directors from June 2019 to March 2024. PATCA is a non-profit corporation that supports technical consultants in Silicon Valley and elsewhere.

16. Since June 2020, I have been employed as a Guest Instructor for the UCLA Department of Electrical and Computer Engineering. I teach classes on wireless communications for upper-level undergraduate students and graduate students in electrical engineering.

17. I am a named inventor on over 100 issued United States patents related to wireless communications, signal processing, and integrated circuits.

18. I have been a member of the Institute of Electrical and Electronics Engineers (“IEEE”) since 1983 (42 years) and am currently a Senior member. I have participated in the activities of the IEEE Standards Association (“IEEE-SA”)

continuously since 2000. I have participated in the IEEE 802.11 Wireless Local Area Networks (“WLAN”) Working Group as a voting member since 2000.

III. RELEVANT LEGAL STANDARDS

19. I am not an attorney. In preparing and expressing my opinions and considering the subject matter of the '243 patent, I am relying on certain legal principles that counsel has explained to me.

20. I understand that prior art to the '243 patent includes patents and printed publications in the relevant art that predate the priority date of the '243 patent. For purposes of this Declaration, I am applying the earliest claimed priority date of June 3, 2011, as the priority date of the '243 patent.

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

22. I have been further informed by Cisco’s counsel that there are several recognized rationales for combining references or modifying a reference to show obviousness. These rationales include: (a) combining prior art elements according

to known methods to yield predictable results; (b) simple substitution of one known element for another to obtain predictable results; (c) use of a known technique to improve a similar device (method, or product) in the same way; (d) applying a known technique to a known device (method, or product) ready for improvement to yield predictable results; (e) choosing from a finite number of identified, predictable solutions, with a reasonable expectation of success; and (f) some teaching, suggestion, or motivation in the prior art that would have led a POSITA to modify the prior art or to combine prior art teachings to arrive at the claimed invention.

23. Also, I have been informed and understand that obviousness does not require physical combination/bodily incorporation, but rather consideration of what the combined teachings would have suggested to a POSITA at the time of the alleged invention.

IV. BACKGROUND

A. Wireless Networks

24. Well before the '243 patent, “wireless [local area networks] (WLAN) technology ha[d] exploded, as users from a wide range of backgrounds and vertical industries have brought this technology into their homes, offices, and increasingly into the public air space.” Ex.1005, 1:26-31; Ex.1012, 4 (recognizing “marked increase in the adoption of WLAN technologies.”). It was known that wireless networks comprise a plurality of wireless access points (also called APs or access

elements), a plurality of client devices (also called access elements) and a central management device that controls the network. Ex.1001, 1:19-23, 3:23-60. At the time, such wireless networks utilized standardized protocols such as 802.11. Ex.1005, 3:49-51; Ex.1012, 4. The 802.11 protocol allowed for shared bandwidth; whereby multiple access points could utilize the same channel for communication with client devices. Ex.1005, 8:21-30; Ex.1012, 4. Depending on the transmission power, such implementations may result in coverage overlaps that induce co-channel interference. Ex.1005, 8:21-30; Ex.1012, 4. It was recognized in the art that “many WLANs do not perform at optimum speed due to overlapping coverage areas and channel interference.” Ex.1005, 2:36-38; Ex.1012, 17 (“...high co-channel interference, effectively reducing the client throughput levels...”). To reduce the interference, it was recognized in the art an access point’s transmit power should be adjusted (i.e., reduced). Ex.1005, 11:60-66; Ex.1006, Abstract; Ex.1012, 18.

B. RSSI and Power Adjustment

25. To determine the amount of channel overlap, in accordance with the 802.11 protocol, each access point was configured to perform a scanning procedure to measure the received signal strength (RSSI) between neighboring access points. Ex.1005, 2:64-5:3; Ex.1005, 4; Ex.1012, 4, 10. It was known in the art for each access point to report the measured RSSI values (in dBm) to a central management

device. Ex.1005, 4:14-61; Ex.1012, 10. The central management device processes the RSSI (and other related information) via an algorithm to determine an adjusted transmit power of the access points that minimizes overlap and interference, thereby optimizing WLAN performance. Ex.1005, 2:32-33, 3:30-34, 12:19-21; Ex.1006, 12 (“...decreases the power of the APs to reduce interference...”). The transmit power algorithm, for example, used an equation based on current transmit power, a power threshold and the highest RSSI value. Ex.1006, 18 (“ $P_{\text{after}} = P_{\text{before}} - (RSSI_{\text{nth}} - RSSI_{\text{threshold}})$ ”); *see also* Ex.1012, 10 (adjusted transmit power = Tx_Max for a given AP + (TX power control thresh – RSSI of 3rd highest neighbor above the threshold)).

V. LEVEL OF ORDINARY SKILL IN THE ART

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

27. A POSITA in the field of the '243 patent, as of the earliest claimed priority date of June 3, 2011, would have been someone knowledgeable and familiar with wireless communications including wireless networks and local area networks (WLAN) based on IEEE 802.11 standards. That person would have a

bachelor's degree in electrical engineering, computer science, or equivalent training, and approximately two years of experience implementing IEEE 802.11. Lack of work experience can be remedied by additional education, and vice versa.

28. For purposes of this Declaration in general, and unless otherwise noted, my statements and opinions, such as those regarding my experience and the understanding of a POSITA generally (and specifically related to the references I consulted herein), reflect the knowledge that existed in the field as of the priority date of the '243 patent. Unless otherwise stated, when I provide my understanding and analysis below, it is consistent with the level of a POSITA prior to the priority date of the '243 patent.

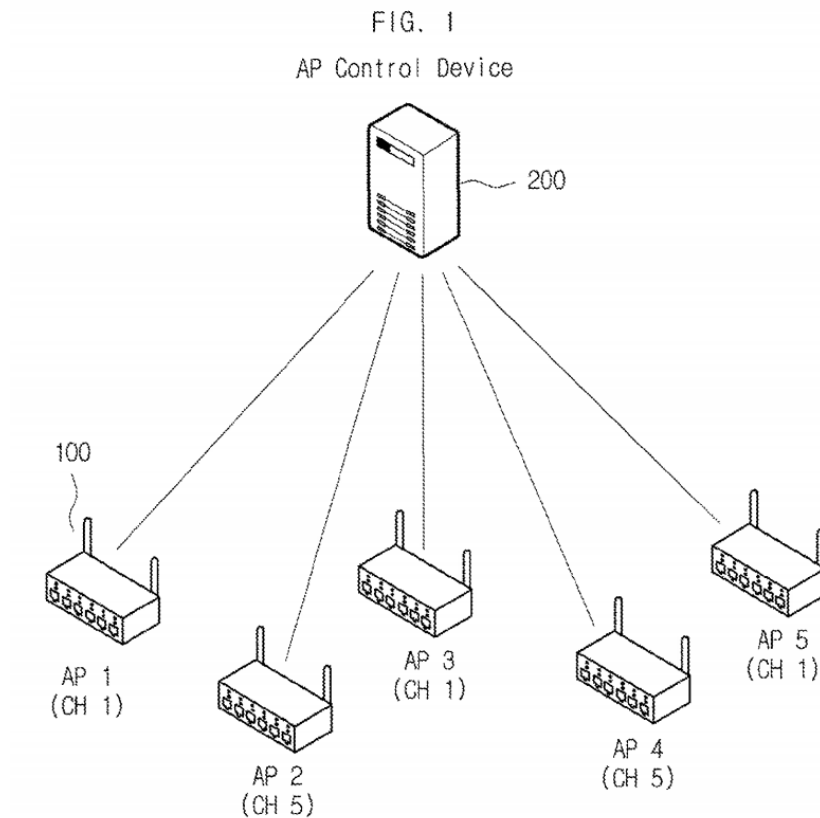
VI. OVERVIEW OF THE '243 PATENT

A. Summary of the '243 patent

29. The '243 patent describes and claims nothing more than well-known techniques of adjusting the power of multiple access points ("APs") on the same channel. The '243 patent is titled "Wireless Access Point and Method and Device for Controlling Wireless Access Point." Ex.1001, Title. According to the '243 patent, it relates to "a method and a device for controlling the wireless access point, and more specifically to a method and a device for controlling a wireless access point to optimize its coverage and capacity under in [sic] an environment of interference." Ex.1001, 1:15-23.

30. The '243 patent recognizes that utilizing multiple access points ("AP") on the same channel may "caus[e] interference and deteriorating the performance of the wireless network." Ex.1001, 1:36-41. The '243 patent notes that this problem was addressed in the art by controlling "the power level of a transmission signal output from a sub-AP...based on received signal strength indicator (RSSI) readings and frame error rate (FER) of a main AP, thereby eliminating shadow areas and minimizing interference between the main AP and the sub-AP." Ex.1001, 1:41-49. However, the '243 patent states that this approach is not optimal "since each of a plurality of sub-APs using the same channel needs to adjust the transmission power individually, it is impossible and inefficient to minimize the interference within a short period of time." Ex.1001, 1:51-55.

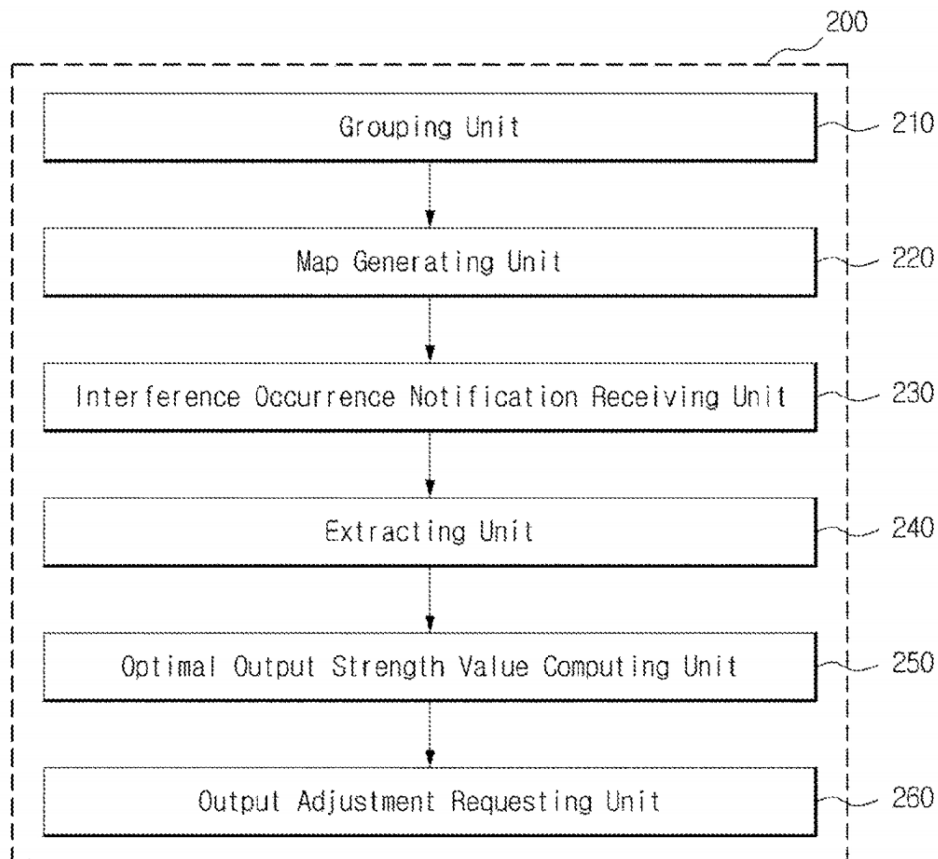
31. To improve upon the prior art technique and minimize interference between the access points, the '243 patent discloses an AP control device that adjusts the power of access points on the same channel. Ex.1001, 1:59-4:7, 5:1-49.



Ex.1001, FIG. 1.

32. In the context of Figure 3, reproduced below, the '243 patent illustrates the operation of the AP control device 200.

FIG. 3



Ex.1001, FIG. 3.

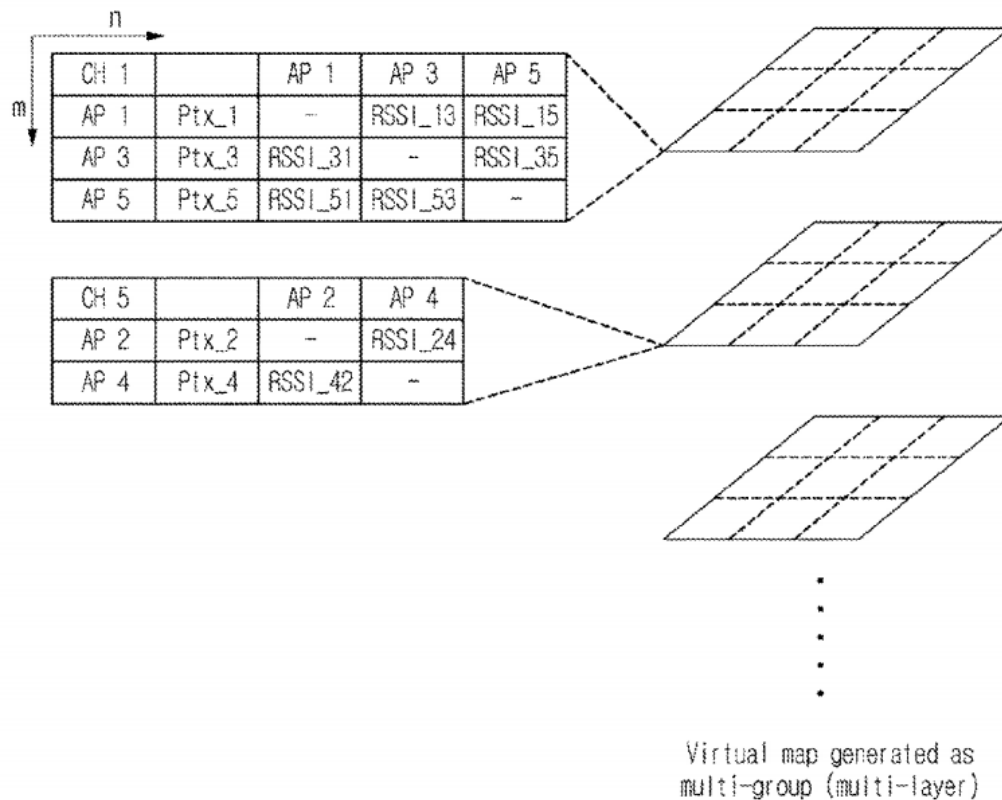
With reference to the above figure, the '243 patent discloses that the AP control device includes a grouping unit 210, map generator unit 220, an interference occurrence notification receiving unit 230, an extracting unit 240, an optimal output strength value computing unit 250, and an output adjustment requesting unit 260.

Ex.1001, 6:61-7:4. According to the '243 patent, although the units may be implemented in “hardware configurations, such as FPGA (Field Programmable Gate Array) or ASIC (Application Specific Integrated Circuit)” they are “not...restricted to either software or hardware and it is possible that each of the

elements is configured to be in an addressable storage medium and to run one or more processors.” Ex.1001, 7:55-8:2.

33. During operation, the “grouping unit 210 groups APs that use the same channel.” Ex.1001, 7:5-9. “The map generating unit 220... generates a virtual map that includes the RSSI value between the grouped APs and the output strength value of the grouped APs.” Ex.1001, 7:10-15. An example map is illustrated as a two-dimensional (m x n matrix) at Figure 6, reproduced below.

FIG. 6



Ex.1001, FIG. 6.

34. With further reference to Figure 3, the “interference occurrence notification receiving unit 230 receives a message indicating whether interference has occurred between the grouped APs.” Ex.1001, 7:16-25. If interference has occurred, “the extracting unit 240 refers to the virtual map generated by the map generating unit 220 to extract the AP that has the highest RSSI value among the grouped APs.” Ex.1001, 7:26-29. “The optimal output strength value computing unit 250 computes the corrected output strength value (Ptx_modi) for minimizing the interference between the APs, based on an RSSI value ($RSSI\_m$) of an AP extracted by the extracting unit 240, a predetermined threshold value ($RSSI\_th$) of RSSI between the grouped APs and a currently used output strength value (Ptx_c) of the grouped A[P]s.” Ex.1001, 7:37-44. The mathematical expression is as follows.

$$Ptx\_modi = Ptx\_c - (RSSI\_m - RSSI\_th)$$

35. Lastly, the “output adjustment requesting unit 260 sends an output strength adjustment request to each of the grouped APs so as to adjust the current output strength value based on Ptx_modi .” Ex.1001, 7:49-54. Representative Claim 1 of the ’243 patent is reproduced below.

1. A device for controlling a wireless access point comprising:

- a grouping unit configured to group wireless access points using a same channel based on channel use information received from the wireless access points;
- a map generator configured to compute a received signal strength indicator (RSSI) between the grouped wireless access points and an output strength value for each of the grouped wireless access points;
- an extractor configured to extract a wireless access point having a highest RSSI value among the grouped wireless access points, if interference occurs between the grouped wireless access points; and
- an optimal output strength value calculator configured to compute a corrected output strength value based on the highest RSSI value of the extracted wireless access point, a predetermined threshold value of the RSSI between the grouped wireless access points, and a currently used output strength value.

36. As I explain in detail below, however, there is nothing novel about the invention disclosed and claimed in the '243 patent. Utilizing a control device to control AP output power, as recited in the claim, was already known at the time the '243 patent was filed.

B. Prosecution History

37. The '243 patent was filed as a PCT October 19, 2011, claims priority to Korean application KR1020110054124, filed June 3, 2011, and issued on February 23, 2016.

38. The '243 patent received allowance, without any substantive examination. With respect to claim 1, the Notice of Allowance indicated the following reason for allowance.

The following is an examiner's statement of reasons for allowance: The prior art of record Scherzer et al (US Publishing 2004/0037258 A1) discloses a device 21 (fig. 2) for controlling a group of wireless access points 25-30 using a same channel (fig. 1a page 3 paragraph 0041). However, the prior fails to teach or make obvious for **"an optimal output strength value calculator configured to compute a corrected output strength value based on the highest RSSI value of the extracted wireless access point, a predetermined threshold value of the RSSI between the grouped wireless access points, and a currently used output strength value"**, when such unit is considered within the specific structure of the device recited in claim 1. The prior

Ex.1002, 49. Notably, as I demonstrate below, there is nothing novel about claim 1 (or any of the other claims) of the '243 patent since the identified features, which appear to be the reason for allowance, were known in the art and it would have been obvious to combine the prior art as claimed.

VII. CLAIM CONSTRUCTION

39. It is my understanding that in order to properly evaluate the '243 patent, the terms of the claims must first be interpreted. It is my understanding that for the purposes of this *inter partes* review, the claims are to be construed under the so-called *Phillips* standard, under which claim terms are given their ordinary and customary meaning as would be understood by one of ordinary skill in the art in

light of the specification and prosecution history, unless the inventor has set forth a special meaning for a term.

40. I also understand that certain terms in a patent claim may be drafted in “means-plus-function” format. Without conceding that the claim limitations reciting these terms satisfy the written description requirement, I provide the following construction for these limitations.

41. Consistent with the above noted understanding, for the purposes of this declaration, no terms require specific construction, other than the following.

A. ***“grouping unit” “map generator” “extractor” “optimal output strength value calculator” and “output adjustment requester”***

42. Claims 1 and 2 recite the following elements: “*grouping unit*”, “*map generator*”, “*extractor*”, “*optimal output strength value calculator*”, and “*output adjustment requester*” “*configured to*” perform various functions. I understand that these elements may represent a “nonce word” (i.e., a structureless generic term). I understand that for each such element recited in the claims, the specification should explain what structure performs the corresponding function; if the specification does not describe sufficient structure for performing the function, the claim is invalid for indefiniteness. I also understand that the possibility of an existing patent claim being invalid for indefiniteness is an issue outside the permissible scope of an *inter partes* review. Accordingly, I have not considered, and I express no opinion

on the question of whether the specification identifies sufficient structure as to each element.

Claimed “nonce word”	Claimed function	Function described in specification
<i>grouping unit</i>	<i>group wireless access points using a same channel based on channel use information received from the wireless access points</i>	Ex.1001, 5:30-36, 6:63-7:9, FIG. 3.
<i>map generator</i>	<i>compute a received signal strength indicator (RSSI) between the grouped wireless access points and an output strength value for each of the grouped wireless access points</i>	Ex.1001, 6:63-7:4, 7:10-15, FIG. 3.
<i>extractor</i>	<i>extract a wireless access point having a highest RSSI value among the grouped wireless access points, if interference occurs between the grouped wireless access points</i>	Ex.1001, 6:63-7:4, 7:26-37, FIG. 3.
<i>optimal output strength value calculator</i>	<i>compute a corrected output strength value</i>	Ex.1001, 6:63-7:4, 7:38-50, FIG. 3.
<i>output adjustment requester</i>	<i>transmit an output strength adjustment request to each of the grouped wireless access points</i>	Ex.1001, 6:63-7:4, 7:49-55, FIG. 3.

43. The specification describes such functions being performed by hardware or software.

The elements illustrated in FIG. 2 and FIG. 3 in accordance with an exemplary embodiment refer to hardware configurations, such as FPGA (Field Programmable Gate Array) or ASIC (Application Specific Integrated Circuit), and perform certain functions.

Nevertheless, it shall not mean that the elements are restricted to either software or hardware, and it is possible that each of the elements is configured to be in an addressable storage medium and to run one or more processors.

Ex.1001, 7:55-63.

44. Accordingly, in view of the '243 patent's disclosure, a POSITA would have understood that the corresponding structure of each of the terms "*grouping unit*", "*map generator*", "*extractor*", "*optimal output strength value calculator*", and "*output adjustment requester*" includes "hardware or executable software in a storage medium."

VIII. DETAILED UNPATENTABILITY ANALYSIS

45. I have been asked to provide my opinion as to whether the Challenged Claims of the '243 patent would have been obvious in view of the prior art. The discussion below provides a detailed analysis of how the prior art references I reviewed teach the elements of the Challenged Claims of the '243 patent.

46. As part of my analysis, I have considered the scope and content of the prior art and any potential differences between the claimed subject matter and the prior art. I conducted my analysis as of the earliest claimed priority date of the '243

patent: June 3, 2011. I have also considered the level of ordinary skill in the pertinent art as of that date.

47. I describe in detail below the scope and content of the prior art, as well as any differences between the claimed subject matter and the prior art, on an element-by-element basis for claims 1, 2, 4, 5, and 11 of the '243 patent. This analysis supports my opinion that the differences between the Challenged Claims and the prior art discussed herein are such that the subject matter as a whole would have been obvious at the time of the filing of the '243 patent to a person having ordinary skill in the art to which the subject matter pertains. I note that my analysis and proposed prior art combinations rely on the teachings of the references and not on physical incorporation of the elements.

48. Additionally, as part of my analysis, I have reviewed and appropriately cite to other prior art references as demonstrating knowledge in the art.

49. I will now describe, in the grounds below, on an element-by-element basis, how the prior art teaches all elements of claims 1, 2, 4, 5, and 11.

A. Ground 1: Claims 1, 4, and 5 are obvious over Hills in view of Wang

1. Summary of Hills

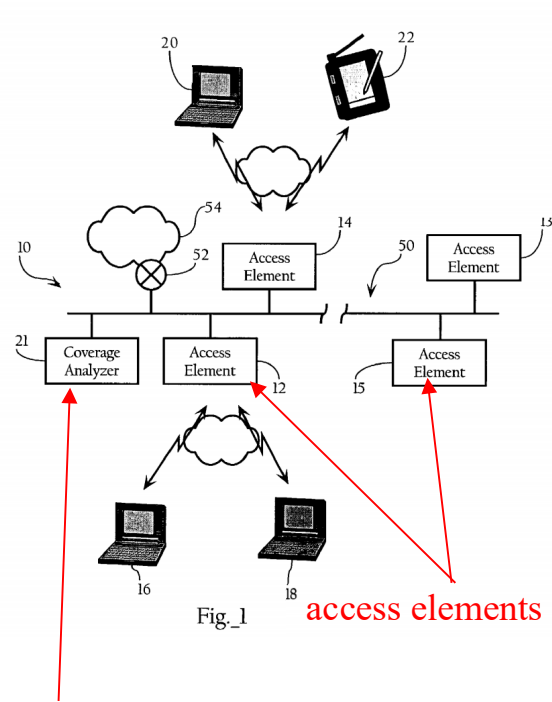
50. Like the '243 patent, U.S. No. 7,313,113 to Hills et al. ("Hills," Ex.1005) "relates to wireless computer networks and, more particularly, to methods, apparatuses and systems facilitating configuration of transmit power in a

wireless network environment comprising a plurality of wireless access points.”

Ex.1005, 1:19-23.

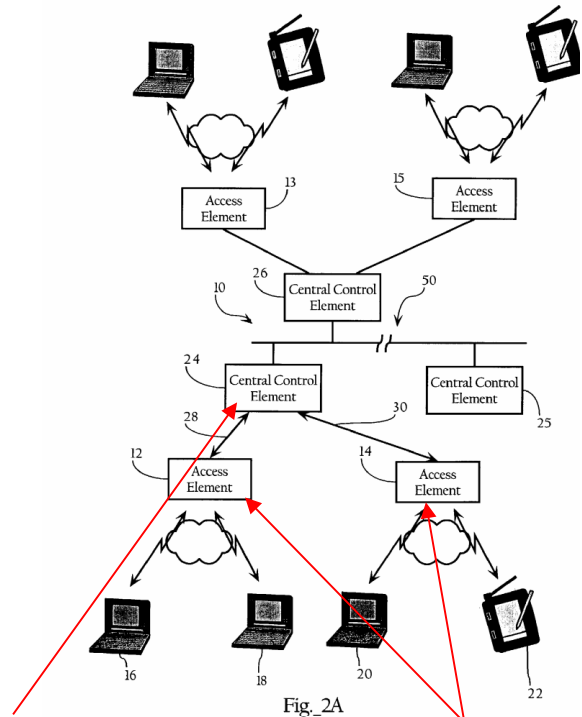
51. Also, like the '243 patent, Hills recognizes that “the presence of access points operating on the same or overlapping channels within the vicinity of each other can affect the performance of the enterprise’s wireless network.” Ex.1005, 2:19-22. For example, “many WLANs do not perform at optimum speed due to overlapping coverage areas and channel interference.” Ex.1005, 2:36-38. Hills seeks to address the noted problem by disclosing “methods, apparatuses and systems facilitating the configuration of transmit power and coverage areas corresponding to access points in a wireless network environment.” Ex.1005, 2:48-51.

52. In more detail, Hills discloses “a central management device such as the coverage analyzer 21 (FIG. 1) or central control element 24” that computes optimal transmission power levels for access points (also referred to as access elements) that operate on the same channel. Ex.1005, 3:26-57, 12:19-21. Exemplary central management devices and access points (or access elements) are illustrated at Figures 1 and 2A below.



central management device

central management device



access elements

Ex.1005, FIG. 1 (annotated).

Ex.1005, FIG. 2A (annotated).

53. Hills' access elements gather data (e.g., channel scan data and positional data) and transmit this data to the central management device, which maintains it in tables or a data structure. Ex.1005, 4:14-61, 5:26-35, 13:36-44. The central management device uses the data to group access elements that are on the same floor and use the same channel. Ex.1005, 12:19-29. For example, in the context of Figure 2A, the central management device groups access elements 12 and 14 that are on the same floor of the enterprise and use the same channel. Ex.1005, 5:65-7:44, 12:19-29.

54. Hills’ central management device generates a two-dimensional matrix that identifies the access elements on the same channel and a signal strength value (e.g., RSSI) as determined by each access element. Ex.1005, 5:3-5, 6:57-7:3, 9:12-14:15. The central management device compares the signal strength value against a coverage threshold and if the signal strength is greater than the threshold, the transmit power for the access element is reduced by 10dB. Ex.1005, 12:33-49. Although Hills’ example is a fixed 10dB reduction, Hills explains that “the amount by which the transmit powers are reduced, can be fully parameterized and configurable.” Ex.1005, 12:49-52. According to Hills, the process of reducing transmit power helps “ensure that the coverage areas of access elements do not overlap neighboring access elements assigned the same channel.” Ex.1005, 12:55-58.

55. Accordingly, Hills shows that it was known for a management device to adjust transmission power of grouped access elements that use the same channel based on a signal strength value (e.g., RSSI) received from an access element and a threshold.

2. Summary of Wang

56. Chinese publication CN 101626615A to Wang Lu (“Wang,” Ex.1006) is titled “AP power adjustment method and device,” and likewise generally pertains to adjusting the power of access points to reduce interference. Ex.1006, Abstract

(“The present invention discloses a method and device for adjusting the power of an Access Point (AP)... the AC [Access Controller] automatically decreases the power of the APs to reduce interference”).

57. Wang discloses an algorithm that computes the adjusted access point power (P-after) based on currently used power (P-before), the largest signal strength (RSSI-nth) and a preset threshold (RSSI-threshold).

Step S705: The AC sorts the RSSIs reported by each of the neighboring APs corresponding to the AP in descending order. Each neighboring AP of an AP records the RSSI of messages sent from the AP and reports it to the AC. The AC sorts the RSSI reported by all neighboring APs in descending order based on the RSSI value. Then, it finds the Nth largest RSSI value, marks the neighboring AP that reported this RSSI as NAP-nth, and records the RSSI of the AP it senses as RSSI-nth. This is determined as the standard RSSI and used as the basis for subsequent adjustments.

Step S706: The AC determines the relationship between the standard RSSI (RSSI-nth) reported by AP's NAP-nth and the preset RSSI threshold. Wherein, the RSSI threshold can be set and adjusted according to the needs of the actual application scenario, and is marked as RSSI-threshold. If RSSI-nth is greater than RSSI-threshold, the current AP power is considered to be high, and execute step S707; and If RSSI-nth is less than RSSI-threshold, the current AP power is considered low, and execute step S708.

Step S707: The AC decreases AP power. Assume the power of the AP before adjustment is P-before, and the power of the AP after adjustment

is P-after. The algorithm for reducing AP power by AC is as follows:

$$\mathbf{P\text{-}after = P\text{-}before - (RSSI\text{-}nth - RSSI\text{-}threshold)}.$$

Ex.1006, 18, FIG. 7.

58. As shown in the side-by-side comparison, Wang’s power adjustment calculation is just like that of the ’243 patent.

’243 patent (Ex.1001, 7:51)	Wang (Ex.1006, 18)
$P_{tx\_modi} = P_{tx\_c} - (RSSI\_m - RSSI\_th)$	$P\text{-}after = P\text{-}before - (RSSI\text{-}nth - RSSI\text{-}threshold)$

59. Also, like the ’243 patent, Wang discloses that its algorithm “can be implemented in hardware or by means of software plus necessary general-purpose hardware platforms.” Ex.1006, 19, 21. Wang, for example, provides “a software product, which can be stored in a non-volatile storage medium (such as a CD-ROM, USB flash drive, external hard drive, etc.) and comprises several instructions to cause a computer device (such as a personal computer, server, or network device, etc.) to execute the methods described in the various embodiments of the present invention.” Ex.1006, 21.

3. Reasons to Combine Wang with Hills

60. As discussed below, a POSITA would have found it obvious for Hills to utilize Wang’s parameter-based algorithm for computing an adjusted transmit power, in order to reduce interference between access elements that operate on the same channel.

a. Hills and Wang are Analogous Art

61. Hills and Wang are both analogous art to the '243 patent because they both pertain to the field of wireless access networks and address the problem of adjusting transmission power of access points that use the same channel to reduce interference. Ex.1001, 1:15-23, Abstract Ex.1005, 1:19-23, Abstract, FIGS. 1, 2A, 2B, 4, Claims 1, 10; Ex.1006, 16-19, Abstract, FIG. 7. Accordingly, a POSITA would have naturally considered Hills and Wang, which are analogous art.

b. Motivation to combine Wang with Hills

62. A POSITA would have combined the teachings of Wang with Hills to obtain predictable and beneficial results.

i. Applying Wang's algorithm teachings to Hills

63. Hills seeks to minimize interference by reducing transmit power where there is overlap between access points using the same channel. Ex.1005, 1:19-23, 2:19-51, 8:22-30, 12:19-54. Hills discloses reducing the transmit power of the access points by a fixed value, e.g., 10 dB. Ex.1005, 12:49-53. Hills also explains that "one skilled in the art will recognize...[that] the amount by which the transmit powers are reduced, can be fully parameterized." Ex.1005, 12:49-53. A POSITA would have understood that utilizing a fully parameterized power adjustment technique means that rather than reducing power by a fixed value, the adjustment is performed in terms of variables (parameters).

64. Wang provides implementation details regarding parameterized power adjustment, as contemplated by Hills. Wang explains that its parameterized power adjustment technique allows for “select[ing] an optimal power that balances coverage and system capacity.” Ex.1006, 9. In more detail, Wang discloses an algorithm where the transmit power reduction is parameterized in accordance with the following equation: $P\text{-after} = P\text{-before} - (RSSI\text{-}nth - RSSI\text{-threshold})$, where P-after is the adjusted transmission power, RSSI-nth is the largest power reported by the nth access point, RSSI-threshold is a preset threshold value, and P-before the access point power before adjustment. Ex.1006, 18, FIG. 7.

65. It would have been obvious to a POSITA to consider and apply the parameter-based power adjustment algorithm of Wang, when determining the amount of power to reduce in Hills, because Hills expressly contemplates utilizing parameter-based techniques for reducing access point transmit power. Ex.1005, 12:49-53 (“[T]he amount by which the transmit powers are reduced, can be fully parameterized.”). In view of Hills express suggestion, a POSITA would have been motivated to apply Wang’s parameterized technique to Hills.

66. Also, it would have been obvious to a POSITA to apply Wang’s parameter-based power adjustment technique to Hills because it would allow for a more proportional power adjustment. For example, in instances where the signal strength between access points that use the same channel is high, a reduction of

only 10dB (per Hills' example) may not be sufficient to address overlap. A POSITA would have understood that in such instances Hills' central management device (which determines power reduction) would need to iterate and reduce power in 10dB increments multiple times. On the other hand, utilizing Wang's parameter-based power adjustment algorithm would result in a variable power adjustment and potentially require fewer or no additional iterations. Such an implementation would potentially beneficially reduce power adjustment time and iterations.

67. As an additional benefit, it would have been obvious to apply Wang's power adjustment technique to Hills because it would allow for adaptively adjusting power when the network changes. Ex.1006, 19 ("To ensure that the AP power adjustment can adapt to the continuous changes in the wireless network, the power adjustment process is continuously cycled according to the adjustment cycle. That is, after step S709 is completed, the AC restarts step S701 in the next adjustment cycle."). Such an implementation would ensure that regardless of network changes, the access elements' use "an optimal power that balances coverage and system capacity." Ex.1006, 9.

68. The proposed combination of Wang with Hills is nothing more than combining prior art elements (e.g., a parameter-based power adjustment algorithm, per Wang, with Hills' central management device that performs power adjustment) according to known methods (Wang provide significant details regarding

parameter-based power adjustment and Hills contemplates using parameter based power adjustment) to yield predictable results (e.g., using a parameter-based technique to reduce power of access points that use the same channel, thereby minimizing interference).

69. Lastly, a POSITA would have found it obvious to use Wang’s parameter-based power adjustment algorithm at least as known, suitable options. *See Intel Corp. v. Pact XPP Schweiz AG*, 61 F.4th 1373, 1380 (Fed. Cir. 2023) (It is “not necessary to show that a combination is the best option, only that it be a suitable option”). As already noted, Hills explicitly identifies parameter-based techniques as suitable options. Ex.1005, 12:49-52.

ii. Applying Wang’s hardware and software teachings to Hills

70. Hills discloses that its central management device “can be configured to execute the coverage analysis functionality at regular, configurable intervals.” Ex.1005, 5:55-57. Wang complements Hills by disclosing that power reduction execution “can be implemented in hardware or by means of software plus necessary general-purpose hardware platforms.” Ex.1006, 21. Wang, for example, provides “a software product, which can be stored in a non-volatile storage medium (such as a CD-ROM, USB flash drive, external hard drive, etc.) and comprises several instructions to cause a computer device (such as a personal computer, server, or network device, etc.) to execute the methods described in the various embodiments

of the present invention.” Ex.1006, 21. Wang’s teachings represent details directly applicable to successfully implementing the combination of Wang and Hills, which executes a power adjustment algorithm.

71. In view of Wang, a POSITA would have found it obvious for Hills’ central management device to be implemented with executable software stored in non-volatile storage medium to enable the central management device to execute the power adjustment algorithm, per the combination with Wang discussed immediately above. This reason is sufficient to explain why a POSITA would have sought and combined Wang’s disclosures with Hills. Nevertheless, additional reasons for combining the relevant teachings are provided in the claim analysis below.

c. **Reasonable expectation of success**

72. The results would have been predictable and there would have been a reasonable expectation of success given the similarities of the two references. Additionally, a POSITA would have been able to apply Wang’s power adjustment algorithm teachings to Hills, given that Wang provides significant details including a power adjustment equation. A POSITA would have possessed the skills required to make the proposed combination, including being able to use well-known software and hardware techniques (e.g., a software product stored in non-volatile storage medium with computer executable instructions) to implement the proposed

combination. Moreover, the reasonable expectation of success is evidenced by the fact that the '243 patent itself relies on well-known software and hardware techniques. *See* Ex.1001, 7:60-8:2.

4. Claim 1

a. [1.0] *A device for controlling a wireless access point comprising:*

73. To the extent limiting, Hills teaches the preamble.

74. **First**, Hills discloses a “*device*” by teaching “**a central management device** such as the coverage analyzer 21 (FIG. 1) or central control element 24 (see description below and FIGS. 2A and 2B).” Ex.1005, 3:57-60. Hills explains that “the functionality of coverage analyzer may also be incorporated into one or more central control elements.” Ex.1005, 5:33-35. For ease of reference, going forward, I will primarily refer to Hills’ “central management device,” with the understanding that it corresponds to a central control element 24 that includes a coverage analyzer 21. Accordingly, Hills’ central management device (comprising coverage analyzer 21 and central control element 24) corresponds to “*a device*,” as recited in the preamble.

75. **Second**, Hills’ central management device is “*for controlling a wireless access point*” because it controls transmit power level, authentication, load, channel, handoff, etc., of wireless access points (also referred to by Hills as “access elements” or “APs”).

Methods, apparatuses and systems facilitating the **configuration of transmit power and coverage areas corresponding to access points in a wireless network environment.**

Ex.1005, Abstract.

Coverage analyzer 21, in one embodiment, is a network device that receives coverage scan data from the access elements and processes the coverage scan data, in one embodiment, to **compute an optimal set of transmit power levels for the access elements.** In one embodiment, the functionality of coverage analyzer 21 can be incorporated into a wireless network management platform or appliance. As discussed below, the functionality of coverage analyzer may also be incorporated into one or more central control elements 24, 26 as discussed more fully below.

Ex.1005, 5:26-35.

The access elements 12-15 are coupled via communication means using a wireless local area network (WLAN) protocol (e.g., IEEE 802.11a, 802.11b, etc.) to the client remote elements 16, 18, 20, 22.

...

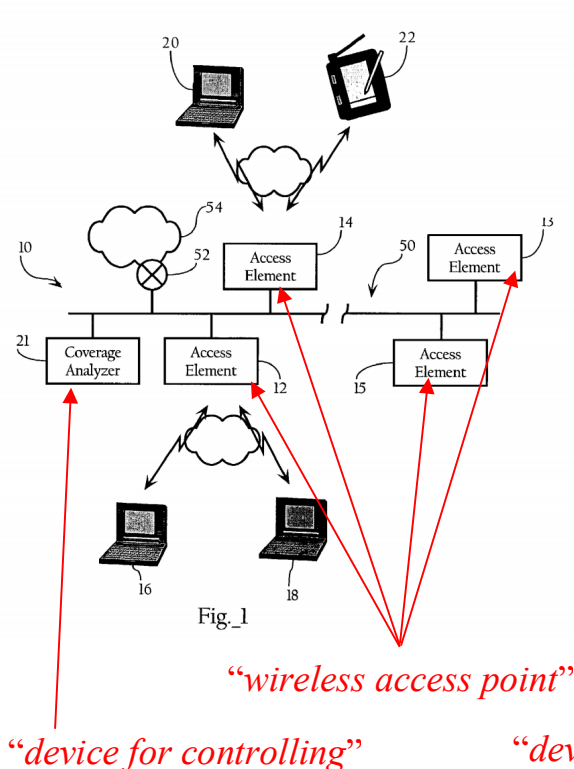
As described in the above-identified patent application, **central control element 24 operates to perform link layer management functions, such as authentication and association on behalf of access elements 12, 14.** For example, the central control element 24 provides processing to dynamically configure a wireless Local Area Network of a system according to the invention while the access elements 12, 14 provide the acknowledgement of communications with the client remote elements 16, 18, 20, 22. **The central control element 24 may for example**

process the wireless LAN network management messages, load control, channel control, and handoff.

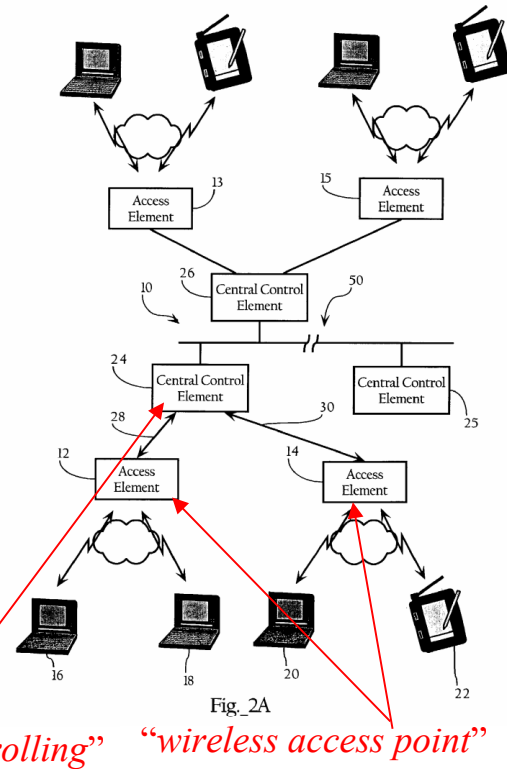
...

According to one embodiment, the central control elements 24, 26 may each incorporate the functionality of coverage analyzer 21 (see above) to receive coverage scan data from the access elements to which they are associated and process the coverage scan data to compute an[d] transmit power levels for the access elements.

Ex.1005, 6:19-7:3. As illustrated below at FIGS. 1 and 2A, Hills' central management device (e.g., coverage analyzer 21 and central control element 24) is for controlling access elements 12, 14, and 15, which wirelessly communicate with client devices 16, 18, 20, 22.



Ex.1005, FIG. 1 (annotated).



Ex.1005, FIG. 2A (annotated).

76. Thus, because Hills describes a central management device for controlling a wireless access point, Hills teaches “[a] device for controlling a wireless access point,” as recited in the preamble.

b. [1.1.1] a grouping unit configured to group wireless access points using a same channel

77. Hills in combination with Wang renders obvious this element.

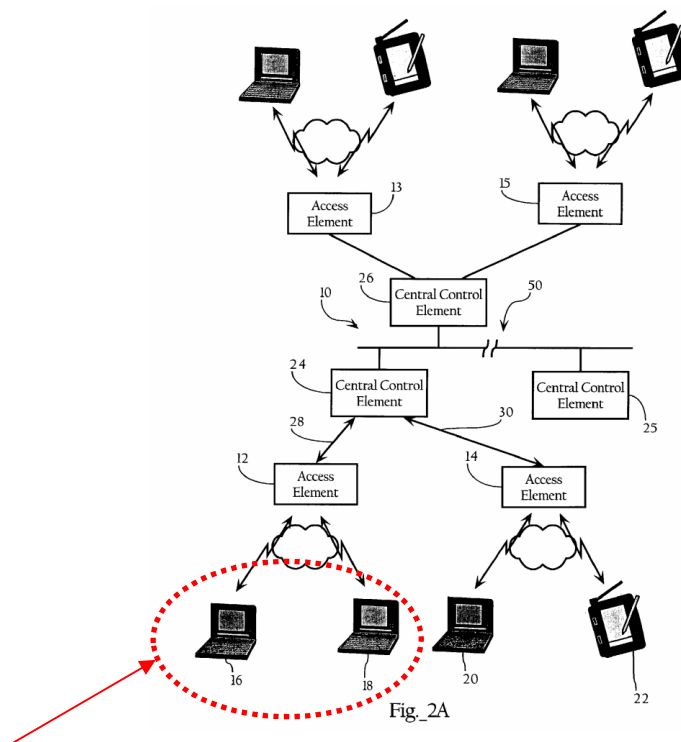
78. First, Hills discloses “a grouping unit configured to group wireless access points using a same channel” by disclosing that the central management device is configured to group together in a two-dimensional matrix ($i \times j$ matrix) access elements that are on the same floor level and that use the same channel.

FIG. 4 illustrates a method directed to minimizing the coverage overlaps of access elements operating on the same channel. As discussed above, in one embodiment, coverage analyzer 21 maintains an $i \times j$ matrix of the signal strengths of the access elements as detected by all other access elements, where $i=j$ and i equals the number of access elements in a given group of access elements. Accordingly, there are no values in the matrix where i equals j . In addition, many values in the matrix may be null or Zero values as well, as many access elements may not detect the signals of all other access elements within a group. A group may be all access elements associated with a given central control element 24, or all access elements in a given physical location, such as a floor of a building.

Ex.1005, 12:19-32.

79. Hills also provides an example, in the context of Figure 2A, where access elements 12 and 14 are connected to central control element 24 and “installed on one floor of an enterprise facility.” *See* Ex.1005, 5:65-7:44. Hills explains that its $i \times j$ matrix corresponds to “the number of access elements in a given group” and that the “group may be all access elements associated with a given central control element 24, or all access elements in a given physical location, such as a floor of a building.” Ex.1005, 12:19-32. Hills further describes that access elements in the group “operate on the same channel” and that the access elements’ transmit power is reduced if the detected signal strength is above a threshold. *See* Ex.1005, 12:19-47 (“FIG. 4 illustrates a method directed to

minimizing the coverage overlaps of access elements operating on the same channel... [C]overage analyzer 21 determines whether the signal strength, S_{ij} , detected by AP_i , is greater than a coverage threshold of -85 dBm....[and if] AP_i , and AP_j , operate on the same channel... coverage analyzer 21 then reduces the transmit power, or generates an instruction to reduce the transmit power”). As such, a POSITA would have understood that within the scope of Hills’ Figure 2A (reproduced below), access elements 12 and 14 may operate on the same floor, use the same channel, and be grouped together when generating a two-dimensional matrix ($i \times j$ matrix).



“group wireless access points using a same channel”

Ex.1005, FIG. 2A (annotated).

Accordingly, Hills discloses grouping access elements on the same floor using the same channel (e.g., access elements 16, 18), which renders obvious “*group[ing] wireless access points using a same channel.*”

80. As noted above in the Claim Construction section, the corresponding structure of the “*grouping unit*” is “hardware or executable software in a storage medium.” It would have been obvious to a POSITA for Hills’ central management device to be implemented with executable software stored in memory, at least because Hills discloses that it “can be configured to **execute** the coverage analysis functionality at regular, configurable intervals.” Ex.1005, 5:55-57.

81. Second, to the extent argued that Hills’ disclosure is not sufficient to disclose the corresponding structure, Wang discloses that a power adjustment algorithm “can be implemented in hardware or by means of software plus necessary general-purpose hardware platforms.” Ex.1006, 21. Wang, for example, provides “**a software product, which can be stored in a non-volatile storage medium** (such as a CD-ROM, USB flash drive, external hard drive, etc.) and comprises several instructions to cause **a computer device (such as a personal computer, server, or network device, etc.) to execute** the methods described in the various embodiments of the present invention.” Ex.1006, 21.

82. In view of Wang’s teachings, a POSITA would have found it obvious for Hills’ central management device to be implemented with executable software

stored in non-volatile storage medium to enable the central management device to perform the disclosed functionality. Such an implementation would facilitate receiving coverage scan data from the access elements, maintaining the coverage scan data in a table, and assembling a two-dimensional matrix to facilitate “minimizing the coverage overlaps of access elements operating on the same channel.” Ex.1005, 12:19-21; *see also* analysis at VII.A.3.

83. Thus, because Hills in combination with Wang discloses that the central management device includes software in a storage medium that when executed groups access elements on the same floor using the same channel, the prior art renders obvious “*a grouping unit configured to group wireless access points using a same channel*” the received data, as claimed.

c. [1.1.2] *based on channel use information received from the wireless access points;*

84. Hills renders obvious this element.

85. First, Hills discloses “*channel use information received from the wireless access points.*”

86. Hills teaches that the access elements obtain “**coverage scan data**” that includes an “indicator of the strength of the detected signal,” “frequency channel,” and other data.

In one embodiment, **the access elements each include a scanning daemon** that, when invoked at each scanning interval, switches

operation of the access element to coverage scan mode. For a scanning period, the scanning daemon monitors for wireless traffic on a given frequency channel and records scan data characterizing any packets detected on the channel.

...

In one embodiment, **the scanning daemon can parse the information in the detected packets and construct a table or other data structure including one or more scan data fields**. The coverage scan data fields can include MAC address, SSID, **frequency channel** and any other information available from 802.11 frame headers, **as well as an indicator of the strength of the detected signal** associated with the packet (see below).

Ex.1005, 4:14-61. Hills' determined signal strength may be obtained in accordance with the 802.11 protocol as "the receive signal strength indicator (RSSI)," where the scanning access element measures "the energy observed at the antenna used to receive the current packet" from a transmitting access element. Ex.1005, 5:3-5; *see also*, Ex.1005, 9:12-16 ("...signal strength information (e.g., ...RSSI...)"); The coverage scan data corresponds to "*channel use information*" because it is information about a used frequency channel, including a determined signal strength (RSSI) on the frequency channel between the access elements.

87. Hills also teaches automatically obtaining access element "**positional**" data using GPS.

As discussed above, the dynamic transmit power functionality may also take location information into account. In one embodiment, the access point table includes positional coordinates of each access element and further includes a z-axis dimension such as floor height or level, which can be...determined automatically through known components, such as a Global Positioning System (GPS) receiver...

As FIG. 6A shows, coverage analyzer 21, in one embodiment, for all access elements AP_i , (302), uses the positional parameters associated with the access elements to determine whether the current access element AP_i includes a neighboring access element within a threshold distance in a given quadrant, Q (304, 306). In one embodiment, a neighboring access element is an access element within a threshold distance and on the same floor as the current access element AP_i .

Ex.1005, 13:23-44. It would have been obvious to a POSITA for each of the access elements to utilize a GPS receiver to obtain its positional data.

88. The positional data identifies where the access element is located, and hence it identifies where the access elements are using the same channel, and for that reason, the position information is part of “*channel use information*.” Also, the positional data corresponds to “*channel use information*” because the distance and floor information is used in pathloss calculations for a used frequency channel.

In one embodiment, a neighboring access element is an access element within a threshold distance and on the same floor as the current access element AP_i . If there are no neighboring access points in a given quadrant, pathloss is set to infinity (307), since the quadrant

is at the edge of the network, and reducing transmit power just reduces the edge of the network. Otherwise, **coverage analyzer 21 computes the pathloss exponent, ExpPL_{ij} , between access element AP_i , and all neighboring access elements AP_j** (308, 310). Equation 1, below, is **a pathloss model, where c =the speed of light, f frequency, and d =distance. Since the pathloss (PL) between a first access element and a second access element is the difference between the transmit power at the first access element and the receive signal strength at the second access element, the pathloss exponent, ExpPL_{ij} , can be derived from Equation (1).**

$$PL = 10\log\left[\left(\frac{c}{4 * f * \pi * d}\right)^{\text{ExpPL}_{ij}}\right]$$

Ex.1005, 13:36-14:60. Hills' detected signal strength may be represented as a **"receive signal strength indicator (RSSI)."** Ex.1005, 5:3-5; *see also* Ex.1005, 9:12-16 (**"...signal strength information (e.g., ...RSSI...)"**).

89. Hills further describes that, in response to a request, the access elements transmit the coverage scan data to the central management device, which "receives coverage scan data from the access elements" and stores it in access element tables or other data structure.

In one embodiment, **the access elements can be configured to automatically transmit the coverage scan data to coverage analyzer 21 after each coverage scan.** In another embodiment, the access elements can store the coverage scan data and **transmit them in response to a request from coverage analyzer 21**...In addition,

coverage analyzer 21 can be configured to execute the coverage analysis functionality at regular, configurable intervals, or on demand. In one embodiment, coverage analyzer 21 **maintains, for each access element, a separate table or other data structure for the received coverage scan data.**

Ex.1005, 5:50-60.

Coverage analyzer 21, in one embodiment, is a network device that receives coverage scan data from the access elements and processes the coverage scan data, in one embodiment, to compute an optimal set of transmit power levels for the access elements.... As discussed below, the functionality of **coverage analyzer may also be incorporated into one or more central control elements 24, 26** as discussed more fully below. In one embodiment, **coverage analyzer 21 includes an access point table storing information relating to known access elements.** In one embodiment, the access point table includes an access element identifier field, and a current transmit power field

Ex.1005, 5:26-39.

Still further, **the central control element 24 may for example process information collected at the access elements 12, 14 on channel characteristic, propagation, and interference or noise... [T]he central control elements 24, 26 may each incorporate the functionality of coverage analyzer 21 (see above) to receive coverage scan data from the access elements to which they are associated and process the coverage scan data to compute an transmit power levels for the access elements.**

Ex.1005, 6:57-7:3.

90. Furthermore, Hills discloses that the positional data is stored in access element tables.

In one embodiment, **the access point table includes positional coordinates of each access element and further includes a z-axis dimension such as floor height or level**, which can be...determined automatically through known components, such as a Global Positioning System (GPS) receiver...

As FIG. 6A shows, coverage analyzer 21, in one embodiment, for all access elements AP, (302), uses the positional parameters associated with the access elements to determine whether the current access element AP, includes a neighboring access element within a threshold distance in a given quadrant, Q (304, 306). In one embodiment, a neighboring access element is an access element within a threshold distance and on the same floor as the current access element AP_i.

Ex.1005, 13:24-44. It would have been obvious to a POSITA for the central management device to receive positional data from the access elements (which obtain it with a GPS receiver) because Hills teaches that the positional data is included in the access point tables (which “stor[es] information relating to known access elements”) and used when determining transmit power.

91. Accordingly, the coverage scan and positional data (separately and together), which are received by the central management device from the access

elements, discloses “*channel use information received from the wireless access points,*” as claimed.

92. Second, Hills renders obvious that the grouping of access elements is “*based on*” the received “*channel use information.*”

93. As explained above, Hills’ “**group...[includes] all access elements in a given physical location, such as a floor of a building,**” which also includes access elements that “**operate on the same channel.**” See Ex.1005, 12:19-47. FIGS. 2A, 4. The received positional data provides “coordinates of each access element and...floor...level” and the coverage scan data identifies each access elements’ “frequency channel.” Ex.1005, 4:14-61, 13:36-41. It would have been obvious to a POSITA to utilize the access elements’ coordinates and floor level to group access elements that are located on the same floor and include access elements that operate on the same channel because Hills’ “method... [seeks to] minimize[e] the coverage overlaps of access elements operating on the same channel.” Ex.1005, 12:19-21, FIG. 4.

94. Thus, because Hills’ group is based on positional and coverage scan data received from the wireless access elements, Hills discloses that the group is “*based on channel use information received from the wireless access points,*” as recited in the claim.

d. **[1.2.1] *a map generator configured to compute a received signal strength indicator (RSSI) between the grouped wireless access points***

95. Hills in combination with Wang renders obvious this element.

96. **First**, as discussed at [1.1.1], Hills' access elements on the same floor using the same channel correspond to the "*grouped wireless access points*."

97. **Second**, in numerous ways, Hills in combination with Wang renders obvious "*a map generator configured to compute a received signal strength indicator (RSSI) between the grouped wireless access points*." As discussed at [1.1.2], Hills discloses that the access elements obtain "coverage scan data," which includes a signal strength indicator. Ex.1005, 4:14-61, 5:26-39, 6:57-7:3. The signal strength indicator may be obtained in accordance with the 802.11 protocol as "the receive signal strength indicator (RSSI)," where an access element measures "the energy observed at the antenna used to receive the current packet" from an access element transmitting on the same channel. Ex.1005, 4:65-5:25, 9:12-16.

i. *Hills performs computations to format coverage scan data*

98. Hills discloses that the central management device receives access elements' coverage scan data (including the signal strength indicator (RSSI) that was measured between the access elements) and stores this data in tables.

The coverage scan data fields can include MAC address, SSID, frequency channel and any other information available from 802.11

frame headers, as well as **an indicator of the strength of the detected signal** associated with the packet (see below).

Ex.1005, 4:14-61. The detected signal strength may be represented as a “**receive signal strength indicator (RSSI)**.” Ex.1005, 5:3-5; *see also* Ex.1005, 9:12-16 (“...**signal strength information (e.g., ...RSSI...)**”).

Coverage analyzer 21, in one embodiment, is a network device that **receives coverage scan data from the access elements and processes the coverage scan data**, in one embodiment, to compute an optimal set of transmit power levels for the access elements.... As discussed below, the functionality of coverage analyzer may also be incorporated into one or more central control elements 24, 26 as discussed more fully below. In one embodiment, coverage analyzer 21 includes **an access point table storing information relating to known access elements**. In one embodiment, the access point table includes an access element identifier field, and a current transmit power field.

Ex.1005, 5:26-39.

Still further, **the central control element 24 may for example process information collected at the access elements 12, 14 on channel characteristic**, propagation, and interference or noise... [T]he central control elements 24, 26 may each incorporate the functionality of coverage analyzer 21 (see above) to receive coverage scan data from the access elements to which they are associated and process the coverage scan data to compute an transmit power levels for the access elements.

Ex.1005, 6:57-7:3.

99. Hills' coverage scan data is transmitted by the access elements over an 802.11 wireless network to the central communications device. Ex.1005, 11:23-52. A POSITA would have understood that 802.11 wireless networks utilize packets for communication. Ex.1005, claim 6 ("...the access elements are each operative to...transmit the packet information and associated signal strengths to the coverage analyzer."); Ex.1010, *generally*. A POSITA would have further understood that the coverage scan data (including the signal strength indicator RSSI) would be encapsulated in packets that are encoded in a binary format (0s and 1s) and transmitted as signals (e.g., electrical, electromagnetic, or radio frequency signals) representing these two states. Ex.1009, 5-6 ("Packets of binary data are sent in this manner... until the message has been fully transmitted."); Ex.1010, 604 ("The DATA field, composed of SERVICE, PSDU, tail, and pad parts, shall be coded with a convolutional encoder of coding rate $R = 1/2$, $2/3$, or $3/4$, corresponding to the desired data rate."). On the receiving side, it would have been obvious to a POSITA for the central management device to perform computations to extract the coverage scan data (including the RSSI measured between the access elements operating on the same channel) from received packets and convert the data into a suitable format for storing it in tables.

100. Accordingly, Hills' computations to format received coverage scan data (including a received strength indicator (RSSI) that measured between the access elements operating on the same channel) for storage in access point tables, renders obvious "*comput[ing] a received signal strength indicator (RSSI) between the grouped wireless access points,*" as claimed.

- ii. *Hills performs computations to sort tables based on RSSI and assemble two-dimensional matrix*

101. Hills discloses that the central management device is configured to sort access element tables by largest signal strength (RSSI) and assemble a two-dimensional matrix ($i \times j$ matrix) with the "detected signal strength [RSSI] among the access elements...operating on the same channel."

In one embodiment, the database maintains a list or table for each access element of the detected access element(s) and a signal strength value associated with each detected access element. In one embodiment, **coverage analyzer 21 sorts each list or table by largest coverage overlap (i.e., signal strength value). In another embodiment, coverage analyzer 21 assembles a two-dimensional matrix including the detected signal strengths among the access elements.**

Ex.1005, 12:7-15.

FIG. 4 illustrates a method directed to minimizing the coverage overlaps of **access elements operating on the same channel.** As discussed above, in one embodiment, **coverage analyzer 21 maintains**

an $i \times j$ matrix of the signal strengths of the access elements as detected by all other access elements, where $i=j$ and i equals the number of access elements in a given group of access elements. Accordingly, there are no values in the matrix where i equals j . In addition, many values in the matrix may be null or zero values as well, as many access elements may not detect the signals of all other access elements within a group. A group may be all access elements associated with a given central control element 24, or all access elements in a given physical location, such as a floor of a building.

As FIG. 4 illustrates, in one embodiment, coverage analyzer 21, for each access element (AP_i) (102), compares **the signal strength detected by the access element from all other access elements (AP_j) in the matrix** (104) against a coverage threshold. For example, in one embodiment, coverage analyzer 21 determines whether the signal strength, S_{ij} , detected by AP_i , is greater than a coverage threshold of -85 dBm (106). As FIG. 4 illustrates, coverage analyzer 21 also determines whether AP_i , and AP_j , operate on the same channel (108) and whether a coverage hole has been detected as to AP_i , (110). Assuming all conditions are met, coverage analyzer 21 then reduces the transmit power, or generates an instruction to reduce the transmit power, for AP_i , and AP_j , (114, 118), if the transmit power for AP_i , and/or AP_j , have not already been reduced during this analysis loop (112, 116).

Ex.1005, 12:19-48. The detected signal strength may be represented as a “**receive signal strength indicator (RSSI)**.” Ex.1005, 5:3-5; *see also* Ex.1005, 9:12-16 (“...signal strength information (e.g., ...**RSSI**...)”).

102. It would have been obvious to a POSITA that sorting the tables based on RSSI (which was measured between access elements operating on the same channel), as Hills teaches, includes performing computations that compare the RSSI values relative to each other to determine the proper order. *See e.g.*, Ex.1008, *generally*. Additionally, it would have been obvious to a POSITA that assembling the two-dimensional matrix includes performing computations on each RSSI to determine the position in the matrix between the access elements (e.g., AP_i and AP_j) that operate on the same channel.

103. Accordingly, Hills’ disclosure of sorting tables based on detected RSSI between the access elements operating on the same channel and assembling a two-dimensional matrix with RSSI values between the grouped access elements, renders obvious “*compute a received signal strength indicator (RSSI) between the grouped wireless access points,*” as claimed.

104. Additionally, Wang discloses sorting RSSI of the access points.

1. A power adjustment method for a wireless access point (AP), which is characterized in that it is applied to a network system comprising at least two APs connected to the same wireless access controller (AC), wherein each AP determines information about its

neighboring APs and determines the Received Signal Strength Indicator (RSSI) generated by the AP's signal in each neighboring AP, and the AC receives information about the neighboring APs transmitted by the AP and the RSSI generated by the AP's signal in each neighboring AP transmitted by each neighboring AP, the method comprising:

the AC determines the current number of neighboring APs of the AP based on the information of the neighboring APs sent by the AP;

when the AC determines that the number of neighboring APs corresponding to the AP exceeds a preset threshold for the number of neighboring APs, it **sorts the RSSI generated by the signals of the AP sent by each neighboring AP in the neighboring APs**; and

the AC selects a standard RSSI according to the sorting order and a preset selection strategy, determines its relationship with a preset RSSI threshold, and adjusts the power of the AP according to the relationship.

Ex.1006, 4; *see also* Ex.1006, 18 (“The **AC sorts the RSSI reported by all neighboring APs in descending order based on the RSSI value**.”), FIG. 4. As already explained, it would have been obvious to a POSITA that sorting RSSI in a given order, as Wang teaches, includes performing computations that compare the RSSI values relative to each other to determine the proper order. *See e.g.*, Ex.1008, *generally*. Accordingly, Wang’s disclosure of sorting RSSI renders obvious “*compute a received signal strength indicator (RSSI) between the grouped wireless access points*,” as claimed.

- iii. Hills performs computations to compute average RSSI values

105. Moreover, Hills discloses that the signal strength (RSSI) values in the matrix correspond to a computed “**average signal strength.**”

As discussed above, **the signal strength values in the coverage matrix can be the average signal strength values** corresponding to the packets transmitted by the access elements.

Ex.1005, 12:13-18; *see also* Ex.1005, 10:56-60 (“... coverage analysis module 80, at a configurable averaging interval or window (e.g., 1 minute, etc.) (412), **computes the average signal strength** from the values collected...”). As already noted, Hills’ signal strength may be represented as a “receive signal strength indicator (RSSI)” measured between access elements. 4:65-5:25, 9:12-16.

Accordingly, Hills’ disclosure of computing average signal values (RSSI) measured between the access elements also renders obvious “*compute a received signal strength indicator (RSSI) between the grouped wireless access points,*” as claimed.

106. As noted above in the Claim Construction section, the corresponding structure of the “*map generator*” is “hardware or executable software in a storage medium.” It would have been obvious to a POSITA for Hills’ central management device to be implemented with executable software stored in memory, at least because Hills discloses that it “can be configured to **execute** the coverage analysis functionality at regular, configurable intervals.” Ex.1005, 5:55-57.

107. Third, to the extent argued that Hills’ disclosure is not sufficient to disclose the corresponding structure, Wang discloses that a power adjustment algorithm “can be implemented in hardware or by means of software plus necessary general-purpose hardware platforms.” Ex.1006, 21. Wang, for example, provides “**a software product, which can be stored in a non-volatile storage medium** (such as a CD-ROM, USB flash drive, external hard drive, etc.) and comprises several instructions to cause **a computer device (such as a personal computer, server, or network device, etc.) to execute** the methods described in the various embodiments of the present invention.” Ex.1006, 21.

108. In view of Wang’s teachings, a POSITA would have found it obvious for Hills’ central management device to be implemented with executable software stored in non-volatile storage medium to enable the central management device to perform the disclosed functionality. Such an implementation would facilitate sorting access point tables based on RSSI and assembling a two-dimensional matrix to facilitate “minimizing the coverage overlaps of access elements operating on the same channel.” Ex.1005, 12:19-21; *see also* analysis at VII.A.3.

109. Accordingly, the central management device including software in storage medium that when executed is configured to compute RSSI (as discussed above in the multiple examples), per the combination of Hills and Wang, renders

obvious “*a map generator configured to compute a received signal strength indicator (RSSI)*,” as recited in the claim.

- e. [1.2.2] *[a map generator configured to compute]... an output strength value for each of the grouped wireless access points;*

110. Hills in combination with Wang renders obvious this element.

111. **First**, as discussed at [1.1.1], Hills’ access elements on the same floor using the same channel correspond to the “*grouped wireless access points*.” Further, as discussed at [1.2.1], Hills in combination with Wang discloses the central management device including software in storage medium that when executed is configured to compute, which renders obvious a “*map generator configured to compute*.”

112. **Second**, in numerous ways, Hills discloses “[*computing*]...*an output strength value for each of the grouped wireless access points*.”

- i. *Hills performs computations to format current transmit power*

113. Hills discloses that the central management device sends a request to the access elements to receive data in beacon frames and probe response frames.

In another embodiment, the access elements can store the coverage scan data and **transmit them in response to a request** from coverage analyzer 21...In addition, coverage analyzer 21 can be configured to execute the coverage analysis functionality at regular, configurable intervals, or on demand. In one embodiment, coverage analyzer 21

maintains, for each access element, a separate table or other data structure for the received coverage scan data.

Ex.1005, 5:50-60.

In one embodiment, coverage analyzer 21 includes an access point table storing information relating to known access elements. In one embodiment, the access point table includes an access element identifier field, and **a current transmit power field**. In 802.11 wireless network environments, the access element identifier is the MAC address corresponding to a given access element, while the service set identifier is the SSID contained in certain management frames, **such as beacon frames, probe response frames**, and association request frames.

Ex.1005, 5:35-45.

114. Hills further discloses that the central management device stores information relating to known access elements, including “current transmit power.”

As discussed below, the functionality of coverage analyzer may also be incorporated into one or more central control elements 24, 26 as discussed more fully below. In one embodiment, **coverage analyzer 21 includes an access point table storing information relating to known access elements**. In one embodiment, the access point table includes an access element identifier field, and **a current transmit power field**.

Ex.1005, 5:26-39; *see also* Ex.1005, 4:17-61. It would have been obvious to a POSITA for Hills’ access elements, in response to a request from the central

management device, to transmit their “current transmit power” in beacon frames or probe response frames. A POSITA would have had a reasonable expectation of success since Hills system operates with the 802.11 standard, which already provided messages for communicating information about transmit power. Ex.1005, 3:49-52 (“The access elements can operate in connection with any suitable wireless communications protocol, including 802.11a and 802.11b.”); Ex.1010, 113 (“The **TPC Report element contains transmit power** ... A TPC Report element is **included in a Beacon frame or Probe Response frame**”).

115. Consistent with the analysis at [1.2.1], a POSITA would have understood that the access elements’ “current transmit power” would be encoded in a binary format (0s and 1s) and transmitted to the central management device as signals (e.g., electrical, electromagnetic, or radio frequency signals) representing these two states. Ex.1010, 604 (“The DATA field, composed of SERVICE, PSDU, tail, and pad parts, shall be coded with a convolutional encoder of coding rate $R = 1/2, 2/3$, or $3/4$, corresponding to the desired data rate.”). On the receiving side, it would have been obvious to a POSITA for the central management device to perform computations to convert the “current transmit power” from a transmission format to a format suitable for storage in “an access point table.” Ex.1005, 5:26-39.

116. Accordingly, performing computations to format the access elements’ “current transmit power” for storage in access point tables, in accordance with

Hills, renders obvious “[computing]... an output strength value for each of the grouped wireless access points,” as claimed.

- ii. Hills performs computations to determine current transmit power

117. Hills discloses that the central management device computes transmit power of access elements on the same channel, which is used to adjust the access elements transmit power. Ex.1005, 14:36-44, FIG. 6 (“...coverage analyzer 21 determines the lowest computed coverage overlap from the values computed for a given access element (328) and **adjusts the transmit power of the access element... Coverage analyzer 21 repeats this process for all desired access elements.**”). A POSITA would have understood that Hills’ computed power adjustment value is used to set each access element’s transmit power in an iterative manner such that the previously computed transmit power is the currently used transmit power.

118. Furthermore, consistent with the analysis at [1.4.1]-[1.4.2] below, Wang discloses an algorithm for adjusting access element transmit power. Wang’s power adjustment is adaptive, meaning that power is adjusted continuously in response to wireless network changes.

To ensure that **the AP power adjustment can adapt to the continuous changes in the wireless network, the power adjustment process is continuously cycled** according to the adjustment cycle. That is, after

step S709 is completed, the AC restarts step S701 in the next adjustment cycle.

Ex.1006, 19. Because adaptive power adjustment is performed on an ongoing basis (to “adapt to continuous changes”), each time a power adjustment cycle is performed, an access element’s “current transmit power” corresponds to the computed power adjustment of the previous power adjustment cycle.

119. For the reasons explained above at VII.A.3, a POSITA would have found it obvious for Hills’ central management device to implement Wang’s algorithm to calculate an optimal transmit power for the access elements.

120. Accordingly, the central management device computing a power adjustment value that is used to set each access elements’ transmit power (in a first power adjustment cycle), in accordance with the combination of Hills and Wang, renders obvious “[computing]... *an output strength value for each of the grouped wireless access points,*” as claimed.

f. [1.3.1] *an extractor configured to extract a wireless access point having a highest RSSI value among the grouped wireless access points,*

121. Hills in combination with Wang renders obvious this element.

122. First, as discussed at [1.1.1], Hills’ access elements on the same floor using the same channel correspond to the “*grouped wireless access points.*”

123. Second, the combination of Hills and Wang discloses “*an extractor configured to extract a wireless access point having a highest RSSI value among the*

grouped wireless access points.” Hills discloses that the “coverage analyzer 21 sorts each list or table by **largest coverage overlap (i.e., signal strength value)**.”

Ex.1005, 12:11-13. In the context of Hills, the detected signal strength is a “**receive signal strength indicator (RSSI)**.” Ex.1005, 5:3-5; *see also* Ex.1005, 9:12-16

(“...signal strength information (e.g., ...RSSI...)”). A POSITA would have understood that the largest signal strength value corresponds to an RSSI that has the highest value between the access elements on the same channel. *See* Analysis at limitation [1.1]; Ex.1005, 12:19-21 (disclosing “a method directed to minimizing the coverage overlaps of **access elements operating on the same channel**.”).

Although Hills sorts by the largest RSSI, it does not expressly teach that the corresponding wireless access element is extracted and that the largest RSSI value is used for calculations (see limitation [1.4], *infra*).

124. Wang further teaches sorting RSSI values and marking the AP reporting the Nth largest RSSI value in Step S705 as “NAP-nth” and using the Nth largest RSSI value for calculating access point power at Step 707.

Step S705: The AC sorts the RSSIs reported by each of the neighboring APs corresponding to the AP in descending order. Each neighboring AP of an AP records the RSSI of messages sent from the AP and reports it to the AC. The AC sorts the RSSI reported by all neighboring APs in descending order based on the RSSI value. Then, it **finds the Nth largest RSSI value, marks the neighboring AP that reported this RSSI as NAP-nth, and records the RSSI of the AP it senses as RSSI-**

nth. This is determined as the standard RSSI and used as the basis for subsequent adjustments.

Step S706: The AC determines the relationship between the **standard RSSI (RSSI_{nth}) reported by AP's NAP-nth** and the preset RSSI threshold. Wherein, the RSSI threshold can be set and adjusted according to the needs of the actual application scenario, and is marked as RSSI-threshold. If RSSI-nth is greater than RSSI-threshold, the current AP power is considered to be high, and execute step S707; and If RSSI-nth is less than RSSI-threshold, the current AP power is considered low, and execute step S708.

Step S707: The AC decreases AP power. Assume the power of the AP before adjustment is P-before, and the power of the AP after adjustment is P-after. The algorithm for reducing AP power by AC is as follows:
$$P\text{-after} = P\text{-before} - (RSSI\text{-nth} - RSSI\text{-threshold}).$$

Ex.1006, 18.

125. In Wang, N is a “preset threshold number of neighboring APs.”

Ex.1006, 5, 10, 17, FIG. 7 (Step S703 “the preset threshold N for the number of neighboring APs”). Wang expressly contemplates that there may be “**two APs connected to the same AC,**” in which case each AP has one neighboring AP (a similar network configuration as Hills example discussed at limitation [1.1.1]).

Ex.1006, 19. If there are two APs connected to the same AC (at Step S702) and the preset threshold of neighboring APs is set to N=1 (for Step S703), then the number

of neighboring APs (two APs) exceeds the preset threshold $N=1$. Ex.1006, FIG. 7.

A POSITA would have understood that in such an instance, the “Nth largest RSSI value” would be the highest RSSI of the two APs in the sorted list, because the list is sorted in descending order. Accordingly, in the instance where the number N of neighboring APs set in the current wireless network is 1 and two access points are present, the RSSI-nth is the highest and marking the NAP-nth discloses *“extract[ing] a wireless access point having a highest RSSI value among the grouped wireless access points,”* as claimed.

126. For the reasons explained above at VII.A.3, a POSITA would have found it obvious for Hills’ central management device to implement Wang’s algorithm to calculate an optimal transmit power for the access elements.

127. As noted above in the Claim Construction section, the corresponding structure of the “*extractor*” is “hardware or executable software in a storage medium.” It would have been obvious to a POSITA for Hills’ central management device to be implemented with executable software stored in memory, at least because Hills discloses that it “can be configured to **execute** the coverage analysis functionality at regular, configurable intervals.” Ex.1005, 5:55-57.

128. To the extent argued that Hills’ disclosure is not sufficient to disclose the corresponding structure, Wang discloses that a power adjustment algorithm “can be implemented in hardware or by means of software plus necessary general-

purpose hardware platforms.” Ex.1006, 21. Wang, for example, provides “**a software product, which can be stored in a non-volatile storage medium** (such as a CD-ROM, USB flash drive, external hard drive, etc.) and comprises several instructions to cause **a computer device (such as a personal computer, server, or network device, etc.) to execute** the methods described in the various embodiments of the present invention.” Ex.1006, 21.

129. In view of Wang’s teachings, a POSITA would have found it obvious for Hills’ central management device to be implemented with executable software stored in non-volatile storage medium to enable the central management device to perform the disclosed functionality. Such an implementation would facilitate extracting the access element with the highest RSSI and performing calculations to determine the optimal output strength value. Ex.1006, 9 (“[S]elect an optimal power that balances coverage and system capacity.”); *see also* analysis at VII.A.3.

130. Thus, because Hills in combination with Wang discloses that the central management device includes software in a storage medium that marks the access element reporting the Nth largest RSSI value among the access elements that use the same channel, the prior art renders obvious “*an extractor configured to extract a wireless access point having a highest RSSI value among the grouped wireless access points,*” as recited in the claim.

g. [1.3.2] *if interference occurs between the grouped wireless access points; and*

131. Hills in combination with Wang renders obvious this element.

132. As explained below, the prior art combination determines “*if interference occurs between the grouped wireless access points*” before marking the access element reporting the Nth largest RSSI value.

133. Hills recognizes that network problems arise when there is “overlapping coverage areas and channel interference.” Ex.1005, 2:36-38. To address this problem, Hills discloses that “**the central control element 24 may for example process information collected at the access elements 12, 14...[including] interference.**” Ex.1005, 6:59-62. Because Hills’ access elements operate in accordance with 802.11 protocol, it would have been obvious to a POSITA for the collected interference information to indicate the level of interference present on a channel. Ex.1005, 3:49-52 (“The access elements can operate in connection with any suitable wireless communications protocol, including 802.11a and 802.11b.”); Ex.1010, 122 (“The RPI histogram report provides an additional mechanism for a [access point] to **gather information on the state of a channel... to assess the general level of interference present on a channel.**”).

134. Wang similarly recognizes the problem of access point interference.

According to the background section, as the number of access points (APs) in a network increases, with an increase in the coverage area, **interference also occurs between the APs**. When there are a large number of APs in the network, such **interference will affect the network performance**.

Ex.1006, 13.

135. Wang utilizes a “preset threshold N for the number of neighboring APs” which corresponds to “the minimum number of APs required to **cause network interference between APs**.” Ex.1006, 14, 16. Before marking the NAP-nth reporting the Nth largest RSSI value at Step S705 and performing power adjusting calculations at Step S706-Step S708, Wang’s algorithm at earlier Step S703 checks to see if the conditions for interference have been satisfied.

Step S703: The AC determines whether the number of neighboring APs of each AP exceeds the preset threshold N for the number of neighboring APs. If the number of neighboring APs of an AP does not exceed the preset threshold N for the number of neighboring APs, then execute step S704; and **If the number of neighboring APs of an AP exceeds the preset threshold N for the number of neighboring APs, then execute step S705**.

Ex.1006, 17. Accordingly, Wang marks the access point having a highest RSSI at Step S705, if the number of neighboring APs exceeds the preset threshold N (which is indicative of interference) at Step S703, thereby rendering obvious extracting the

access point having a highest RSSI “*if interference occurs between the grouped wireless access points,*” as recited in the claim.

136. Additionally, it would have been obvious to a POSITA, when implementing the combination of Hills with Wang, to utilize Hills’ interference information obtained from the access elements (Ex.1005, 6:59-62) in connection with the threshold, as Wang’s algorithm does (Ex.1006, 17). Utilizing interference information gathered by access elements (which indicates a level of interference present on a channel) obviates the need to perform power adjustments if very low interference is present (even though Wang’s inference threshold is satisfied), thereby allowing the signal strength to remain high and provide better coverage in the area. Indeed, the ’243 patent readily admits that it was known in the art to adjust power if interference occurs (e.g., high frame error rate). Ex.1001, 1:34-51.

137. Thus, because Hills in combination with Wang discloses marking the access element reporting the Nth largest RSSI value when a number of neighboring access elements exceeds the preset threshold N and there is interference between access elements that operate on the same channel, the prior art renders obvious extracting the access point having a highest RSSI “*if interference occurs between the grouped wireless access points,*” as recited in the claim.

h. [1.4.1] *an optimal output strength value calculator configured to compute a corrected output strength value*

138. Hills in combination with Wang renders obvious this element.

139. First, Hills recognizes that current wireless networks “do not perform at optimum speed due to overlapping coverage areas and channel interference.” Ex.1005, 2:36-38. To address this problem, Hills “**compute[s] transmit power levels for the access elements to optimize** the performance of the wireless network environment.” Ex.1005, 3:29-34. That is, Hills’ “network device...processes the coverage scan data... **to compute an optimal set of transmit power levels for the access elements.**” Ex.1005, 5:26-39. The optimal transmit power levels represent an “**adjust[ment] of the transmit power where there is overlap.**” Ex.1005, 14:17-21. A POSITA would have understood that computed transmit power after adjustment is a “*corrected output strength value*,” as claimed.

140. Second, Wang seeks to “**select an optimal power** that balances coverage and system capacity.” Ex.1006, 9. The optimal power represents a computed transmit power “adjustment.” Ex.1006, 18.

Step S707: The AC decreases AP power. Assume the power of the AP before adjustment is P-before, and the power of the AP after adjustment is P-after. **The algorithm for reducing AP power by AC is as follows:**

P-after = P-before- (RSSI-nth-RSSI-threshold).

Ex.1006, 18. The computed optimal transmit power “P-after” is a “*corrected output strength value*” that reduces the interference between access points. Ex.1006, 9

(“...adjust AP power based on the network environment, thus reducing interference and improving the overall system throughput...”).

141. For the reasons explained above at VII.A.3, a POSITA would have found it obvious for Hills’ central management device to implement Wang’s algorithm to calculate an optimal transmit power for the access elements.

142. As noted above in the Claim Construction section, the corresponding structure of the “*optimal output strength value calculator*” is “hardware or executable software in a storage medium.” It would have been obvious to a POSITA for Hills’ central management device to be implemented with executable software stored in memory for computing optimal transmit power, at least because Hills discloses that it “can be configured to **execute** the coverage analysis functionality at regular, configurable intervals.” Ex.1005, 5:55-57.

143. To the extent argued that Hills’ disclosure is not sufficient to disclose the corresponding structure, Wang discloses that a power adjustment algorithm “can be implemented in hardware or by means of software plus necessary general-purpose hardware platforms.” Ex.1006, 21. Wang, for example, provides “**a software product, which can be stored in a non-volatile storage medium** (such as a CD-ROM, USB flash drive, external hard drive, etc.) and comprises several instructions to cause **a computer device (such as a personal computer, server, or**

network device, etc.) to execute the methods described in the various

embodiments of the present invention.” Ex.1006, 21.

144. In view of Wang’s teachings, a POSITA would have found it obvious for Hills’ central management device to be implemented with executable software stored in non-volatile storage medium to enable the central management device to perform the disclosed functionality. Such an implementation would facilitate extracting the access element with the highest RSSI and performing calculations to determine the optimal output strength value. Ex.1006, 8 (“[S]elect an optimal power that balances coverage and system capacity.”); *see also* analysis at VII.A.3.

145. Thus, because Hills in combination with Wang discloses that the central management device includes software in a storage medium that when executed is configured to compute an optimal transmit power (e.g., P-after), the prior art renders obvious “*an optimal output strength value calculator configured to compute a corrected output strength value,*” as recited in the claim.

- i. **[1.4.2] *based on the highest RSSI value of the extracted wireless access point, a predetermined threshold value of the RSSI between the grouped wireless access points, and a currently used output strength value.***

146. Hills in combination with Wang renders obvious this element.

147. First, Hills in combination with Wang discloses that the computed optimal transmit power P-after is “*based on the highest RSSI value of the extracted wireless access point.*”

148. As discussed at limitation [1.3.1], Hills in combination with Wang discloses marking the access element (NAP-nth) reporting the Nth largest RSSI value (RSSI-nth). Wang explains that the RSSI-nth is “determined as the standard RSSI and used as the basis for subsequent adjustments.”

Step S705: The AC sorts the RSSIs reported by each of the neighboring APs corresponding to the AP in descending order. Each neighboring AP of an AP records the RSSI of messages sent from the AP and reports it to the AC. The AC sorts the RSSI reported by all neighboring APs in descending order based on the RSSI value. Then, it **finds the Nth largest RSSI value, marks the neighboring AP that reported this RSSI as NAP-nth, and records the RSSI of the AP it senses as RSSI-nth. This is determined as the standard RSSI and used as the basis for subsequent adjustments.**

Ex.1006, 18.

149. As shown below, Wang’s adjustment algorithm for calculating the optimal transmit power P-after, at Step S707, is based on the RSSI-nth reported by the NAP-nth.

Step S707: The AC decreases AP power. Assume the power of the AP before adjustment is P-before, and the power of the AP after adjustment is P-after. **The algorithm for reducing AP power by AC is as follows:**

$$P\text{-after} = P\text{-before} - (\text{RSSI-nth} - \text{RSSI-threshold}).$$

Ex.1006, 18. For the reasons explained above at VII.A.3, a POSITA would have found it obvious for Hills' central management device to implement Wang's algorithm to calculate an optimal transmit power for the access elements.

Accordingly, because the combination of Hills and Wang discloses that the optimal transmit power P-after is based on RSSI-nth (which is the highest RSSI when N=1, as discussed at [1.3.1]), the prior art renders obvious that the corrected output strength value is *"based on the highest RSSI value of the extracted wireless access point,"* as claimed.

150. Second, Hills in combination with Wang discloses that the computed optimal transmit power P-after is *"based on... a predetermined threshold value of the RSSI between the grouped wireless access points."*

151. Wang's algorithm for calculating the optimal transmit power P-after utilizes a preset RSSI-threshold power between the access points.

Step S706: The AC determines the relationship between the standard RSSI (RSSInth) reported by AP's NAP-nth and the **preset RSSI threshold. Wherein, the RSSI threshold can be set and adjusted according to the needs of the actual application scenario, and is marked as RSSI-threshold.** If RSSI-nth is greater than RSSI-threshold, the current AP power is considered to be high, and execute step S707; and If RSSI-nth is less than RSSI-threshold, the current AP power is considered low, and execute step S708.

Step S707: The AC decreases AP power. Assume the power of the AP before adjustment is P-before, and the power of the AP after adjustment is P-after. **The algorithm for reducing AP power by AC is as follows:**

$$P\text{-after} = P\text{-before} - (\text{RSSI-nth} - \text{RSSI-threshold}).$$

Ex.1006, 18.

152. For the reasons explained above at VII.A.3, a POSITA would have found it obvious for Hills' central management device to implement Wang's algorithm to calculate an optimal transmit power for the access elements. In the combination of Hills and Wang, consistent with the analysis at limitation [1.1.1], the preset RSSI threshold would correspond to a preset threshold RSSI power between the grouped access elements on the same floor that use the same channel. Accordingly, the combination of Hills and Wang renders obvious that the computed optimal transmit power P-after is "*based on... a predetermined threshold value of the RSSI between the grouped wireless access points,*" as claimed.

153. Third, Hills in combination with Wang discloses that computed optimal transmit power P-after is "*based on...a currently used output strength value.*"

154. Wang's algorithm for calculating the optimal transmit power P-after, at Step S707, is based on "P-before," which is the AP power before adjustment.

Step S707: The AC decreases AP power. Assume **the power of the AP before adjustment is P-before**, and the power of the AP after adjustment is P-after. **The algorithm for reducing AP power by AC is as follows:**

P-after = **P-before** - (RSSI-nth-RSSI-threshold).

Ex.1006, 18. Because “P-before” is the power before adjustment, it corresponds to the “*currently used output strength value*” of the access point.

155. For the reasons explained above at VII.A.3, a POSITA would have found it obvious for Hills’ central management device to implement Wang’s algorithm to calculate an optimal transmit power for the access elements. Accordingly, the combination of Hills and Wang renders obvious that an optimal transmit power P-after is “*based on... a currently used output strength value,*” as claimed.

5. Claim 4

- j. [4.0] *The device of claim 1, wherein the map generator is configured to generate a virtual map including RSSI values between the grouped wireless access points and the output strength value of each of the grouped wireless access points.***

156. As analyzed at [1.2.1]-[1.2.2], Hills in combination with Wang discloses “*the map generator.*” Further, as analyzed above, the prior art discloses maintaining for each access element a table with determined RSSI values and current transmit power. The prior art also discloses assembling a two-dimensional

matrix (i×j matrix) with RSSI values between access elements that are on the same floor level and that use the same channel. Collectively, the access element tables (which are sorted based on RSSI) and the two-dimensional matrix (i×j matrix) with RSSI values between access elements correspond to “a virtual map including RSSI values between the grouped wireless access points and the output strength value of each of the grouped wireless access points.”

6. Claim 5

- a. **[5.0] *The device of claim 1, wherein the optimal output strength value calculator is configured to compute the corrected output strength value by subtracting a difference between the RSSI value of the extracted wireless access point and a predetermined threshold value of an RSSI value between the grouped wireless access points, from the currently used output strength value.***

157. As analyzed at [1.4.1], Hills in combination with Wang discloses that “the optimal output strength value calculator is configured to compute the corrected output strength value.” Further, consistent with the analysis at [1.4.2], as shown below, the prior art combination discloses computing the adjusted output strength value P-after in the same manner as the ’243 patent.

’243 patent (Ex.1001, 7:51)	Wang (Ex.1006, 18)
$P_{tx\_modi} = P_{tx\_c} - (RSSI\_m - RSSI\_th)$	$P\text{-after} = P\text{-before} - (RSSI\text{-nth} - RSSI\text{-threshold})$

158. As shown above, like the '243 patent, Wang subtracts a difference between the RSSI-nth of the NAP-nth and a preset RSSI-threshold between the access points that use the same channel (i.e., $\text{RSSI-nth} - \text{RSSI-threshold}$) from the power used before adjustment (i.e., P-before), which renders obvious “*subtracting a difference between the RSSI value of the extracted wireless access point and a predetermined threshold value of an RSSI value between the grouped wireless access points, from the currently used output strength value,*” as recited in the claim.

B. Ground 2: Claims 2 and 11 are obvious over Hills in view of Wang and Calhoun

1. Summary of Calhoun

159. U.S. No. 8,040,861 to Calhoun et al. (“Calhoun,” Ex.1011) “relates to wireless communication protocols, and more particularly to management of communications.” Ex.1011, 1:28-33. Calhoun “is a continuation-in-part of U.S. application Ser. No. 10/155,938,” which is cited to by Hills and incorporated in its entirety. Ex.1005, 1:8-15. Calhoun discloses that a central management device transmits information to an access element to control transmit power. Ex.1011, 3:37-51, 3:61-4:11.

2. Reasons to Combine Calhoun with Hills

a. Calhoun is Analogous Art

160. Like Hills, Calhoun is analogous art to the '243 patent because it pertains to the field of wireless access networks and addresses the problem of adjusting transmission power of access points. Ex.1001, 1:15-23, Abstract; Ex.1005, 1:19-23, Abstract, FIGS. 1, 2A, 2B, 4, Claims 1, 10; Ex.1011, 1:28-33, 3:37-4:11, Abstract, FIGS. 1, 4. Additionally, Hills cites to and incorporates by reference, U.S. application Ser. No. 10/155,938, which is also a parent application to Calhoun. Ex.1005, 1:8-15. Accordingly, a POSITA would have naturally considered Calhoun when reviewing Hills, because Calhoun is analogous art and shares the same parent application as Hills.

b. Motivation to combine Calhoun with Hills

161. A POSITA would have combined the teachings of Wang with Hills to obtain predictable and beneficial results.

162. Hills discloses that the central management device generates an “instruction to reduce the transmit power” of access elements. Ex.1005, 12:19-49, FIG. 4. It would have been obvious to a POSITA for the instruction to be received by the access elements, so that the transmit power is reduced to optimize network performance, per Hills’ objective. Ex.1005, 2:29-44, 5:25-30. Notably, Calhoun discloses that the access elements “receive[] information...[that]...control[s]...the transmit power,” including information for “setting transmit power levels at the

access elements.” Ex.1011, 3:37-4:11. In view of Calhoun, it would have been obvious for Hills’ access elements to receive the instruction from the central management device so that the access elements power level is set to an optimal transmit power that minimizes overlap and interference, thereby achieving Hills’ goal of improving network performance. Ex.1005, 2:36-38 (“...many WLANs do not perform at optimum speed due to overlapping coverage areas and channel interference.”), 5:25-30 (“...an optimal set of transmit power levels for the access elements.”), 12:19-49 (“FIG. 4 illustrates a method directed to minimizing the coverage overlaps of access elements operating on the same channel. ... coverage analyzer...generates an instruction to reduce the transmit power, for AP_i, and AP_j...”); Ex.1006, 9 (“The present invention provides a power adjustment method and device for an access point (AP), which automatically adjusts the power in real time in a wireless environment to reduce network interference and improve system throughput.”); *see also* analysis at [2.0], *infra*.

163. The proposed combination is merely applying a known technique (e.g., access elements’ receiving power control information, per Calhoun) to Hills’ similar devices (methods, or products) in the same way (e.g., set the access elements transmit power to minimize overlap and interference, thereby improving network performance).

c. **Reasonable expectation of success**

164. The results would have been predictable and there would have been a reasonable expectation of success given the similarities of the two references and that Hills cites to and incorporates by reference, U.S. application Ser. No. 10/155,938, which is also a parent application to Calhoun. Ex.1005, 1:8-15.

3. **Claim 2**

- a. ***[2.0] The device of claim 1, further comprising an output adjustment requester configured to transmit an output strength adjustment request to each of the grouped wireless access points, the output strength adjustment request being related to adjusting a current output strength value based on the corrected output strength value.***

165. Hills in combination with Wang and Calhoun renders obvious this element.

166. **First**, Hills in combination with Wang and Calhoun renders obvious “an output adjustment requester configured to transmit an output strength adjustment request to each of the grouped wireless access points.”

167. Hills discloses that the central management device communicates with the access elements over the network.

According to another embodiment, **central control element 24 (as well as other central control elements not shown) can communicate with access elements 12, 14 over local area network segment 10.** In addition, using a virtual local area network (VLAN) technology and protocols, central control element 24 may also communicate with

access element 15 over WAN 50. Suitable VLAN protocols include the IEEE 802.1Q (VLAN tagging) protocol or any other protocol allowing for a logic or virtual link layer connection between the central control element and the access elements.

Ex.1005, 7:46-56.

168. Hills further discloses that the central management device generates an **“instruction to reduce the transmit power”** of access elements “AP_i, and AP_j,” which are included in the matrix.

As FIG. 4 illustrates, in one embodiment, coverage analyzer 21, for each access element (AP_i) (102), compares the signal strength detected by the access element from all other access elements (AP_j) in the matrix (104) against a coverage threshold. For example, in one embodiment, coverage analyzer 21 determines whether the signal strength, S_{ij}, detected by AP_i, is greater than a coverage threshold of -85 dBm (106). As FIG. 4 illustrates, coverage analyzer 21 also determines whether AP_i, and AP_j, operate on the same channel (108) and whether a coverage hole has been detected as to AP_i, (110). Assuming all conditions are met, coverage analyzer 21 then reduces the transmit power, or **generates an instruction to reduce the transmit power, for AP_i, and AP_j** (114, 118), if the transmit power for AP_i, and/or AP_j, have not already been reduced during this analysis loop (112, 116).

Ex.1005, 12:19-47, FIG. 4. It would have been obvious to a POSITA for the instruction to be received by the access elements, so that the transmit power is

reduced to optimize network performance, per Hills' objective. Ex.1005, 2:29-44, 5:25-30.

169. Nevertheless, to the extent argued that Hills' is insufficient, Calhoun (which is in the same patent family as Hills) discloses that the access element "receives information...to control its operation," including "control of the transmit power" from the central management device.

Similarly, referring to FIG. 3, the access element 12 receives information via a Ethernet control and information packet 60 having an Ethernet 802.3 header 61 from the central control element 24 to control its operation, including but not limited to, selection of a radio channel for operation (local RF field 62), control of the transmit power of the radio (local RF field 62), and configuration of the WLAN parameters (WLAN field 64) and WLAN protocol frames to be transmitted 66, including, wireless LAN information control (802.11 frame 68) encapsulated with a payload 70.

Ex.1011, 3:37-51. In view of Calhoun, it would have been obvious to have Hills' central management device (which is configured to communicate with the access elements) to transmit the instructions to each of the access elements that are on the same floor and operate on the same channel, so that the power is reduced, thereby achieving Hills' goal of minimizing interference. Ex.1005, 8:26-29, 12:19-21.

170. As noted above in the Claim Construction section, the corresponding structure of the "*an output adjustment requester*" is "hardware or executable

software in a storage medium.” It would have been obvious to a POSITA for Hills’ central management device to be implemented with executable software stored in memory for transmitting an instruction to adjust output power to each of the access elements, at least because Hills discloses that it “can be configured to **execute** the coverage analysis functionality at regular, configurable intervals.” Ex.1005, 5:55-57.

171. To the extent argued that Hills’ disclosure is not sufficient to disclose the corresponding structure, Wang discloses that the device that calculates the power adjustment “can be implemented in hardware or by means of software plus necessary general-purpose hardware platforms.” Ex.1006, 21. Wang, for example, provides “**a software product, which can be stored in a non-volatile storage medium** (such as a CD-ROM, USB flash drive, external hard drive, etc.) and comprises several instructions to cause **a computer device (such as a personal computer, server, or network device, etc.) to execute** the methods described in the various embodiments of the present invention.” Ex.1006, 21.

172. In view of Wang’s teachings, a POSITA would have found it obvious for Hills’ central management device to be implemented with executable software stored in non-volatile storage medium to enable the central management device to perform the disclosed functionality. Such an implementation would facilitate transmitting an instruction to adjust output power to each of the access elements

thereby “minimizing the coverage overlaps of access elements operating on the same channel.” Ex.1005, 12:19-21; *see also* analysis at VII.A.3.

173. Accordingly, because Hills in combination with Wang discloses that the central management device includes software in a storage medium that when executed is configured to transmit instructions to reduce transmit power to each of the access elements that are located on the same floor and use the same channel, the prior art renders obvious “*an output adjustment requester configured to transmit an output strength adjustment request to each of the grouped wireless access points.*”

174. Second, the prior art combination renders obvious that “*the output strength adjustment request [is] related to adjusting a current output strength value based on the corrected output strength value.*”

175. As discussed at [1.4.2], in the combination of Hills and Wang, the central management device seeks to decrease access elements’ power in accordance with a computed optimal transmit power (e.g., P-after) (“*the corrected output strength value*”).

Step S707: **The AC decreases AP power.** Assume the power of the AP before adjustment is P-before, and **the power of the AP after adjustment is P-after.** The algorithm for reducing AP power by AC is as follows:

$$P\text{-after} = P\text{-before} - (\text{RSSI-nth-RSSI-threshold}).$$

Ex.1006, 18.

176. In the proposed combination with Calhoun, the instructions to reduce transmit power (“*the output strength adjustment request*”) are related to setting transmit power levels at the access elements based on the optimal transmit power (e.g., P-after) (“*the corrected output strength value*”).

As FIG. 4 illustrates, in one embodiment, coverage analyzer 21, for each access element (AP_i) (102), compares the signal strength detected by the access element from all other access elements (AP_j) in the matrix (104) against a coverage threshold. For example, in one embodiment, coverage analyzer 21 determines whether the signal strength, S_{ij} , detected by AP_i , is greater than a coverage threshold of -85 dBm (106). As FIG. 4 illustrates, coverage analyzer 21 also determines whether AP_i , and AP_j , operate on the same channel (108) and whether a coverage hole has been detected as to AP_i , (110). Assuming all conditions are met, coverage analyzer 21 then reduces the transmit power, or **generates an instruction to reduce the transmit power, for AP_i , and AP_j** (114, 118), if the transmit power for AP_i , and/or AP_j , have not already been reduced during this analysis loop (112, 116).

Ex.1005, 12:33-47, FIG. 4.

The central control element 24 utilizes the additional information encapsulated in the Ethernet frame with the WLAN protocol frame to perform calculations to...make decisions ... include assigning radio channels useable under the 802.11 standard to access elements, **setting transmit power levels at the access elements.**

Ex.1011, 3:61-4:11.

177. Accordingly, because in the combination of Hills, Wang, and Calhoun the instructions to reduce transmit power are related to setting transmit power levels at the access elements based on the optimal transmit power (e.g., P-after), the prior art renders obvious “*the output strength adjustment request being related to adjusting a current output strength value based on the corrected output strength value,*” as recited in the claim.

4. Claim 11

- b. [11.0] *A method for controlling an output strength value of a wireless access point by a device for controlling the wireless access point, the method comprising:*

178. To the extent limiting, Hills discloses “[a] method for controlling an output strength value of a wireless access point,” by teaching a “**method... facilitating configuration of transmit power...of wireless access points.**”

Ex.1005, 1:19-24; *see also* Ex.1005, 2:39-44, 12:4-14:60, FIGS. 3, 4, 5, 6A, 6B.

179. Further, consistent with the analysis at [1.0], Hills discloses that its method is performed “*by a device for controlling the wireless access point*” because Hills’ “**central management device**” (e.g., coverage analyzer 21 and central control element 24) controls transmit power level, as well as authentication, load, channel, handoff, etc., of the wireless access points (also referred to by Hills

as “access elements” or “APs”). Ex.1005, 5:26-35, 6:26-7:3, Claims 1, 10, 11, Abstract, FIGS. 1, 2A, 2B.

c. [11.1.1] *(a) setting a channel for communication, searching for neighboring wireless access points, and*

180. Hills renders obvious this element.

181. First, Hills discloses “*setting a channel for communication*” by teaching that the access elements, when operating in scan mode to monitor wireless communication, use an initial frequency channel and then switch to another frequency channel.

In one embodiment, **the access elements each include a scanning daemon** that, when invoked at each scanning interval, switches operation of the access element to coverage scan mode. For a scanning period, **the scanning daemon monitors for wireless traffic on a given frequency channel and records scan data characterizing any packets detected on the channel. The scanning daemon, in one embodiment, monitors wireless traffic on a given channel and then switches to another frequency channel.** The scanning daemon can operate in a variety of manners during the scanning period. For example, the scanning daemon can monitor for wireless traffic on a single frequency channel for the entire scanning period and switch to another frequency channel in a subsequent scanning period. Alternatively, the scanning daemon can scan a plurality of frequency channels during a given scan period. In addition, the scanning daemon can be configured to transmit the coverage scan data directly to a central

repository, such as coverage analyzer 21, or store it locally for later transmission in response to a request from the coverage analyzer 21.

Ex.1005, 3:61-4:33. A POSITA would have understood that for the access element to “monitor[] wireless traffic on a given channel,” that channel has been set for wireless communication and when the access element “switches to another frequency channel,” that other channel has been set for wireless communication.

182. Second, Hills discloses “*searching for neighboring wireless access points*” by teaching that, in scanning mode, the access elements scan their areas for neighboring wireless access elements.

The access elements feature a coverage scanning mode, according to which the access elements monitor their respective coverage areas for wireless traffic associated with neighboring access elements and clients and record data associated with the signal associated with the wireless traffic, such as signal strength. The coverage data can be transmitted to a central management device, such as the coverage analyzer 21 (FIG. 1) or central control element 24 (see description below and FIGS. 2A and 2B) for processing.

Ex.1005, 2:52-60.

183. Accordingly, setting a frequency channel for wireless communication and scanning for neighboring wireless access elements, as Hills describes, renders obvious “*setting a channel for communication, searching for neighboring wireless access points,*” as recited in the claim.

- d. [11.1.2] *transmitting information on the wireless access point and the searched neighboring wireless access points to the device for controlling the wireless access point,*

184. First, as discussed at [11.0], Hills discloses a central management device that controls the wireless access element, which corresponds to “*the device for controlling the wireless access point.*”

185. Second, consistent with the analysis at [1.1.2], Hills discloses that in response to a request, the access elements transmit “coverage scan data” to the central management device, which “receives coverage scan data from the access elements” and stores it in access element tables or other data structure. Ex.1005, 4:14-61, 5:26-39, 6:57-7:3. Furthermore, consistent with the analysis at [1.1.2], it would have been obvious to a POSITA for the access elements to transmit “positional” data (which is obtained with a GPS receiver) to the central management device, because Hills teaches that the positional data is included in the access point tables and used when determining transmit power. Ex.1005, 13:36-14:60.

186. The coverage scan data and positional data, collectively, correspond to “*information on the wireless access point and the searched neighboring wireless access points*” because the data includes information on both the wireless element and on the neighboring wireless element.

During the scan, the scanning daemon monitors for packets on a given channel, parsing the packets and recording information about the packets in a data structure ...**the MAC addresses of the source and destination stations...The coverage scan data fields can include MAC address, SSID, frequency channel and any other information available from 802.11 frame headers, as well as an indicator of the strength of the detected signal associated with the packet** (see below). ... The access elements, such as access elements 12, 14, include functionality allowing for detection of the strength of the received signals....The 802.11 protocol specifies an optional parameter, the receive signal strength indicator (RSSI).... **The access elements 12, 14 include the detected signal strength value associated with a packet in the coverage scan table.** In one embodiment, the scan data fields can also include a time stamp indicating when the packet was detected.

Ex.1005, 4:4-5:25.

As discussed above, the dynamic transmit power functionality may also take location information into account. In one embodiment, the access point table includes **positional coordinates of each access element and further includes a z-axis dimension such as floor height or level**, which can be...determined automatically through known components, such as a Global Positioning System (GPS) receiver... As FIG. 6A shows, coverage analyzer 21, in one embodiment, for all access elements AP_i , (302), uses the **positional parameters associated with the access elements** to determine whether the current access element AP_i , includes a neighboring access element within a threshold distance in a given quadrant, Q (304, 306). In one embodiment, a

neighboring access element is an access element within a threshold distance and on the same floor as the current access element AP.

Ex.1005, 13:23-44.

187. Because Hills transmits coverage scan data and positional data includes information on both the wireless access element (performing the scan) and information on the neighboring access elements (being scanned) to the central management devices, Hills renders obvious “*transmitting information on the wireless access point and the searched neighboring wireless access points to the device for controlling the wireless access point,*” as recited in the claim.

e. [11.1.3] wherein the setting, searching and transmitting is performed by the wireless access point;

188. Consistent with the analysis at [11.1.1]-[11.1.2], Hills’ access element sets the frequency channel, scans for neighboring access elements, and transmits coverage scan and positional data, which renders obvious that “*the setting, searching and transmitting is performed by the wireless access point,*” as recited in the claim.

f. [11.2.1] (b) grouping wireless access points using a same channel,

189. Consistent with the analysis at [1.1.1], Hills’ central management device groups access elements located on the same floor that operate on the same channel, which renders obvious “*grouping wireless access points using a same channel,*” as recited in the claim.

- g. [11.2.2] *based on the information on the wireless access point and the neighboring wireless access points received from the wireless access point,***

190. Consistent with the analysis at [1.1.2], Hills’ grouping is based on coverage scan and positional data received from the wireless access elements, which renders obvious that the grouping is “*based on the information on the wireless access point and the neighboring wireless access points received from the wireless access point,*” as recited in the claim.

- h. [11.2.3] *the grouping being performed by the device for controlling the wireless access point;***

191. Consistent with the analysis at [11.2.1], Hills’ central management device performs the grouping, which renders obvious “*the grouping being performed by the device for controlling the wireless access point,*” as recited in the claim.

- i. [11.3.1] *(c) determining whether interference has occurred between the grouped wireless access points and transmitting the determination to the device for controlling a wireless access point,***

192. First, as analyzed at [11.0], Hills’ central management device corresponds to “*the device for controlling a wireless access point.*” Further, as analyzed at [11.2.1], Hills discloses grouping access elements located on the same floor that operate on the same channel, which correspond to “*the grouped wireless access points.*”

193. **Second**, consistent with the analysis at [1.3.2], Hills discloses that its access elements operate in accordance with 802.11 protocol and collect interference information that is transmitted to the central management device for processing. Ex.1005, 3:49-52 (“The access elements can operate in connection with any suitable wireless communications protocol, including 802.11a and 802.11b.”), 6:59-62, (“[T]he central control element 24 may for example process information collected at the access elements 12, 14...[including] interference.”). Because Hills’ access elements operate in accordance with 802.11 protocol, it would have been obvious to a POSITA for the collected interference information to indicate the level of interference present on a channel. Ex.1010, 122 (“The RPI histogram report provides an additional mechanism for a [access point] to **gather information on the state of a channel... to assess the general level of interference present on a channel.**”). Accordingly, the combination of Hills and Wang discloses assessing the general level of interference on a channel between access elements on the same floor that operate on the same channel and that the interference information is transmitted to the central management device, the prior art renders obvious “*determining whether interference has occurred between the grouped wireless access points and transmitting the determination to the device for controlling a wireless access point,*” as recited in the claim.

- j. **[11.3.2] *the determining and the transmitting the determination being performed by the grouped wireless access points;***

194. Consistent with the analysis at [11.3.1], the assessing and the transmitting are performed by the access elements on the same floor that operate on the same channel, which renders obvious “*the determining and the transmitting the determination being performed by the grouped wireless access points,*” as recited in the claim.

- k. **[11.4.1] *(d) computing a corrected output strength value for reducing the interference and***

195. Consistent with the analysis at [1.4.1], Hills in combination with Wang discloses that the central management computes an optimal transmit power (e.g., P-after) for reducing the interference, which renders obvious “*computing a corrected output strength value for reducing the interference,*” as recited in the claim.

- l. **[11.4.2] *transmitting the corrected output strength value to the grouped wireless access points,***

196. Consistent with the analysis at [2.0], Hills in combination with Wang, and Calhoun discloses transmitting to the access elements that are on the same floor and operate on the same channel instructions to reduce transmit power based on the optimal transmit power (e.g., P-after), which renders obvious “*transmitting the corrected output strength value to the grouped wireless access points,*” as recited in the claim.

- m. **[11.4.3] *the computing and the transmitting the corrected output strength being performed by the device for controlling the wireless access point; and***

197. Consistent with the analysis at [1.4.1] and [11.4.2], Hills in combination with Wang, and Calhoun discloses the central management performs the computing and the transmitting of the instructions to reduce transmit power based on the optimal transmit power (e.g., P-after), which renders obvious “*the computing and the transmitting the corrected output strength being performed by the device for controlling the wireless access point,*” as recited in the claim.

- n. **[11.5.1] *(e) adjusting a current output strength value based on the corrected output strength value,***

198. As discussed at [1.4.2] and [11.4.3], Hills in combination with Wang discloses computing an optimal transmit power (e.g., P-after), which corresponds to “*the corrected output strength value.*” Further, as discussed at [2.0] and [11.4.3], Hills in combination with Wang and Calhoun discloses transmitting to the access elements instructions to reduce transmit power based on the optimal transmit power (e.g., P-after).

199. It would have been obvious to a POSITA, when implementing the combination of Hills, Wang, and Calhoun, for each access element to reduce transmit power based on the computed optimal transmit power (e.g., P-after), in accordance with the instruction, to thereby minimize interference and improve network performance. Ex.1005, 2:36-38 (“...many WLANs do not perform at

optimum speed due to overlapping coverage areas and channel interference.”),
12:44-45 (“FIG. 4 illustrates a method directed to minimizing the coverage overlaps
of access elements operating on the same channel. ... coverage analyzer...generates
an instruction to **reduce the transmit power, for AP_i, and AP_j...**”); Ex.1006, 9
 (“The present invention provides a power adjustment method and device for an
access point (AP), which automatically **adjusts the power in real time in a
wireless environment to reduce network interference and improve system
throughput.**”).

200. Accordingly, because in the combination of Hills, Wang, and Calhoun,
it would have been obvious for access elements on the same floor that operate on
the same channel, in response to a central management device’s instructions, to
reduce a current transmit power based on the optimal transmit power (e.g., P-after),
the prior art renders obvious “*adjusting a current output strength value based on the
corrected output strength value,*” as recited in the claim.

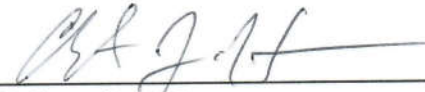
- o. [11.5.2] *the adjusting being performed by the grouped wireless access points.***

201. Consistent with the analysis at [11.2.1] and [11.5.1], access elements
on the same floor that operate on the same channel adjust the transmit power in
response to received instructions, which renders obvious that “*the adjusting being
performed by the grouped wireless access points,*” as recited in the claim.

IX. DECLARATION

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

Date: January 6, 2024



Christopher Hansen