

Petition for *Inter Partes* Review of
U.S. Patent No. 11,770,313 B2

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

Charter Communications, Inc.,
Petitioner

v.

Adaptive Spectrum and Signal Alignment, Inc.,
Patent Owner

Case No. IPR2025-00013

U.S. Patent No. 11,770,313 B2

Filing Date: November 23, 2020
Issue Date: September 26, 2023

Title: METHOD, APPARATUS, AND SYSTEM FOR OPTIMIZING PERFORMANCE OF A
COMMUNICATION UNIT BY A REMOTE SERVER

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OF U.S. PATENT NO. 11,770,313 B2**

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List of Exhibits

Exhibit No.	Description of Document
1001	U.S. Patent No. 11,770,313 B2 to Wonjong Rhee (Application filed November 23, 2020, issued September 26, 2023)
1002	Declaration of Dr. James Martin
1003	U.S. Patent No. 7,408,907 B2 to Neil Diener (Application filed August 15, 2003, issued August 5, 2008)
1004	U.S. Patent Application Publication No. 2012/0320768 A1 to Shmuel Shaffer, et al. (Application filed June 20, 2011, issued December 20, 2012)
1005	<i>Adaptive Spectrum and Signal Alignment, Inc. v. Charter Communications, Inc.</i> , No. 2:24-cv-00124 (E.D. Tex.), Amended Complaint
1006	'313 Patent File History
1007	<i>Adaptive Spectrum and Signal Alignment, Inc. v. Charter Communications, Inc.</i> , No. 2:24-cv-00124 (E.D. Tex.), Docket Control Order
1008	Docket Navigator – Time to Milestones for the Eastern District of Texas, <i>available at</i> https://search.docketnavigator.com/patent/court/222/14
1009	Docket Navigator – Time to Milestones for the District of Colorado, <i>available at</i> https://search.docketnavigator.com/patent/court/10/14
1010	IEEE Std. 802.11n-2009™ (Amendment to IEEE Std. 802.11™, 1999 Edition (Reaff 2003))
1011	U.S. Patent No. 5,699,365 to Jeffrey T. Klayman, et al. (Application filed March 27, 1996, issued December 16, 1997)

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Exhibit No.	Description of Document
1012	U.S. Patent No. 6,477,669 to Anil K. Agarwal, et al. (PCT Application filed July 15, 1998, issued November 5, 2002)
1013	U.S. Patent No. 7,809,996 John M. Cioffi (Application filed August 4, 2008, issued October 5, 2010)
1014	F. Peng, J. Zhang, and W. Ryan, “Adaptive Modulation and Coding for IEEE 802.11n”, IEEE (2007)
1015	Y. Song, X. Zhu, Y. Fang, and H. Zhang, “Threshold Optimization for Rate Adaptation Algorithms in IEEE 802.11 WLANs,” IEEE Transactions on Wireless Communications, Vol. 9 No. 1 (Jan. 2010)
1016	H. Jung, K. Cho, Y. Seok, T. Kwon, and Y. Choi, “RARA: Rate Adaptation Using Rate-adaptive Acknowledgment for IEEE 802.11 WLANs,” IEEE (2008)
1017	S. Wong, H. Yang, S. Lu, and V. Bharghavan, “Robust Rate Adaptation for 802.11 Wireless Networks,” ACM (Sept. 23-26, 20006)
1018	Cisco Enterprise Wireless, Intuitive Wi-Fi Starts Here, CISCO E-Book
1019	Cisco Spectrum Expert Users Guide, Software Release 4.0, CISCO Systems, Inc. (Dec. 2010)
1020	Cisco CleanAir Technology: Intelligence in Action, White Paper, CISCO (2010)
1021	’313 Patent Claim Listing
1022	U.S. Patent No. 8,467,369 to L.W. Yonge, et al. (Application filed June 4, 2008, issued June 18, 2013)
1023	ETSI TX 136 300 V9.3.0 Technical Specification (3GPP TS 36.300 Version 9.3.0 Release 9) (April 2010)

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Exhibit No.	Description of Document
1024	IEEE Std. 802.11g™-2003 (Amendment to IEEE Std. 802.11™, 1999 Edition (Reaff 2003))
1025	U.S. Patent No. 10,848,398 to Wonjong Rhee (PCT application filed Nov. 10, 2011, issued Nov. 24, 2020)

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I. INTRODUCTION

Petitioner Charter Communications, Inc. (“Petitioner”) respectfully submits this Petition for *Inter Partes* Review of claims 1-23 (the “Challenged Claims”) of U.S. Patent No. 11,770,313 (the “’313 patent”) (EX1001). Petitioner requests institution of *Inter Partes* Review (“IPR”) and a finding that the Challenged Claims are unpatentable.

II. MANDATORY NOTICES UNDER 37 CFR § 42.8(A)(1)

A. Real Parties-In-Interest under § 42.8(b)(1)

Petitioner and Plume Design, Inc. are the real parties-in-interest to this IPR petition.

B. Related Matters under § 42.8(b)(2)

The ’313 patent is asserted in pending litigation involving Petitioner and Patent Owner, *Adaptive Spectrum and Signal Alignment, Inc. v. Charter Communications, Inc., et al.*, Case No. 2:24-cv-00124 (E.D. Tex.). The amended complaint in the related case, in which the ’313 patent was first asserted, was first served on Petitioner on July 1, 2024. (EX1005). The ’313 patent is a continuation of U.S. Patent No. 10,848,398 (the “’398 patent”) which is also asserted in the litigation. EX1025. Petitioner has concurrently filed an IPR petition challenging the ’398 patent, IPR2025-00012. There are no other known related cases involving Patent Owner and the ’313 patent.

C. Lead and Back-Up Counsel under § 42.8(b)(3)

Petitioner provides the following designation of counsel.

LEAD COUNSEL	BACK-UP COUNSEL
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	Edward Wang <i>Pro hac vice</i> (application to be filed) ewang@proskauer.com Proskauer Rose LLP 1001 Pennsylvania Ave., NW Suite 600 Washington, DC 20004 Tel: (202) 416-6800

D. Service Information under § 42.8(b)(4)

This Petition is being served by Federal Express to the attorneys of record for the '313 patent, Michael North, Chung Park, Donald Gibson, and Xin Dai at

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North Weber & Baugh, 3260 Hillview Ave., Palo Alto, CA 94304 and 228

Hamilton Ave., 3rd Floor, Palo Alto, CA 94301. Petitioner consents to and prefers electronic service at the addresses provided above for lead and back-up counsel.

III. FEE PAYMENT UNDER 37 CFR § 42.103

Petitioner requests review of twenty-three claims, with a \$44,875 payment.

IV. REQUIREMENTS UNDER 37 CFR §§ 42.104 AND 42.108

A. Grounds for Standing

Petitioner certifies the '313 patent is IPR eligible and Petitioner is not barred or otherwise estopped.

B. Identification of Challenge and Statement of Precise Relief Requested

Petitioner requests the Board institute IPR of claims 1-23 based on:

Ground	'313 Patent Claim	Basis for Challenge under 35 U.S.C.	Application of Prior Art
1	1-23	§ 103	Diener
2	1-23	§ 103	Diener in view of Shaffer

Submitted herewith is the Declaration of James Martin, Ph.D. ("Martin") (EX1002), a qualified technical expert.

C. Considerations Under 35 U.S.C. § 325(d)

This Petition does not present "the same or substantially the same prior art or arguments previously were presented to the Office." 35 U.S.C. §325(d). At application submission, the examiner rejected the claims under 35 U.S.C. §112(b),

§102 as anticipated by U.S. Patent No. 5,970,064 (Clark) which disclosed a remote server comprising three interfaces, and §103 as obvious over Clark in view of additional references. (EX1006-2, 441-454). In response, applicant amended claims and argued the identified prior art references did not disclose multiple, different interfaces. (*Id.*, 355-364). At final rejection, the examiner disagreed with applicant's reasoning and concluded the claimed "interfaces" could refer to the same device. (*Id.*, 299-314). The examiner reaffirmed in an Advisory Action. (*Id.*, 268-270).

Applicant filed an RCE, restating that the claims require three distinct interfaces. (*Id.*, 259-267). This argument was rejected, by the examiner noting that dependent claim 18 explicitly allows two of the three interfaces to be the same. (*Id.*, 1-16). To overcome the rejection, applicant amended claim 1 to state: "the first, second, and third interfaces being different from each other." (EX1006-1, 145). The examiner explained that Clark was still prior art to the extent that it disclosed multiple switches which would each have a distinct interface. (*Id.*, 128-130). The examiner noted that the recited interfaces cannot be on different communication units because they must be coupled to a memory that stores the collected data. (*Id.*).

To get around the prior art, applicant removed its prior amendment and amended claim 1 to require "in response to the processor determining a change in

performance in at least one of the first network or the second network” transmitting the policy to the first communication unit. (*Id.*, 119). The examiner concluded that, for the same reasons that the prior art did not disclose already-allowed claim 19, it did not disclose claim 1. (*Id.*, 124). The claims were allowed on May 2, 2023. (*Id.*, 70).

The prior art references identified in this Petition were never discussed nor analyzed during prosecution of the ’313 patent. Neither reference is listed on the face of the ’313 patent. None of the other cited prior art references, discussed in this Petition to evidence the state of the art at the time of invention, were discussed or analyzed during prosecution.

D. The Board Should Not Exercise its Discretion Under 35 U.S.C. § 314(a) to Deny Institution

The Challenged Claims are asserted by Patent Owner in parallel district court litigation. In *Apple v. Fintiv* (Paper 11), the Board issued precedential guidance on six non-dispositive factors to be considered when there is a co-pending district court litigation (“*Fintiv* Factors”). Taken together, these factors weigh against exercising discretion to deny institution.

***Fintiv* Factor 1: Whether the court granted a stay or evidence exists that one may be granted if the proceeding is instituted.** Petitioner has not moved for a stay in the co-pending litigation; therefore, *Fintiv* Factor 1 is neutral. *See Sotera*

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Wireless, Inc. v. Masimo Corp., IPR2020-01019 (Paper 12) (PTAB Dec. 1, 2020)
at 14; *Sand Revolution II, LLC v. Continental Intermodal Grp. Trucking LLC*,
IPR2019-01393 (Paper 24) (PTAB June 16, 2020). As noted in *Fintiv* Factor 4,
Petitioner stipulates it will not pursue any invalidity references relied on in this
Petition in the co-pending litigation.

***Fintiv* Factor 2: Proximity of the court’s trial date to the Board’s
projected statutory deadline for a final written decision.** The co-pending
litigation is in its early stages and, at the time of filing this Petition, Plaintiff has
only served infringement contentions and Petitioner’s motion to transfer the co-
pending litigation to the District of Colorado is pending. The parties have not
engaged in any other written discovery, depositions, nor begun claim construction.
According to the Court’s Docket Control Order, a *Markman* hearing is set for
March 19, 2025 and trial is currently set for September 22, 2025. (EX1007).
However, as indicated in Petitioner’s Motion to Transfer, both the Eastern District
of Texas and District of Colorado have median times-to-trial that indicate a trial
date may not be until early 2026 to early 2027. (EX1008-1009). The projected
statutory deadline for a final written decision is in April 2026. Thus, given the
pending venue decision which may affect case deadlines and based on the Courts’
median times-to-trial, this factor is neutral.

***Fintiv* Factor 3: Investment in the parallel proceedings by the court and the parties.** This factor weighs in favor of not exercising discretion to deny institution. The district court case is in its early stages and the claim construction hearing will not occur until March 2025. (EX1007). Indeed, the most fact-intensive work (fact and expert discovery), substantive issues (e.g., claim construction), and dispositive decisions (summary judgment and trial) have not yet begun in the co-pending litigation. *See, e.g., Juniper Networks, Inc. v. Huawei Digit. Techs. (Cheng Du) Co.*, IPR2020-01130, Paper 13 at 13 (Jan. 22, 2021); *Sand Revolution II*, IPR2019-01393, Paper 24 at 11. The district court has expended minimal resources to this case.

Where, as here, “the evidence shows that the petitioner filed the petition expeditiously, such as promptly after becoming aware of the claims being asserted, this fact has weighed against exercising discretion to deny institution.” *Fintiv, Inc.*, IPR2020-00019 (Paper 11) at 10-11. Petitioner was not made aware of Patent Owner’s intent to assert the ’313 patent against Petitioner until late June 2024 and was served with infringement contentions—identifying the asserted claims—on June 28, 2024. This Petition was filed approximately 17 weeks after that date. Thus, Petitioner was “reasonably diligen[t]” in filing this Petition under Factor 3 which weighs against exercising discretion. *See Peloton Interactive, Inc. v. iFit, Inc.*, IPR2022-00029 (Paper 13) at 45 (Apr. 22, 2022) (determining that filing a

Petition within 10 weeks after Patent Owner informed petitioner of the claims being asserted “show[s] reasonable diligence that weighs against discretionary denial”) ”); *Apple Inc. v. Jawbone Innovations, LLC*, IPR2022-01084 (Paper 9) at 18-19 (Dec. 16, 2022) (concluding factor 3 weighs against discretionary denial where Petitioner waited four months to file the Petition after being served with infringement contentions containing the asserted claims); *cf. Comcast Cable Communications, LLC v. Touchstream Technologies, Inc.*, IPR2024-00324 (Paper 13) at 11-12 (July 24, 2024) (determining that waiting 7 months after learning of asserted claims is too long of a delay in filing the Petition, but still instituting on other grounds).

***Fintiv* Factor 4: Overlap between issues raised in the petition and the parallel proceeding.** This factor weighs in favor of not exercising discretion to deny institution. If this Petition is instituted, Petitioner will not pursue the invalidity references relied on in the Petition in the district court litigation. *See generally Sand Revolution II, LLC*, IPR2019-01393 (Paper 24).

***Fintiv* Factor 5: Whether the petitioner and the defendant in the parallel proceedings are the same party.** Petitioner is the defendant in the parallel proceeding; however, this factor alone should not be dispositive. *See Sand Revolution II, LLC*, IPR2019-01393 (Paper 24), at 12-14, 57.

***Fintiv* Factor 6: Other circumstances that impact the Board's**

discretion, including the merits. This Petition presents a strong case for invalidity of the '313 patent. Director Vidal's Interim Guidance, dated June 21, 2022, indicated that the Board would not exercise discretion to deny institution where a petition presents compelling evidence. The claims at issue are broad and rendered obvious by the asserted grounds. Where, as here, a strong case for anticipation and/or obviousness is presented, this factor weighs in favor of not exercising discretion to deny institution. *See Fintiv, Inc.*, IPR2020-00019 (Paper 11), at 14-16; *Sand Revolution II, LLC*, IPR2019-01393 (Paper 24), at 12-14, 57.

Thus, *Fintiv* factors 3-4 and 6 weigh in favor of not exercising discretion to deny institution, factors 1-2 are neutral, and only factor 5 favors denying institution. Together, the factors weigh in favor of not exercising discretion to deny institution and the merits of this Petition warrant consideration.

V. TECHNICAL BACKGROUND AND STATE OF THE ART

The '313 patent pertains to: (1) a centralized communications system utilizing communication units and a remote server to acquire performance information; and (2) generic algorithms relating to adaptation. (EX1002 ¶¶27-29). Adaptation involves inputting performance data into an algorithm to result in an actionable output (i.e., the adaptation) which communicates modifications and transmission control strategies to communication units within the system network.

(*Id.* ¶31). Adaptation is used in communications systems that serve numerous end users and, by 2011, network standards (e.g., IEEE 802.11 Wi-Fi, 3GPP 3G/4G, ISO DSL, CableLabs DOCSIS 3.0) reflected these technologies. (*Id.*).

The exemplary “Adaptation Algorithm” in the ’313 Patent is a well-known “rate adaptation algorithm” which involves observing channel conditions and adapting transmission modulation and coding to optimal settings (e.g., highest permitted bit rate). (*Id.* ¶32). The concept of a rate adaptation algorithm such as this was well-known and disclosed in prior art. (*See, e.g.*, EX1010-1013). Indeed, the ’313 patent identifies the IEEE 802.11g standard as disclosing a “rate adaptation algorithm[] implemented in the WiFi communication system” which “uses real-time data.” EX1001 at 1:58-62. As Dr. Martin explains, determining “optimal rate adaptation is one of the most widely researched topics in the related academic literature between 2000-2011.” (EX1002 ¶35; EX1014-1017). To optimize communications between a base station (e.g., an Access Point (AP)) and a communications device (corresponding to a Wi-Fi device or station) those in the field have used either closed-loop or open-loop methodologies. (EX1002 ¶¶35-37).

Also by 2011, it was known to manage performance of the base stations and associated communications devices. (*Id.* ¶38). This includes monitoring spectrum conditions at a central controller which receives data and create decisions regarding how to best manage and/or spectrum. (*Id.*). Examples of spectrum

management across multiple base stations and communications devices—including across multiple networks—include: load balancing, channel reallocation, link level adaptations, altering communications parameters, and selecting new algorithms. (*Id.*; *see also* EX1018-1020).

VI. OVERVIEW OF THE '313 PATENT

A. Level of Ordinary Skill in the Art

A person of ordinary skill in the art as of November 10, 2011 (“POSITA”) would have possessed at least a bachelor’s degree in electrical engineering, or related field, with at least two years of experience with transmission optimization techniques in the field of DSL, cable, or wireless communication systems. Additional education could compensate for less practical experience and vice versa. (EX1002 ¶64).

B. Priority Date

The '313 patent claims the benefit of Application No. PCT/US2011/060265 filed on November 10, 2011. (EX1001). Petitioner uses November 10, 2011 as the priority date for the purposes of this Petition, but does not concede that the Challenged Claims are entitled to that date.

C. Specification

The '313 patent is directed to optimizing performance of communication unit(s) via a remote server. (EX1001, Abstract). The disclosed system includes one

or more communication units and a remote server with, memory, processor, and may include a network interface “to communicate with” other devices. (*Id.*, Abstract, 16:36-42, Fig. 6). The specification acknowledges “exemplary prior art communication system[s]” including access points connected to wireless stations similar to the system recited in the ’313 patent. (*Id.*, 1:33-39). An exemplary prior art system is depicted in Figure 1:

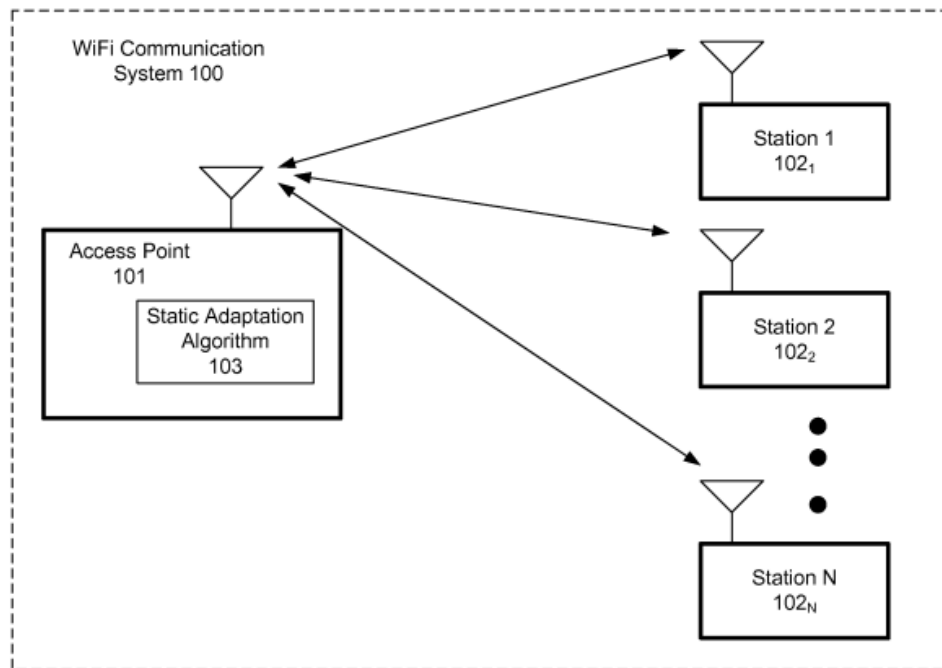


FIG. 1 (prior Art)

(*Id.*, Fig. 1).

According to the specification, the inventions of the ’313 patent improve upon prior art systems by analyzing data and providing rules and conditions based on that data to improve system performance. (*Id.*, 4:65-5:2, 5:25-31). The ’313

patent teaches a “dedicated server” which collects this data and provides the rules and conditions to the communication units for execution. (*Id.*, 5:31-41, 8:52-57).

Thus, the disclosed system is “similar to the communication system of FIG. 1, but is operable to communicate with [a] remote server 204 (interchangeably referred to as an optimization center),” as depicted in Figure 2:

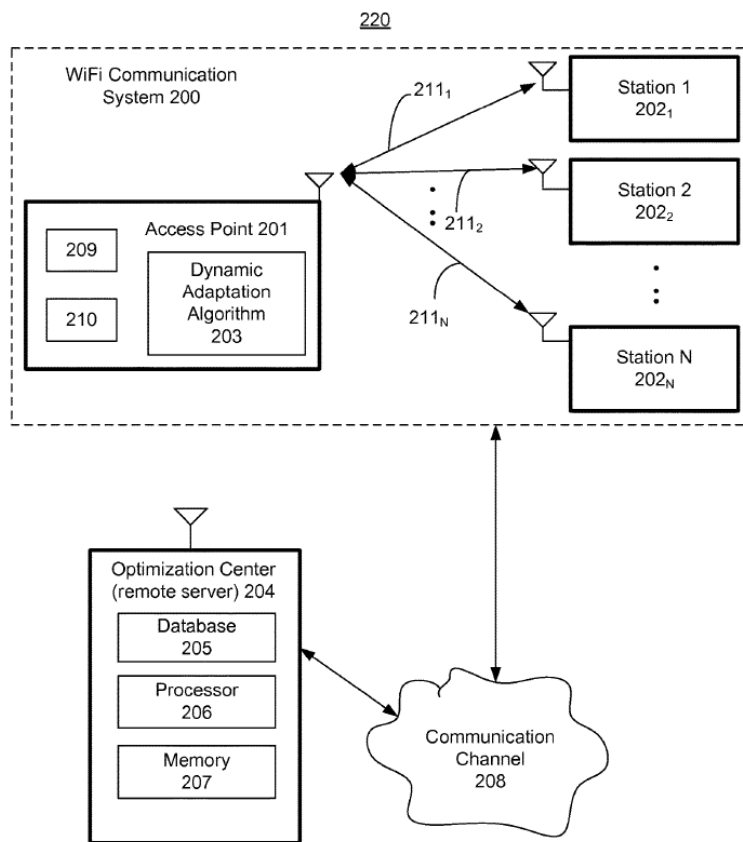


FIG. 2

(*Id.*, Fig. 2, 6:37-41). This disclosed system is not “limited to DSL or WiFi communication systems, but appl[ies] to any communication system that needs to run/execute adaptation algorithms . . . to cope with real-time variations in link channel, noise, interference, and other factors that affect communication

performance.” (*Id.*, 11:37-42). The ’313 patent also teaches an embodiment where the remote server determines the presence of an interference condition and, accordingly, communicates, where applicable, the optimum algorithm to be used by the communication units. (*Id.*, 10:57-11:3).

The disclosed method includes: (1) collecting operational and/or performance data from communication unit(s); (2) generating a policy for those communication units based on the collected data; and (3) sending the policy to the communication units which implement those policies based on the data. (*Id.*, 14:63-15:47). This method is depicted in Figure 4:

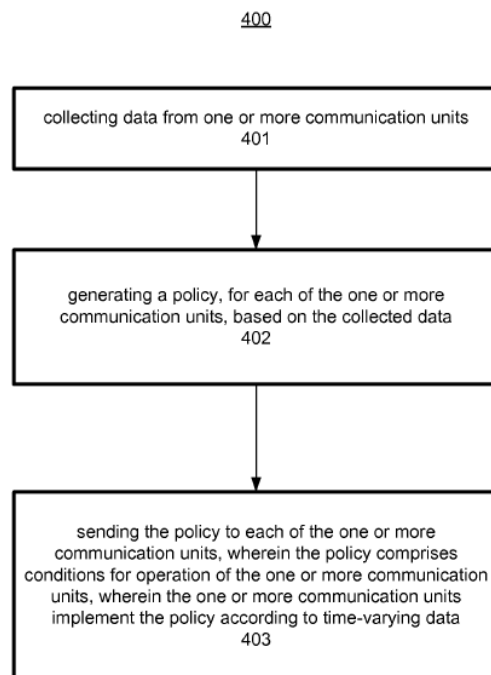


FIG. 4

(*Id.*, Fig. 4).

D. The Challenged Claims

This Petition challenges claims 1-23 of the '313 patent.

E. Claim Listing

Exhibit 1021 is a claim listing enumerating each claim element. Bracketed notations (e.g., [a], [b], etc.) are used to refer to individual elements.

VII. CLAIM CONSTRUCTION

Petitioner does not believe any claim constructions are required and interprets the claims at issue in accordance with their ordinary and customary meanings to the extent possible. 37 C.F.R. §41.100(b). To be clear, Petitioner is not suggesting that there are no disputes regarding claim scope, including with respect to § 112 issues. Rather, the invalidity Grounds raised herein render obvious the Challenged Claims under any reasonable interpretation of the claims, and thus the Board need not issue any formal constructions. *Nidec Motor Corp. v. Zhongshan Broad Ocean Motor Co.*, 868 F.3d 1013, 1017 (Fed. Cir. 2017).

VIII. THE CHALLENGED CLAIMS ARE INVALID

Claims 1-23 of the '313 patent are obvious in view of the identified prior art.

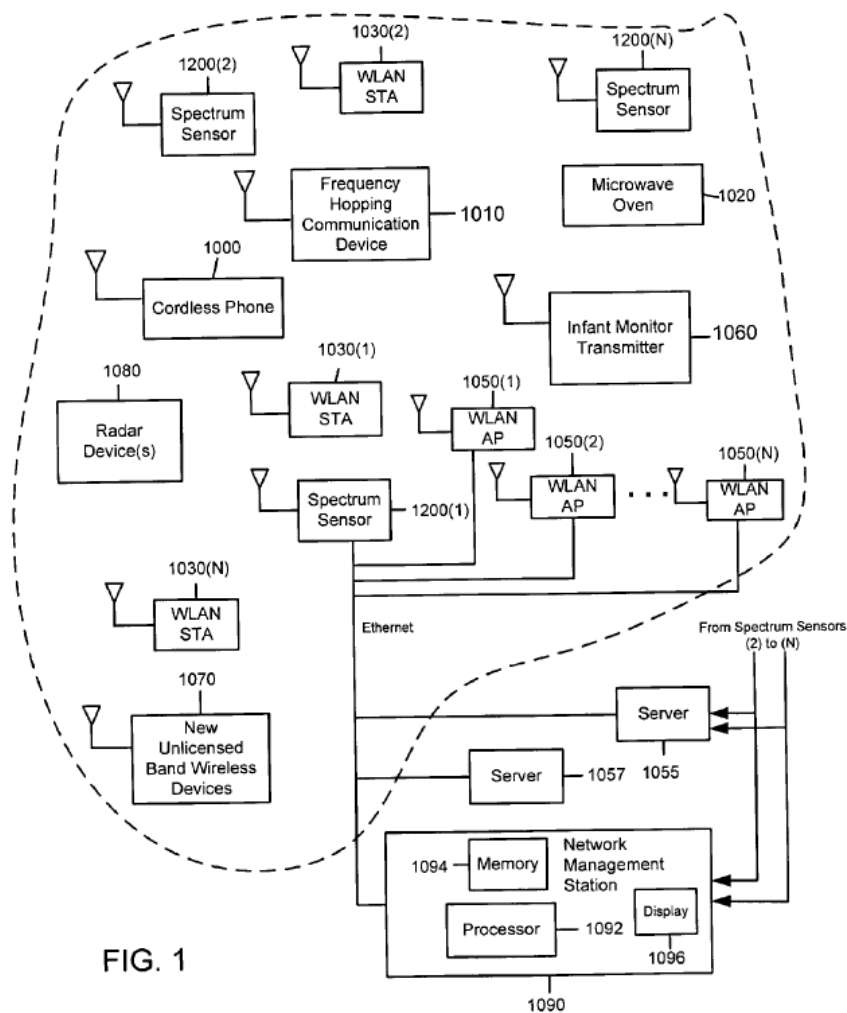
A. Summary and Date Qualification of Prior Art

1. Diener (EX1003)

U.S. Patent No. 7,408,907 to Neil R. Diener (“Diener”) is entitled “System and Method for Management of a Shared Frequency Band Using Client-Specific

Management Techniques,” filed August 15, 2003, issued August 5, 2008, and qualifies as prior art under 35 U.S.C. §§ 102(a), (b), and (e) (pre-AIA).

Diener teaches a communication management system involving radio communication parameters. (EX1003, Abstract). Like the disclosed inventions of the '313 patent, Diener analyzes collected data at a remote server and generates a policy based on that data to improve system performance. An exemplary system as taught by Diener is depicted in Figure 1:



(*Id.*, Fig. 1). As shown above, Diener teaches APs and sensors that gather spectrum intelligence across one or more networks which is provided to a Network Management Station (i.e., a server) via an interface. (*Id.*, Fig. 1, 6:58-63, 8:40-45, 20:64-66). As shown in Figure 1 above, the network management station is coupled to the APs and sensors to receive the information. (*Id.*, Fig. 1).

The received spectrum intelligence information which is stored and processed through signal classification. (*Id.*, 6:45-61, 9:15-33). Signal classification is used to generate policies to improve performance and mitigate interference within the networks. (*Id.*, 9:37-10:18). Diener explains that the management station generates controls “to adjust one or more operating parameters of devices or networks of devices operating in the frequency band.” (*Id.*, 9:57-59).

2. Shaffer (EX1004)

U.S. Patent Application Publication No. 2012/0320768 to Shmuel Shaffer, et al. (“Shaffer”) is entitled “Reducing the Impact of Hidden Nodes in Mesh Networks,” filed June 20, 2011, published December 20, 2012, and qualifies as prior art under 35 U.S.C. § 102(e) (pre-AIA).

Shaffer teaches a two-algorithm technique that helps optimize performance within a communications network with detected hidden nodes. (EX1004, Abstract, [0058]). These techniques result in a system with “a greatly reduced collision rate compared with current systems” and “improves network efficiency”. (*Id.*, [0113]).

Shaffer discloses two specific algorithms to avoid collisions based on hidden nodes: (1) a cost function algorithm that optimizes route selection; and (2) a transmission power algorithm to minimize hidden nodes. (*Id.*, [0058]).

Shaffer's method operates within a wireless network, consisting of a head-end device and multiple nodes, as well as a network administrator which determines the appropriate algorithm to employ based on network conditions. (*Id.*, Fig. 1; [0103]). The system in Shaffer is depicted below:

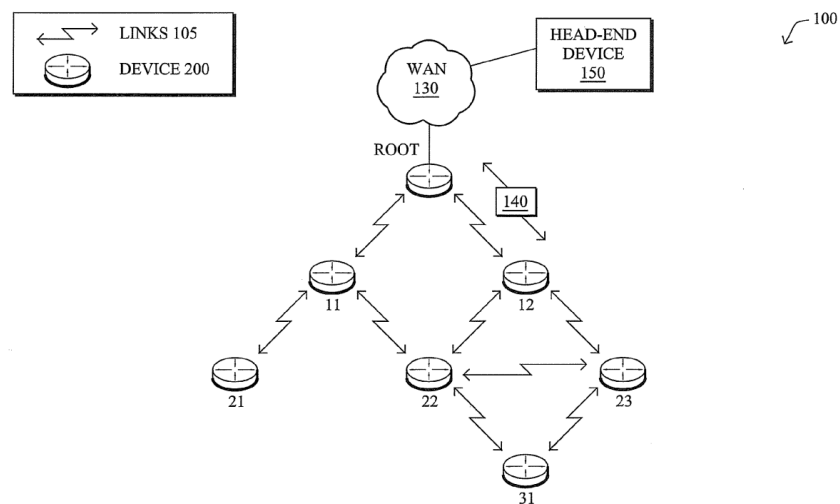


FIG. 1

(*Id.*, Fig. 1).

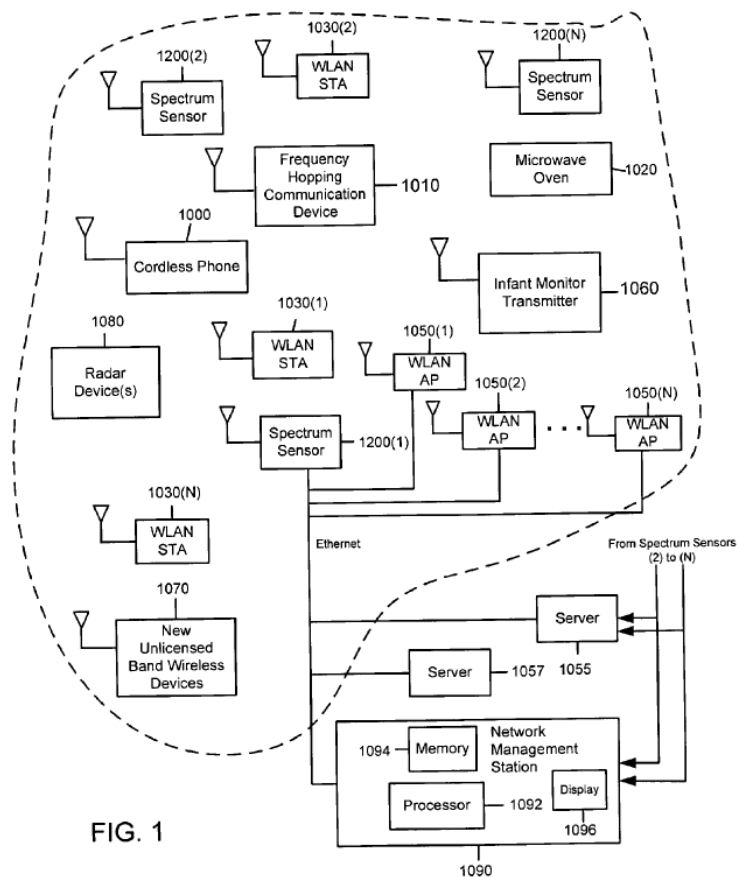
B. Ground 1: Obviousness of Claims 1-23 Based on Diener

1. Claim 1

Diener teaches and/or renders obvious claim 1.

i. Claim 1, Preamble

To the extent the preamble is limiting, it is disclosed by Diener. The preamble recites “A communication system comprising.” Diener teaches “a system . . . for managing communication with a plurality of client devices operating in a radio frequency band.” (EX1003, 3:49-51). The communication system of Diener is depicted in Figure 1:



(*Id.*, Fig. 1). A POSITA would have understood that Diener’s system is a communication system. (EX1002 ¶89).

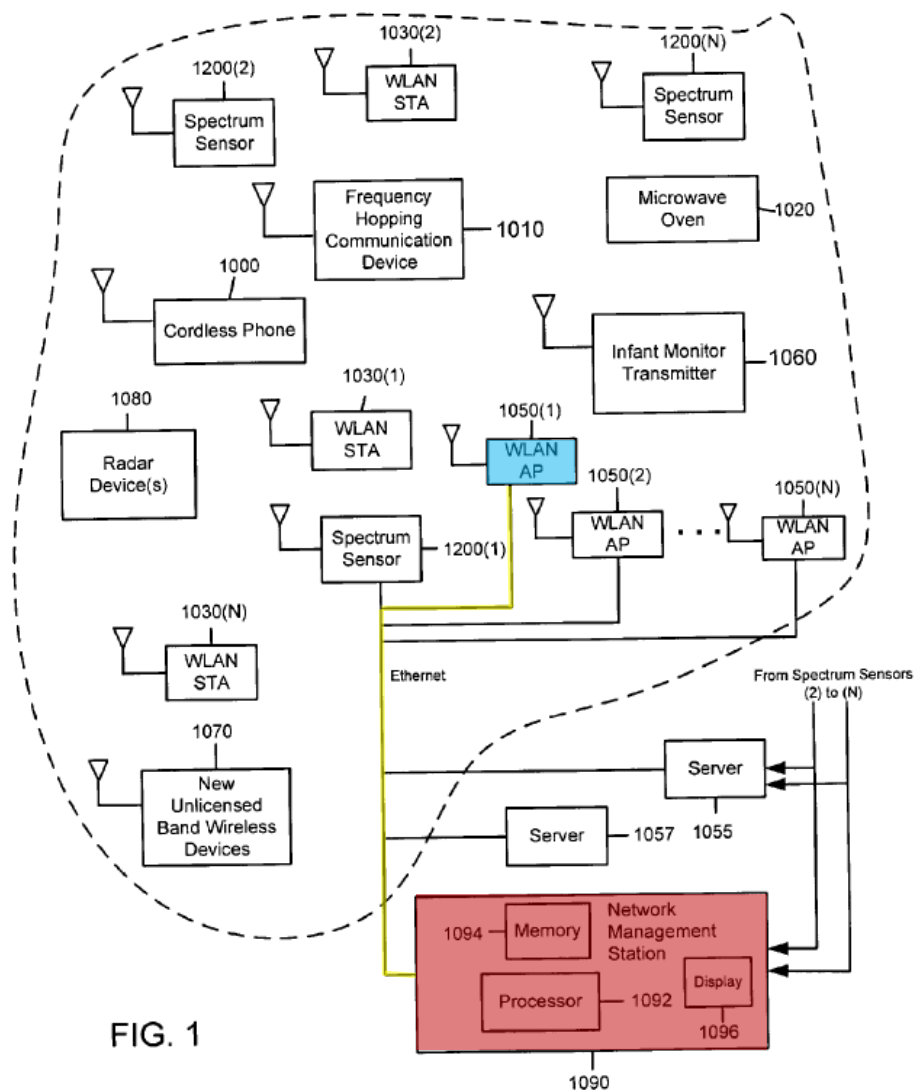
Thus, Diener teaches the preamble of claim 1.

ii. Element 1(a)

Diener discloses “a first interface coupled to a first communication unit, the first interface receives a first set of collected data associated with a first network managed by the first communication unit.”

Diener’s communication system includes a remote server, network management station 1090 (“NMS”). (EX1003, Fig. 1). As is explained more fully below, a POSITA would have understood that the NMS includes interfaces where data is received from the APs and spectrum sensors. (EX1002 ¶¶93-94).

Additionally, Diener teaches that communication units (e.g., WLAN access points) are coupled to a first interface of the NMS. (EX1003, Fig. 1, 65:55-57 (“networking managing station 1090 . . . coupled by wire or wireless link to the APs")). A POSITA would have understood each WLAN AP 1050 to correspond to a communication unit. (EX1002 ¶92). The coupling between exemplary WLAN AP 1050(1) (i.e., a first communication unit) and the NMS is depicted below:

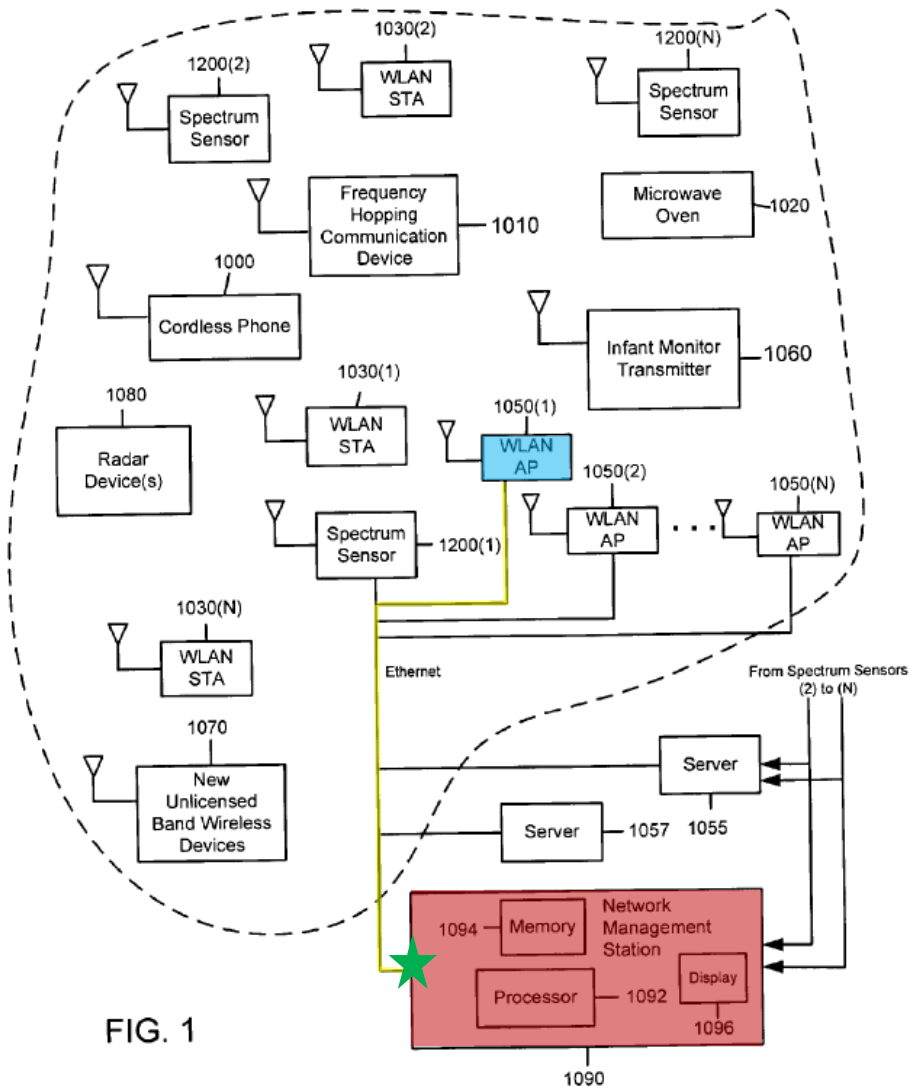


(*Id.* (annotated)).

Diener explains “network management station 1090 . . . may receive spectrum activity information from one or more WLAN APs 1050(1) to 1050(N).”

(*Id.*, 7:3-7). The spectrum activity information is received at an interface (e.g., a point of interaction) at the NMS where both WLAN AP 1050(1) and spectrum

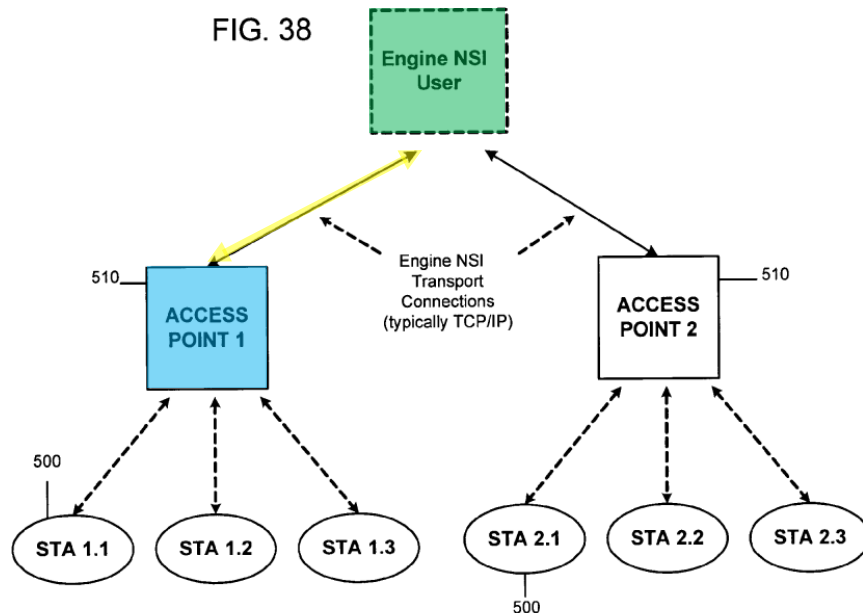
sensor 1200(1) are coupled. (See, e.g., Fig. 1.; EX1002 ¶¶93-94). The first interface where spectrum activity information is received at NMS is shown below:



(EX1003, Fig. 1 (annotated in green to identify a first interface)).

Moreover, Diener teaches different “Network Spectrum Interfaces” (“NSI”) within its system, including Engine NSI 270 which “defines how information is exchanging between” higher-up manager services (such as those performed at the

NMS) and engine servers executed by an AP. (*Id.*, 66:64-67). The Engine NSI is depicted below:



(*Id.*, Fig. 38 (annotated)). A POSITA would have recognized that in Diener’s system an Engine Network Spectrum Interface would include a “first interface” at the NMS which receives information from an access point (such as WLAN AP 1050(1) (i.e., a first communication device)). (EX1002 ¶94).

Diener also teaches that the NMS receives collected data at the first interface from the communication units (i.e., WLAN APs). For example, Diener discloses that the NMS receives collected data (i.e., spectrum information): “The spectrum intelligence gathered by the spectrum sensors is fed to one or several processing platforms such as a network management station 1090.” (EX1003, 6:58-62

(emphasis added), 7:3-7 (NMS “may receive spectrum activity information” from the WLAN APs)).

The spectrum activity information constitutes collected data associated with the wireless network. Diener teaches the use of “real-time spectrum analysis component,” called SAGE, which may be part of an AP. (EX1003, 4:38-40, 26:26-28, 72:60-65, Fig. 6). “The SAGE 20 obtains real-time information about the activity in a frequency band.” (*Id.*, 11:40-41 (emphasis added)). This data “comprise[s] information related to the activity in the frequency band as a whole, as well as statistics associated with a wireless network operating in the frequency band . . . which may be obtained by an AP.” (*Id.*, 8:59-62 (emphasis added)). Accordingly, the spectrum information gathered includes data collected by the WLAN APs concerning the network associated with that AP.

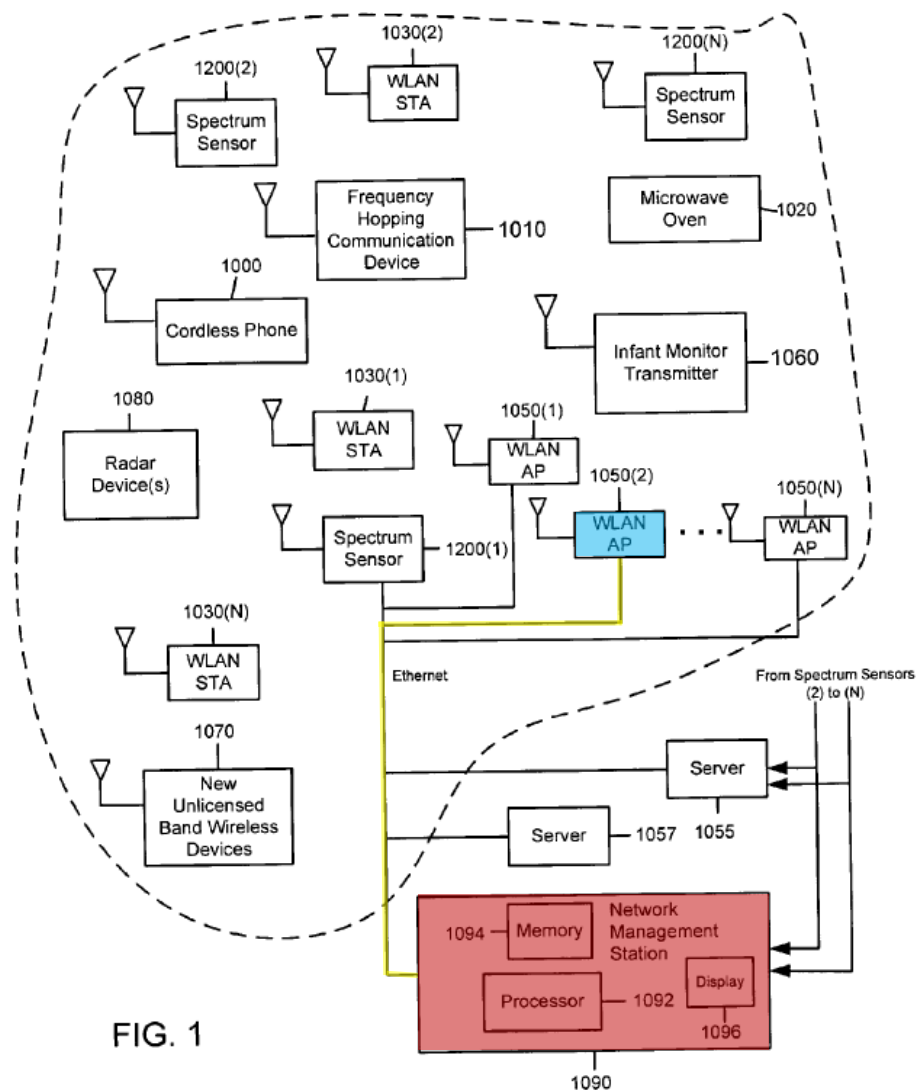
Diener explains that there are multiple wireless networks within its communications system, “[o]ne example of such a network is a WLAN.” (*Id.*, 5:50-52). And WLAN AP 1050(1) manages its associated client stations (STAs 1030(1) to 1030(N)) which operate within its WLAN. (*Id.*, Fig. 1, 6:11-18, 9:2-6, 3:54-60). A POSITA would have therefore understood the spectrum information received from WLAN AP 1050(1) to constitute collected data associated with the WLAN (i.e., first network) managed by the WLAN AP 1050(1). (EX1002 ¶¶95-97).

Thus, Diener teaches element 1(a).

iii. Element 1(b)

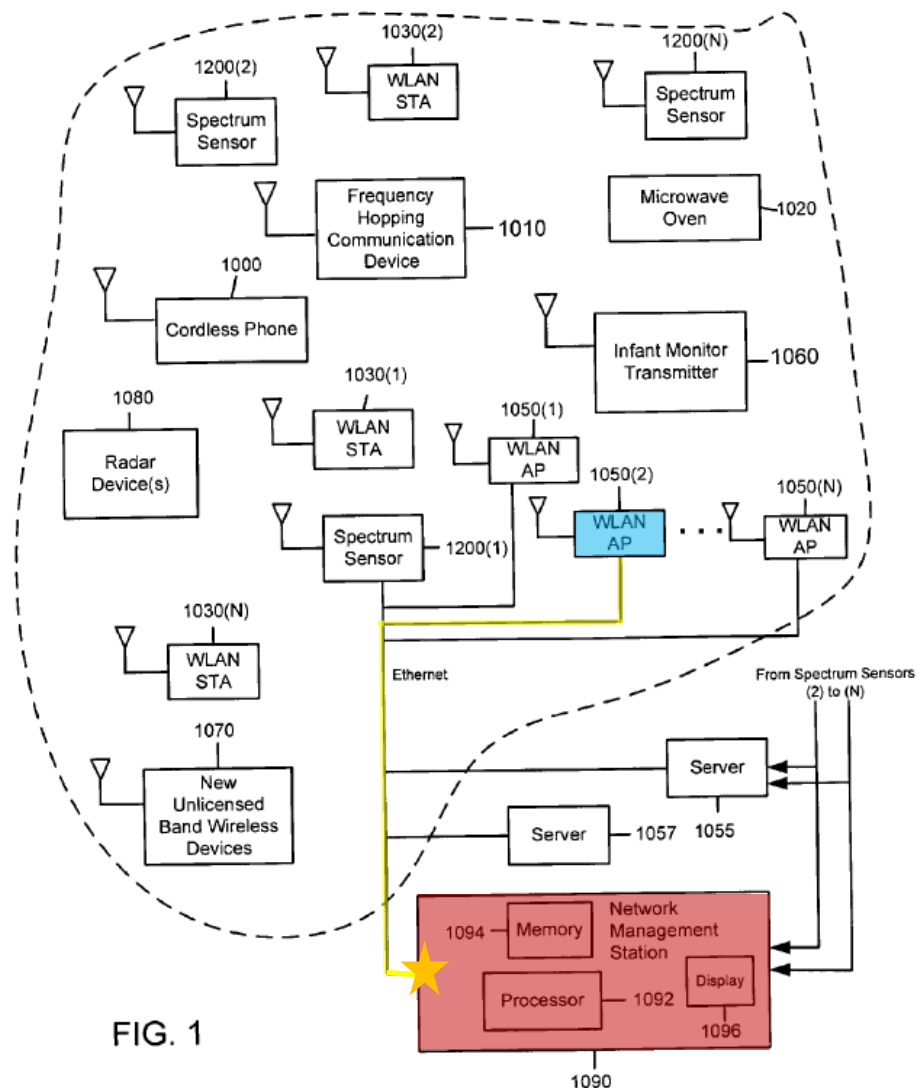
Diener discloses “a second interface coupled to a second communication unit, the second interface receives a second set of collected data associated with a second network managed by the second communication unit, the second network being a different network than the first network.”

Diener’s system includes “one or more wireless networks each comprising multiples devices or nodes that operate in the shared frequency band.” (*Id.*, 5:50-52). As shown in Figure 1, Diener’s system also includes multiple access points (i.e., communication units) coupled to the NMS:

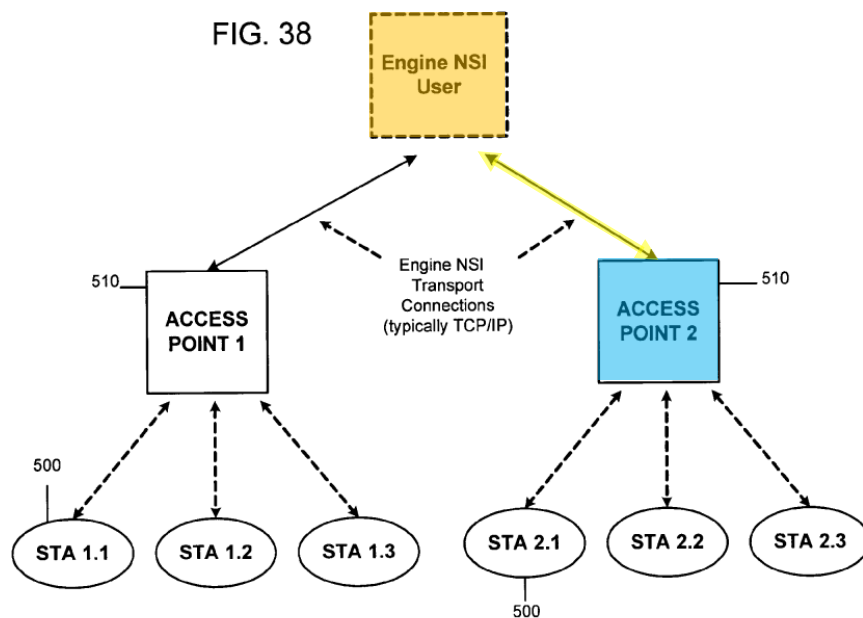


(*Id.*, Fig. 1 (annotated); *see also id.*, 6:8-18 (“[m]ultiple WLAN APs 1050(1) to 1050(N) may be operating in the region, each of which has one or more associated client STAs 1030(1) to 1030(N)”)). WLAN AP 1050(2) corresponds to a second communication unit which manages a second network (e.g., a second WLAN). (EX1002 ¶101).

As with element 1(a), the NMS includes an interface where data is received from each WLAN AP. A POSITA would have recognized that the NMS includes a second interface which is coupled to WLAN AP 1050(2) (i.e., the second communication unit) where data associated with the WLAN managed by that AP is received from WLAN AP 1050(2). (EX1002 ¶¶102-103). The second interface on the NMS is depicted below:



(*Id.*, Fig. 1 (annotated in orange to identify a second interface)). Although the second interface appears to be in the same location as the first interface, a POSITA would have understood that the point of contact between WLAN AP 1050(2) and the NMS (i.e., second interface) to be distinct from the point of contact between WLAN AP 1050(1) and the NMS (i.e., the first interface). (EX1002 ¶102). As explained regarding element 1(a), Diener teaches Engine NSI 270 as an exemplary interface at the NMS coupled to the second communication unit (i.e., WLAN AP 1050(2)):



(*Id.*, Fig. 38 (annotated)). A POSITA would have recognized that the Engine NSI would include a “second interface” at the NMS which receives information from WLAN AP 1050(2). (EX1002 ¶102).

It is this second interface on the NMS where collected data is received from WLAN AP 1050(2). (EX1003, 6:58-62). As with element 1(a), the spectrum activity information collected by the WLAN APs, which is fed to the NMS, constitutes collected data associated with the network. (*See also* EX1003, 3:60-4:7, 6:58-62, 7:3-7, 8:50-64). Diener discloses that the data collected from WLAN AP 1050(2) and is associated with the WLAN managed by WLAN AP 1050(2) (i.e., the second network), as opposed to data pertaining to WLAN AP 1050(1). (*Id.*, 20:64-66, 21:20-27 (the servers “adjust parameters in one or more wireless networks” and oversee activity in an entire region “which may include multiple wireless networks of the same or different varieties”) (emphasis added)). Thus, WLAN AP 1050(2) may manage a different wireless network, even if of the same variety, as the wireless network managed by WLAN AP 1050(1). Alternatively, Diener explains that “[o]ne or more of the WLAN APs 1050(1) to 1050(N) may be connected to a wired network (e.g., Ethernet network).” (*Id.*, 6:24-26). And NMS “manage[s] wired networks as well as wireless networks.” (*Id.*, 7:11-14). Again, a POSITA would have understood that in Diener’s system the network managed by WLAN AP 1050(2) to be a second network, different from the network managed by WLAN AP 1050(1).

Thus, Diener teaches element 1(b).

iv. Element 1(c)

Diener discloses “a memory coupled to the first and second interfaces, the memory stores the first and second sets of collected data.”

As explained regarding elements 1(a) and 1(b), Diener discloses an NMS which includes a first and second interface where spectrum information is received regarding a first and second WLAN network, respectively. Diener also states that “[t]he network management station 1090 has, for example . . . a memory 1094.” (*Id.*, 7:7-11; *see also id.*, Fig. 1 (depicting memory 1094 within NMS)). Moreover, “the spectrum activity information [i.e., collected data] can be accumulated and stored on a short-term basis (seconds or minutes) or a long-term basis (minutes to hours) for subsequent analysis.” (*Id.*, 9:12-21 (emphasis added); *see also id.*, 30:42-45 (“instructions stored on a computer/processor readable medium and executed by the processor (server 1055 or network management station 1090)”). And the NMS stores information for multiple APs. (*Id.*, 9:6-8).

A POSITA would have understood the memory within NMS to be communicatively coupled to the first and second interfaces where data is received. (EX1002 ¶108; *see also* EX1003, Fig. 1). For the received collected data to be stored within memory, a POSITA would have known that the memory 1094 would be communicatively coupled to the interfaces within NMS. (*Id.*, ¶¶108-109; *see also* EX1003, Fig. 1 (depicting memory 1094 within NMS)).

Thus, Diener teaches element 1(c).

v. Element 1(d)

Diener discloses “a processor coupled to the memory, the processor generates at least one policy based at least in part on an analysis of the first and second sets of collected data.”

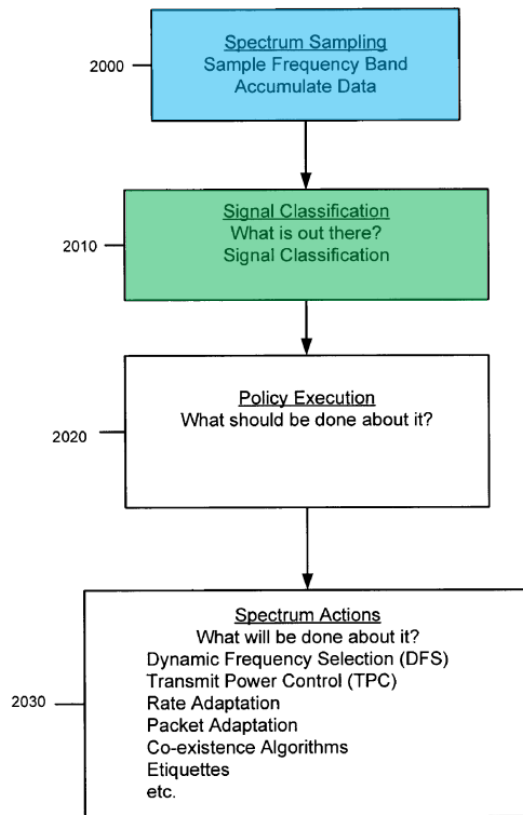
Diener teaches that “[t]he network management station 1090 has, for example, a processor 1092, a memory 1094 that stores one or more software programs executed by the processor.” (*Id.*, 7:7-11, Fig. 1). Because the memory “stores one or more software programs executed by the processor,” a POSITA would have understood that the processor is coupled to the memory. (EX1002 ¶112; EX1003, 7:7-11, Fig. 1, 9:22-25)).

Diener teaches that the processor within the NMS analyzes the received spectrum activity information (i.e., the first and second sets of collected data). Diener teaches that “spectrum activity information may be processed in a processor (local to or remote from the source devices of the actual spectrum activity information).” (EX1003, 9:22-25 (emphasis added)). A POSITA would have understood that this processor, which is remote from the source devices, would be part of the NMS. (EX1002 ¶114).

Diener further teaches that the “spectrum activity information is reported . . . to other devices to [] analyze” and “can be accumulated and stored . . . for

subsequent analysis.” (EX1003, 9:12-18). A POSITA would have understood that the processor within the NMS analyzes the collected data sets during the signal classification step. (EX1002 ¶¶114-116). Diener discloses a signal classification step which follows the spectrum sampling step:

FIG. 5



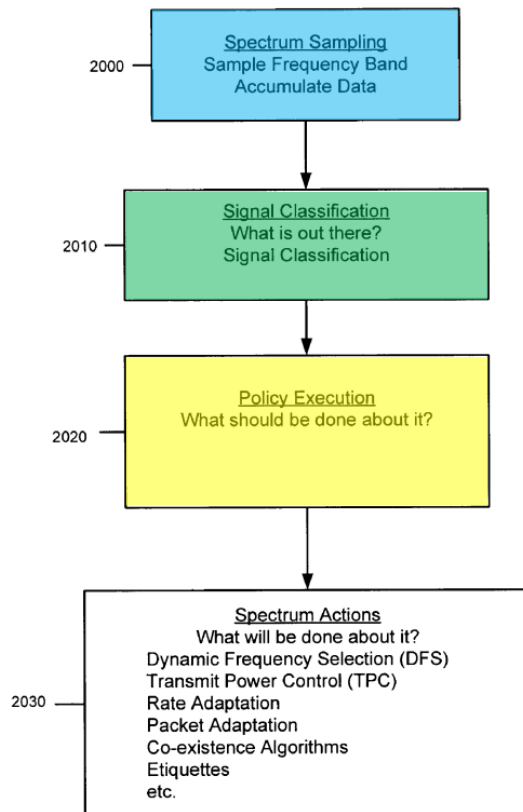
(EX1003, Fig. 5 (annotated)). The signal classification step “involves processing the output of the spectrum sampling step” which “is data classifying the signals/devices detected” and includes the received spectrum activity information. (*Id.*, 9:22-37; *see also id.*, 25:4-9 (explaining it is the processor at the NMS that

carries out classification)). Diener also teaches that “the spectrum activity information [is] processed at a computing device to generate reports and/or controls for one or more devices or network of devices (e.g., one or more APs)”. (*Id.*, 8:34-45). A POSITA would have considered the “processing” of the spectrum activity information during signal classification to include “analysis” of that information (EX1002 ¶114).

Moreover, a POSITA would have understood, based on the teachings of Diener, that the analyzed spectrum activity information would include both the first and second sets of collected data pertaining to two different networks. (*Id.*). Diener explains that NMS has a “global view of the spectrum activity of the entire region of unlicensed band operation, which may include multiple wireless networks of the same or different varieties (e.g., IEEE 802.11g WLAN, WPAN, Bluetooth™, etc.).” (EX1003, 21:20-25, 21:51-53 (emphasis added)).

Based on the processor’s analysis of the first and second sets of collected data (i.e., after performing signal classification on the received spectrum activity information), Diener teaches that the NMS generates a policy. Diener teaches that spectrum information is processed by the NMS “where policy decisions are made”. (*Id.*, 6:58-67 (emphasis added)). After spectrum sampling and signal classification, Diener teaches a “policy execution” step where the NMS determines what to do in response to the processed information:

FIG. 5



(*Id.*, Fig. 5 (annotated)).

Regarding the policy execution step, Diener explains:

The policy execution step 2020 involves determining what, if anything, should be done about the information output by the signal classification step 2010. For example, the policies dictate what spectrum actions in or controls of a communication device or network of devices to take on the basis of the output of the signal classification step 2010.

(*Id.*, 9:47-52). Diener also explains that a network expert 80 (which may be executed on or interfaced with the NMS) “makes broader type policy decisions . . .

such as those that affect an entire network of devices (e.g., multiple APs and their associated STAs in a WLAN).” (*Id.*, 20:4-10, 21:44-53).

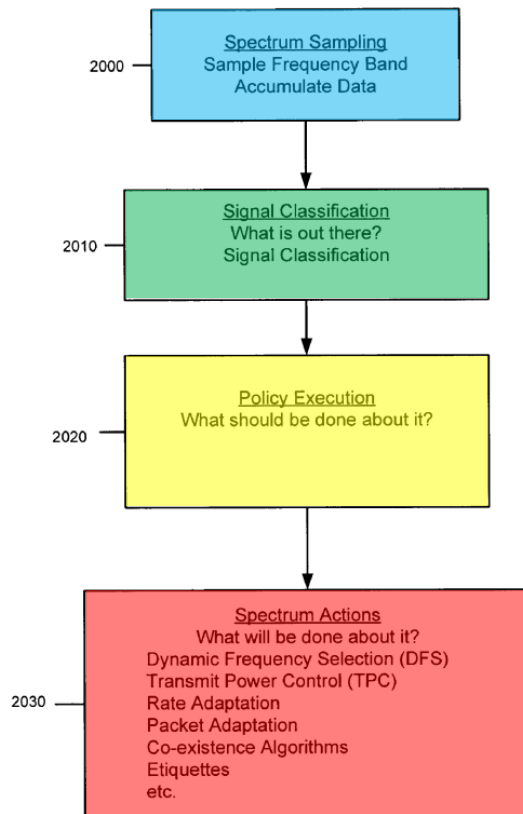
The disclosed “policy” in Diener includes determining that interference needs to be avoided or mitigated in a particular frequency environment and providing “suggestions for taking corrective action” by the WLAN APs. (*Id.*, 54:63-55:3). The generated policies may differ “depending on the interfering signal” that is generated during the signal classification step. (*Id.*, 60:58-60).

Diener teaches a variety of “recommended actions” to be taken when the NMS generates a policy of interference avoidance or mitigation. For example, Diener explains that “policies dictate what spectrum actions in or controls of a communication device or network of devices to take” including:

[A]ssigning a device to a different frequency sub-band or channel in the frequency band (dynamic frequency selection—DFS), network load balancing (on the basis of channel frequencies or time), adjusting the transmit power (transmit power control—TPC), adjusting the communication data packet, executing interference mitigation or co-existence algorithms, executing spectrum etiquette procedures, executing spectrum priority schemes, or re-assigning STAs to APs in a WLAN.

(*Id.*, 9:49-10:2). The generated policy including some of these recommended actions are also depicted in the last step of Figure 5:

FIG. 5



(*Id.*, Fig. 5 (annotated)). Additionally, a POSITA would have found it obvious based on the teachings of Diener that it is the processor of NMS which generates these policy decisions. (EX1002 ¶121).

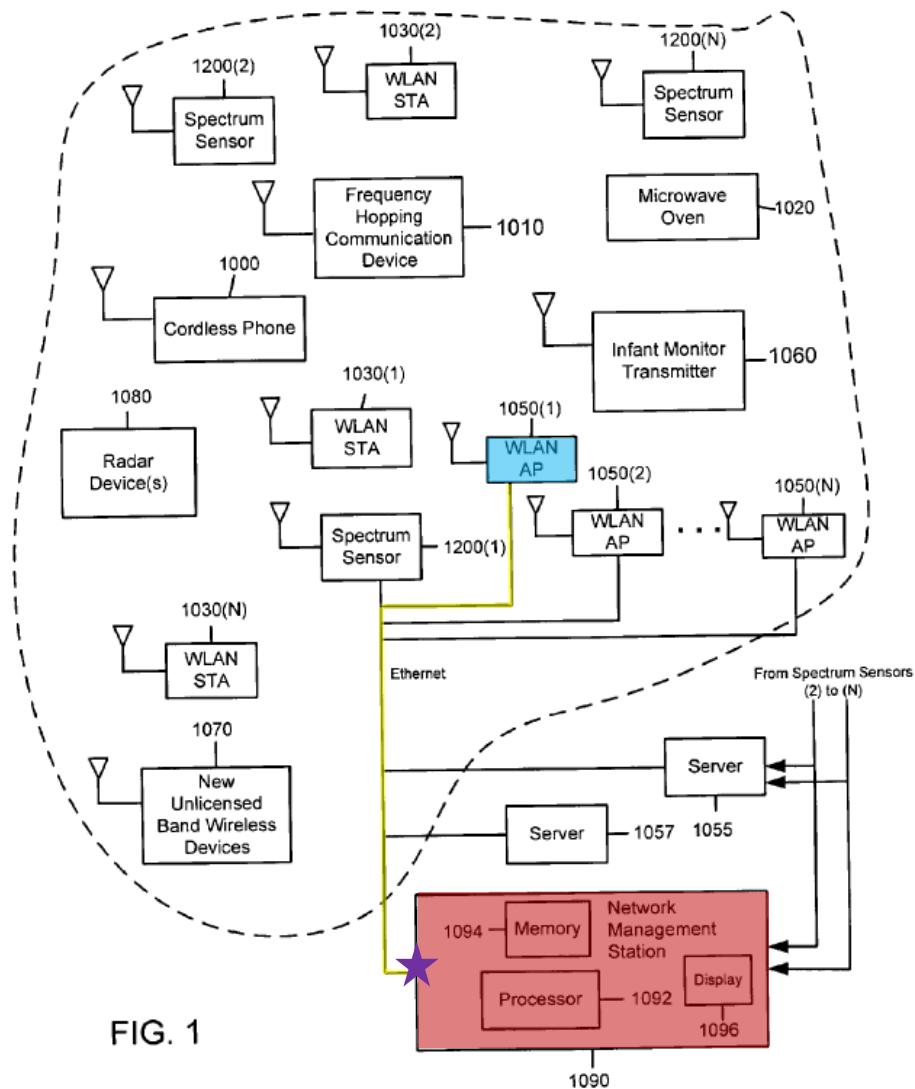
Thus, Diener teaches and/or renders obvious element 1(d).

vi. Element 1(e)

Diener discloses “a third interface coupled to the processor, the third interface transmits, in response to the processor determining a change in performance in at least one of the first network or the second network, the at least

one policy to the first communication unit that makes a performance-related adjustment within the first network based on the at least one policy.”

A POSITA would have recognized there to be a third interface at the NMS at the point of interaction where the determined policy is transmitted to the relevant WLAN AP. (EX1002 ¶124). For example, as shown in Figure 1, a third interface exists where the NMS has a point of interaction with WLAN AP 1050(1) and through which it transmits a generated policy for that AP:



(EX1003, Fig. 1 (annotated in purple to identify the third interface)). A POSITA would also have understood that this third interface is communicatively coupled to processor 1092 within the NMS that generated the respective policy discussed in element 1(d). (EX1002 ¶125).

As explained regarding element 1(d), Diener teaches the processor of the NMS detects the current performance of the devices within the frequency band

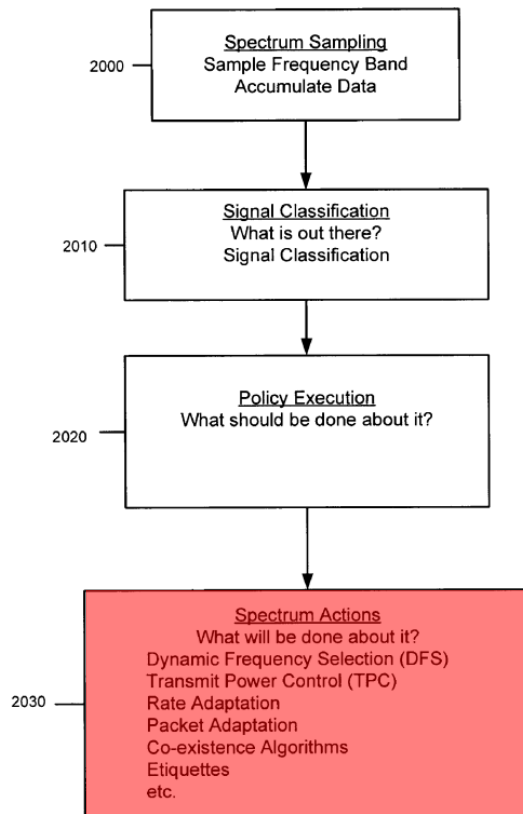
during signal classification. Diener explains that signal classification may indicate to the remote server that “an interference condition” exists in a respective network or networks. (EX1003, 9:37-42, 6:2-5 (describing inevitable interference between device signals)). Because the collected data is associated with two networks, a POSITA would have considered the processor’s determination of interference to be a change in performance in at least one of the first or second networks. (EX1002 ¶127).

Diener teaches communicating the policy of interference mitigation or avoidance to WLAN AP 1050(1) (i.e., the first communication unit) including recommendations or controls of specific actions to be taken. (EX1003, 2:18-24, 9:46-59). Diener explains that when the policy of interference avoidance or mitigation is determined after spectrum sampling and signal classification, “a real-time alert may be generated” which “may include recommendations to a user or to a network administrator to make adjustments to a device or network of devices operating in the frequency band.” (*Id.*, 9:37-46). The “controls” dictated by the determined policies may include assigning a device to a different channel or frequency sub-band, network load balancing, adjusting transmission power, adjusting communication data rate, adjusting transmitted data packet parameters, executing interference algorithms, executing spectrum etiquette or priority schemes, or re-assigning STAs to a different WLAN AP. (*Id.*, 9:60-10:2).

Diener further discloses that the policy—indicating interference mitigation is needed and recommending an action or control—is “delivered by the network management station 1090 via the network connection to one or more APs (e.g., one or more of APs 1050(1) to 1050(N)).” (*Id.*, 10:28-31). This transmission is done via control signal which is also generated by the NMS. (*Id.*, 10:19-25). A POSITA would have understood that the control signal transmitting the policy to WLAN AP 1050(1), for example, would be transmitted through a third interface on NMS. (EX1002 ¶126).

Diener states that “[t]he AP will receive the control signal and change one of its operational parameters” according to the communicated policy. (EX1003, 10:31-33). Specifically, the WLAN AP may take the recommended action such as the “spectrum actions” identified in the last step of Figure 5:

FIG. 5



(*Id.*, Fig. 5 (annotated)). A POSITA would have understood that these spectrum actions occur at the WLAN AP—where the control signal communicates the policy and associated controls. (EX1002 ¶128; *see also* EX1003, 10:27-33). Moreover, a POSITA would recognize that each of these recommended actions correspond to a performance-related adjustment within the first network. (EX1002 ¶128). Diener explains that these suggested actions are done “to maintain desirable performance” in light of current interference affecting multiple networks. (EX1003, 2:24-27, 6:2-5). Accordingly, a POSITA would have understood that implementation of any of

these actions by WLAN AP 1050(1) in response to the transmitted policy—which is implemented to avoid or mitigate interference—would result in an adjustment to the performance within that WLAN (i.e., the first network). (EX1002 ¶128).

Thus, Diener teaches element 1(e). In sum, Diener teaches and/or renders obvious claim 1.

2. Claim 2

Diener discloses “the communication system of claim 1, wherein the adjustment within the first network is an implementation of an algorithm.” Diener teaches and/or renders obvious the communication system of claim 1.

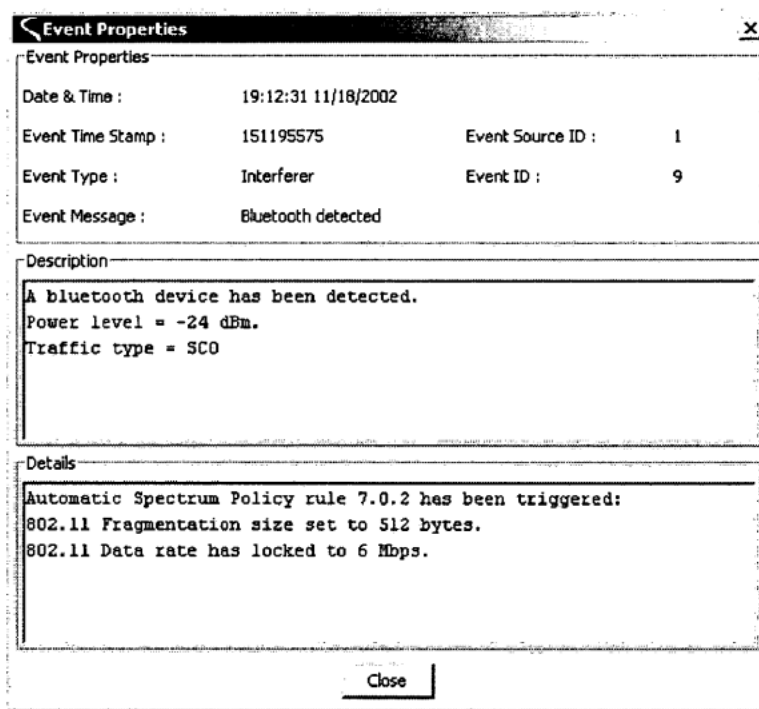
Additionally, as explained regarding element 1(d) above, Diener discloses specific recommended actions to be taken by a WLAN AP to avoid or mitigate interference. A POSITA would have understood that implementation of any of the above actions by the WLAN AP would involve an implementation of an algorithm. (EX1002 ¶133; EX1003, Fig. 5).

In one example, Diener describes a situation where background noise results in data packet loss which is reflected in the collected spectrum information. (*Id.*, 60:53-57). “The policy associated with this case may be to use a spatial processing algorithm to improve the link margin between two devices.” (*Id.*, 60:60-64). Thus, a POSITA would have understood that, in this situation, the WLAN AP receiving

that policy would employ a spatial processing algorithm to improve the link margin. (EX1002 ¶132).

In another example, the spectrum activity information indicates to the server the presence of a Bluetooth™ device in a second, Bluetooth™ network, causing interference:

FIG. 19



(EX1003, Fig. 19). In this situation, Diener's system triggers an automatically-generated policy which tells the WLAN AP to adjust fragmentation size and data rate on its 802.11 network. (*Id.*). A POSITA would have recognized that the WLAN AP, after receipt of this policy, would implement algorithms to adjust fragmentation size to 512 bytes and set the data rate to 6 Mbps. (EX1002 ¶133).

Thus, Diener teaches and/or renders obvious claim 2.

3. Claim 3

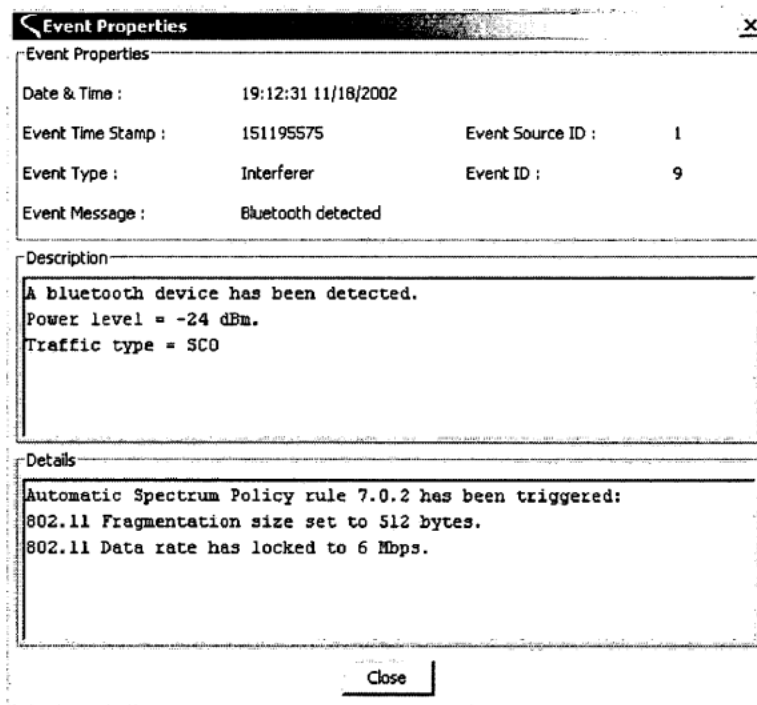
Diener discloses “the communication system of claim 1, wherein the adjustment within the first network is a change in parameter value.” Diener teaches and/or renders obvious the communication system of claim 1. Additionally, Diener discloses that the transmitted policy includes “a control . . . of at least one parameter associated with radio communication between the” AP and wireless devices in the environment. (EX1003, 3:54-60).

Diener explains that the generated policy at the NMS includes controls instructing the AP to make a particular adjustment within its network. (EX1003, 9:60-10:2). Generally speaking, the controls generated “adjust one or more operating parameters of devices or networks of devices operating in the frequency band.” (*Id.*, 9:55-59 (emphasis added)). Thus, a POSITA would have understood Diener to disclose making adjustments within a first network that involve changing a parameter value. (EX1002 ¶¶135-136).

More specifically, Diener teaches examples of these “controls” (EX1003, 9:60-10:2) and explains the controls change “frequency[] of operation, bandwidth of operation, data rate, transmit power, etc.” (*Id.*, 11:20-33). A POSITA would have understood that implementing these controls at the AP would involve changing a parameter value. (EX1002 ¶137). For example, one control taught by

Diener is “adjusting a parameter of the transmitted data packet.” (EX1003, 9:66 (emphasis added)). Another control is “adjusting the communication data rate” which is exemplified in Figure 19:

FIG. 19



(*Id.*, Fig. 19, 9:65-66). A POSITA would have understood the adjustment of the specific data rate to 6 Mbps to be a change in parameter value. (EX1002 ¶137).

Thus, Diener teaches and/or renders obvious claim 3.

4. Claim 4

Diener discloses “the communication system of claim 1 wherein the first communication unit reduces interference in the second network based on an implementation of the at least one policy within the first network.” Diener teaches

and/or renders obvious the communication system of claim 1. Additionally, as explained regarding element 1(d), Diener teaches that its policies are generated to mitigate, or avoid interference in one or more networks. As such, the implementation of the generated policy by WLAN AP 1050(1) results in a reduction of interference in the second network. For example, Diener teaches a WLAN AP implementing a policy of moving to another channel to mitigate interference with another network. (EX1003, 59:45-63).

As another example, Diener teaches a policy of interference mitigation between an IEEE 802.11 network and a Bluetooth™ network. (EX1003, 61:33-62:3). To reduce interference between these two networks, Diener teaches instructing WLAN AP 1050(1) to schedule its transmission of QoS packets in between the Bluetooth's SCO packets. (*Id.*, 61:43-47). A POSITA would have known that this policy, transmitted to and implemented by WLAN AP 1050(1), would reduce interference in the second (Bluetooth™) network. (EX1002 ¶¶141-142).

Thus, Diener teaches and/or renders obvious claim 4.

5. Claim 5

Diener discloses “the communication system of claim 4 wherein the at least one policy adjusts channel transmission characteristics of at least one wireless channel within the first network.” As explained, Diener teaches and/or renders

obvious the communication system of claim 4. Additionally, Diener discloses a policy of channel switching which adjusts the channel transmission characteristics of a wireless channel within the first network.

For example, Diener teaches a policy of adjusting an AP or devices within the AP's network "to a clean/unused channel". (EX1003, 59:54-58). Similarly, Diener discloses a policy that adjusts a client device's channel frequency. (*Id.*, cl. 6). A POSITA would have known that these types of adjustments—switching channels—would be an adjustment of channel transmission characteristics of a wireless channel within the network associated with that AP (e.g., WLAN AP 1050(1)'s first network)). (EX1002 ¶144).

Diener also teaches a policy of frequency hopping to avoid interference between two networks. (EX1003, 62:18-49). When a Bluetooth™ network interferes with an IEEE 802.11 network, Diener teaches one policy that "the Bluetooth network should remove hops that enter the 802.11 band." (*Id.*, 62:20-21). A POSITA would have understood that this policy would be an adjustment of channel transmission characteristics on the respective wireless channel within the WLAN. (EX1002 ¶145; EX1003, 62:31-48 (describing a policy of limiting dynamic rate adapting devices to a particular percentage of the band when frequency hopping signals are detected)).

Thus, Diener teaches and/or renders obvious claim 5.

6. Claim 6

Diener discloses “the communication system of claim 5 wherein the channel transmission characteristics comprise a modification to a transmission band across the at least one wireless channel within the first network.” Diener teaches and/or renders obvious the communication system of claim 5. Additionally, Diener teaches generating and implementing policies that adjust channel transmission characteristics.

In one example, Diener teaches adjusting the percentage of a frequency band that may be used by a dynamic rate adapting device. (EX1003, 62:31-48). The policy may involve limiting the dynamic rate adapting device to 50% or 75% of the band to allow a frequency hopping network use of the band. (*Id.*). A POSITA would have understood that the respective adjustments to the channel include modifications to the specific characteristics of the transmission band within the network. (EX1002 ¶¶146, 148 (explaining that a modification to the percentage of use by certain devices in a band result in a modification to the characteristics of the transmission band)).

Thus, Diener teaches and/or renders obvious claim 6.

7. Claim 7

Diener discloses “the communication system of claim 1 wherein the first and second sets of collected data comprise historical data.” Diener teaches and/or

renders obvious the communication system of claim 1. Additionally, Diener discloses that the collected data received by the NMS includes historical data.

Diener explains that “the spectrum activity information can be accumulated and stored on a short-term basis (seconds or minutes) or a long-term basis (minutes to hours) for subsequent analysis”. (EX1003, 9:12-21). A POSITA would have understood that collected data stored “on a long-term basis” constitutes historical data. (EX1002 ¶151). Moreover, Diener teaches building “histograms of signal pulse data that are useful for signal classification,” which a POSITA would have recognized to include historical data. (*Id.* ¶152; EX1003, 14:35-37).

Thus, Diener teaches and/or renders obvious claim 7.

8. Claim 8

Diener renders obvious claim 8.

i. Claim 8, preamble

To the extent the preamble is limiting, it is disclosed by Diener. The preamble recites: “The communication system of claim 1 wherein the processor”. As explained regarding claim 1, Diener teaches and/or renders obvious the communication of claim 1 with a processor.

Thus, Diener teaches and/or renders obvious the preamble of claim 8.

ii. Element 8(a)

Element 8(a) recites: “generates a first control signal that is sent to the first communication unit at a first pre-defined time, the first control signal comprising a first policy adjustment to the first network”.

Diener teaches “network management station 1090 ... may receive spectrum activity information and generate the control signals.” (EX1003, 10:23-25 (emphasis added)). It is these control signals which transmit the policy from the NMS to the APs. (*Id.*, 9:60-10:2, 10:12-18; *see also* element 1(e), *supra*). Accordingly, a POSITA would have understood that the generated control signals are sent to, for example, WLAN AP 1050(1) including the respective policy adjustment to the first network. (EX1002 ¶156).

A POSITA would have found it obvious, based on the teachings of Diener, to send a first control signal to WLAN AP 1050(1) at a first pre-defined time. (*Id.* ¶157). Diener discloses time-based policies wherein “[s]ome policies will be dependent on context information such as location, time of day, etc.” (EX1003, 62:64-65). Diener also teaches generating a policy of moving a specific AP (such as WLAN AP 1050(1)) to another channel during a specific time of day when it is detecting occasional interference. (*Id.*, 22:18-23). These time-based policies are also discussed in specific examples within Diener where a policy may instruct an AP to schedule IEEE 802.11 packet transmission around Bluetooth™ SCO packet

transmissions. (*Id.*, 61:34-49). The examples demonstrate that Diener discloses embodiments where transmission policies would change at predetermined times at least twice in a day if not more.

A POSITA reading Diener would have understood that these policies—transmitted to the AP by control signal—include pre-defined times for the specific actions to be performed. (EX1002 ¶¶157-158). A POSITA would have found it obvious based on Diener’s disclosure that the control signal would be sent at the pre-defined time laid out in the policy. (*Id.* ¶159). For example, a POSITA would have known that the control signal and policy could be communicated to the AP as soon as it is generated and include scheduling information for future transmissions. (*Id.*). Alternatively, the NMS could set a pre-defined time to *send* the control signal to the AP that corresponds to the time of day or specified transmission schedule to be implemented by the AP in response the policy. (*Id.*). In one of the policy examples disclosed by Diener, for example, a POSITA would have recognized that when the policy indicates an AP should be moved to a channel at a specific time of day, the control signal could be sent at that pre-defined time of day instructing the AP to immediately switch channels. (*Id.*).

Sending a control signal at a pre-defined time was known in the art and would have been known to a POSITA at the time of invention. (*Id.* ¶159). For example, it was known to use a “central coordinator” to assign “predetermined

time intervals in which certain stations are granted use of the medium.” (EX1022, 1:20-31; EX1002 ¶160). It was further known to transmit these schedules to the respective stations at predetermined times, such as during a TDMA Contention Period, instructing the stations as to when they may transmit on the medium. (*Id.*, 9:27-39, 10:60-65 (“The frequency of beacon transmission depends on how frequently the associated management information needs to be communicated”)). As another example, a POSITA would have been aware of 3GPP specifications governing policy updates transmitted downlink (e.g., from a controller to communication units) at specific, predefined periodic intervals. (EX1002 ¶160; EX1023). It would have been obvious based on the knowledge of a POSITA that the control signals in Diener would be sent at predetermined times. (EX1002 ¶160).

Thus, Diener renders obvious element 8(a).

iii. Element 8(b)

Element 8(b) recites: “generates a second control signal that is sent to the second communication unit at a second pre-defined time, the second control signal comprising a second policy adjustment to the second network.”

Diener explains that the NMS (which may utilize a network expert to determine policies) covers “multiple WLAN APs, such as APs 1050(1) to 1050(N)” and adjust “parameters in one or more wireless networks”. (EX1002,

20:59-66). Thus, a POSITA would have understood that the NMS generates multiple control signals to transmit multiple policies to different WLAN APs (e.g., WLAN AP 1050(1) and 1050(2)) that adjust the different wireless networks. (EX1002 ¶162). Accordingly, a POSITA reading Diener would have known that the processor within the NMS would generate a second control signal, sent to WLAN AP 1050(2), including a second policy adjustment to that WLAN. (*Id.*).

Additionally, for the reasons discussed regarding element 8(a), a POSITA would have found it obvious to send the second control signal at a second pre-defined time to the second communication unit. For example, where the generated policy indicates a second AP should use a channel at a specific time of day—corresponding to the time of day when the first AP is switched off that channel—a POSITA would have found it obvious to send the control signal at that pre-defined time instructing the AP to immediately make the channel switch. (*Id.* ¶¶163-165). As explained, although Diener does not state when the control signals are sent, a POSITA would have found it obvious to send the control signal to the respective AP at the specific time that the remote server (i.e., NMS) pre-determined the AP should take action. (*Id.*). And, as explained immediately above, transmitting a control signal (e.g., a beacon or policy update) at a predefined time was known in the art. (EX1022-1023; EX1002 ¶165).

Thus, Diener renders obvious element 8(b). In sum, Diener renders obvious claim 8.

9. Claim 9

Claim 9 recites: “the communication system of claim 8 wherein the first pre-defined time and the second pre-defined time are different.” As explained, Diener renders the communication system of claim 8 obvious. Additionally, a POSITA would have found it obvious, based on the teachings of Diener, to send the first and second control signals are different pre-defined times. (EX1002 ¶¶168-169).

For example, Diener teaches time of day policies that instruct particular APs to make use of a particular channel at certain, different times of day. (EX1003, 22:18-23, 62:64-65). And, a POSITA would have found it obvious to send a first and second control signal to these two APs—WLAN APs 1050(1) and 1050(2) associated with two different networks—at the specific time that the channel should be used. (EX1002 ¶¶168-169). A POSITA would have found it obvious that these two pre-defined times should be different to avoid interference on the channel by the APs. (*Id.*).

Thus, Diener renders obvious claim 9.

10. Claim 10

Claim 10 recites: “the communication system of claim 8 wherein the first policy adjustment and the second policy adjustment are different.” Diener renders obvious the communication system of claim 8.

While Diener teaches time of day policy adjustments of the same variety (i.e., switching channels), Diener also teaches making different policy adjustments based on time-of-day policies with pre-defined times. (EX1003, 61:42-49, 62:4-17). For example, Diener teaches time-based policies when interference is detected between a Bluetooth™ network and an IEEE 802.11 network. (*Id.*). In that instance, Diener teaches a first policy adjustment wherein the IEEE 802.11 AP transmits QoS packets at pre-defined times that do not interfere with the scheduled timing of the Bluetooth’s SCO packets. (*Id.*, 61:42-49). Diener also teaches a second policy adjustment for the Bluetooth™ network in which the Bluetooth™ network will idle slots when IEEE 802.11 transmissions occur. (*Id.*, 62:9-12).

A POSITA would have found it obvious that the control signals containing these policies would be sent at pre-defined times. (EX1002 ¶¶160, 162-164).

Thus, Diener renders obvious claim 10.

11. Claim 11

Diener discloses “the communication system of claim 1 wherein the first and second communication units are Wi-Fi access points.” Diener teaches and/or

renders obvious the communication system of claim 1. Additionally, as explained regarding claim 11, the exemplary first and second communication units in Diener are WLAN APs 1050(1) and 1050(2). Diener teaches that the WLAN is “an IEEE 802.11 WLAN” and that the AP (i.e., access point) is “an IEEE 802.11 AP”. (EX1003, 11:8-11, 6:11-12). A POSITA would have recognized that an IEEE 802.11 includes a Wi-Fi network and, therefore, WLAN APs 1050(1)-(2) include Wi-Fi access points. (EX1002 ¶173).

Thus, Diener teaches and/or renders obvious claim 11.

12. Claim 12

Claim 12 recites: “the communication system of claim 1 wherein the first and second communication units are cellular base stations.” Diener teaches and/or renders obvious the communication system of claim 1. Additionally, Diener teaches that the WLAN APs are exemplary “network base station device[s]” and the APs “may be any wireless base station device that wireless [sic] communicates with a plurality of client station devices.” (EX1003, 3:54-55, 74:29-31 (emphasis added)). A POSITA would have understood that the communication units in Diener are not limited to WLAN APs but generally include wireless network base stations operable within Diener’s communications system. (EX1002 ¶¶175-176).

Diener also teaches numerous wireless devices within its communications system, including cordless phones and Bluetooth wireless devices. (EX1003, Fig.

1, 6:27-36). A POSITA would have understood that a cellular phones present in the unlicensed frequency band described by Diener are associated with cellular base stations. (EX1002 ¶176; *see also id.* (citing Diener’s reference to “multiple wireless networks of the same of different varieties” which may include cellular networks managed by cellular base stations) (EX1003, 21:20-24)).

Thus, Diener teaches and/or renders obvious claim 12.

13. Claim 13

Claim 13 recites: “the communication system of claim 12 wherein the first communication unit is a small cell base station.” Diener teaches and/or renders obvious the communication system of claim 12. As explained regarding claim 12, Diener teaches that an AP (i.e., communication unit) “may be any wireless base station device.” (EX1003, 3:54-55, 74:29-31).

A POSITA would have found it obvious based on the teachings of Diener that Diener discloses including a small cell base station as the first communication unit in Diener’s system. (EX1002 ¶¶178-180). A POSITA would have recognized that a small cell base station is a wireless or cellular base station and, as explained, a POSITA would have found it obvious to include a cellular base station within Diener’s system. (EX1002 ¶¶175-176, 179).

Additionally, a POSITA would have known that a small cell base station may be limited in range and/or to specific geographical areas. (*Id.* ¶180). Diener

discloses that its communication system includes Personal Area Networks which are “limited to a few meters.” (*Id.*, 3:27-31). Because Diener teaches that its network base stations could be “any wireless base station device,” a POSITA would have found it obvious to include a small cell base station as a first communication unit where, for example, the first network was a Personal Area Network, limited in range. (EX1002 ¶180; EX1003, 74:29-31).

Thus, Diener teaches and/or renders obvious claim 13.

14. Claim 14

Diener discloses “the communication system of claim 1 wherein the first and second sets of collected data comprise RSSI measurements collected within the first and second networks.” Diener teaches and/or renders obvious the communication system of claim 1. Additionally, Diener teaches that the data received by the NMS includes a received signal strength indication (RSSI). (EX1003, 69:27-29). In Diener, the SAGE outputs “timing, strength and duration” of the received signals and “[t]he L1 measurement engine 220 outputs a timestamp and associated received signal strength indicator (RSSI) power values for each of a plurality of Fast Fourier Transform (FFT) bins.” (*Id.*, 15:35-42, 69:27-29 (emphasis added)).

Diener teaches that data output by the SAGE—which could include RSSI measurements—is collected for the networks associated with WLAN AP 1050(1)

and 1050(2) and transmitted to the NMS for analysis. (*See* elements 1(a)-1(b), *supra*). A POSITA would have, therefore, understood Diener to disclose that the first and second sets of collected data includes a RSSI measurement. (EX1002 ¶182).

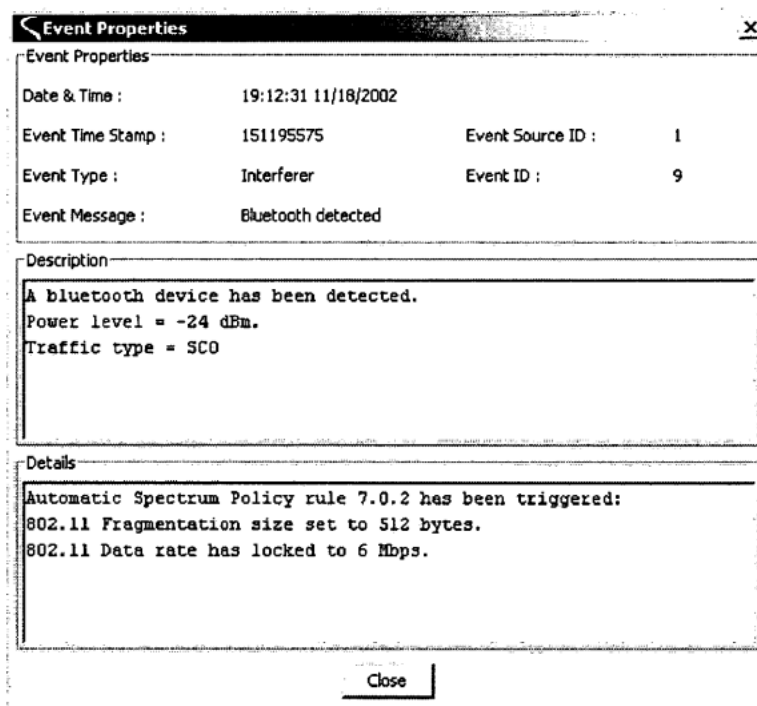
Thus, Diener teaches and/or renders obvious claim 14.

15. Claim 15

Diener discloses “the communication system of claim 14 wherein the at least one policy adjusts a transmission rate of at least one channel within the first network.” Diener teaches and/or renders obvious the communication system of claim 14. Additionally, Diener discloses a policy that involves “adjusting a transmit data rate of the AP and/or STAs” within the first network. (EX1003, 19:48-50). Diener teaches policies that adjust “operating parameters of . . . network of devices operating in the frequency band” including transmission data rates. (*Id.*, 9:55-59, 74:61-64, 73:20-44).

As another example, Figure 19 depicts a particular policy that adjusts the transmission rate:

FIG. 19



(*Id.*, Fig. 19)). This policy sets the transmission data rate to 6 Mbps. (*Id.*). A POSITA would have understood that these taught adjustments to the transmission data rate constitute adjustments to a transmission rate of a channel within the first network (i.e., within the WLAN associated with WLAN AP 1050(1) to which the policy is communicated). (EX1002 ¶185).

Thus, Diener teaches and/or renders obvious claim 15.

16. Claim 16

Diener discloses “the communication system of claim 1 wherein the first and second sets of collected data comprise collected measurements related to SNR across a plurality of wireless channels within the first and second networks.”

Diener teaches and/or renders obvious the communication system of claim 1.

Additionally, Diener discloses the first and second sets of collected data (i.e., spectrum activity information) include signal-to-ratio (SNR) measurements across the wireless channels in those networks. Diener teaches “comput[ing] a signal to interference and noise ratio (SINR) and perform[ing] further spectrum analysis”. (EX1003, 59:11-13). A POSITA would have considered SINR to include measurements related to SNR. (EX1002 ¶188; *see also* EX1003, 8:7-14 (“Minimizing interference is expressed in terms of signal-to-noise ratio (SNR)”).

Additionally, a POSITA would have understood, based on the teachings of Diener, that these SINR computations are done by a client device (e.g., an STA or AP) and form part of the spectrum activity information and intelligence transmitted to the NMS (i.e., first and second sets of collected data). (*Id.* ¶188). Because Diener teaches collecting data across multiple networks—each of which would include multiple channels as known to a POSITA—a POSITA would have found it obvious that SINR would be measured across a plurality of channels within each network. (EX1002 ¶189).

Thus, Diener teaches and/or renders obvious claim 16.

17. Claim 17

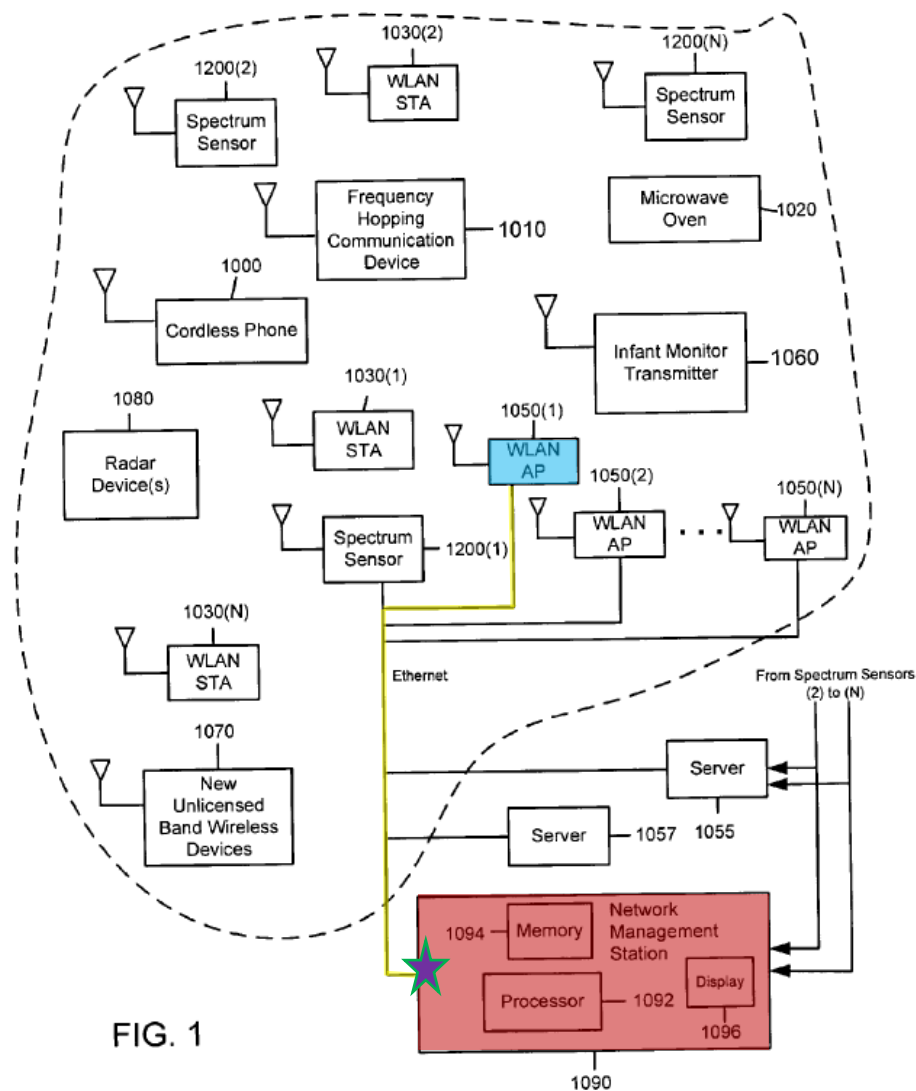
Diener discloses “the communication system of claim 16 wherein the at least one policy adjusts a transmission power level across a first wireless channel within

the plurality of wireless channels.” Diener teaches and/or renders obvious the communication system of claim 16. Additionally, Diener discloses a policy the includes “adjusting the transmit power (transmit power control—TPC)”. (*Id.*, 9:60-65, Fig. 5 (“Transmit Power Control” as a spectrum action after the policy step), 19:14-15, 19:62-64 (“adjusting the transmit power of an AP”)). A POSITA would have understood that the action of adjusting the transmit power of an AP would result in an adjustment of transmission power level across a wireless channel over which that AP is transmitting data. (EX1002 ¶191).

Thus, Diener teaches and/or renders obvious claim 17.

18. Claim 18

Diener discloses “the communication system of claim 1 wherein the two interfaces within the first, second and third interfaces are the same interface.” Diener teaches and/or renders obvious the communication system of claim 1. As explained regarding elements 1(a) and 1(e), the first and third interfaces on the NMS are the same interface. As shown below, the first and third interfaces are the point of interaction between WLAN AP 1050(1) and the NMS:



(*Id.*, Fig. 1 (annotated)). This interface is both: (1) the interface where collected data is received from WLAN AP 1050(1) by NMS; and (2) the interface where policy information and the control signal is transmitted from NMS. A POSITA would have recognized that the first and third interfaces on the NMS are the same interface. (EX 1002 ¶193).

Thus, Diener teaches and/or renders obvious claim 18.

19. Claim 19

Diener teaches and/or renders obvious claim 19.

i. Claim 19, preamble

To the extent the preamble is limiting, it is disclosed by Diener. The preamble recites: “A method for managing a plurality of networks, the method comprising.” Diener discloses “a system and method for managing communication with a plurality of wireless client devices operating in a radio frequency band shared by other types of devices.” (EX1003, 3:49-53 (emphasis added)). Moreover, Diener teaches “one or more wireless networks each comprising multiple devices or nodes that operate in the shared frequency band”. (*Id.*, 5:50-52).

Diener also teaches that a network expert—in conjunction with the NMS—has a “global view of the spectrum activity of the entire region . . . which may include multiple wireless networks of the same or different varieties”. (*Id.*, 21:20-55). Accordingly, a POSITA would have recognized that the method of managing communication with a plurality of wireless devices includes managing a plurality of different networks. (EX1002 ¶¶198-199).

Thus, Diener teaches the preamble of claim 19.

ii. Element 19(a)

Diener discloses “receiving, by a server, from network monitoring devices that monitor data associated with an operation of two or more communication units located in at least two networks, the data comprising a parameter.”

As explained regarding claim 1, Diener teaches an NMS, which is a remote server, which receives data from the communication units (i.e., WLAN APs) and spectrum sensors (i.e., network monitoring devices). As explained regarding claim 1, that received data is associated with WLAN APs 1050(1) and 1050(2) located in two networks.

A POSITA would have also understood that the spectrum information collected (i.e., data) is monitored. (EX1002 ¶¶203, 205-206). Diener teaches the use of “real-time spectrum analysis component” called SAGE which may be part of an AP or part of a spectrum sensor. (EX1003, 4:38-40, 26:26-28, 72:60-65, Fig. 6). Diener teaches: “The SAGE 20 obtains real-time information about the activity in a frequency band.” (*Id.*, 11:40-41). “For example, when an interference condition (presence of another signal in the frequency band of operation, adjacent frequency channel of operation, etc., of a device or network of devices in the frequency band) is detected, a real-time alert may be generated to advise a network administrator about the condition.” (*Id.*, 9:37-42). A POSITA would have understood that this data is monitored to indicate, for example, the current presence

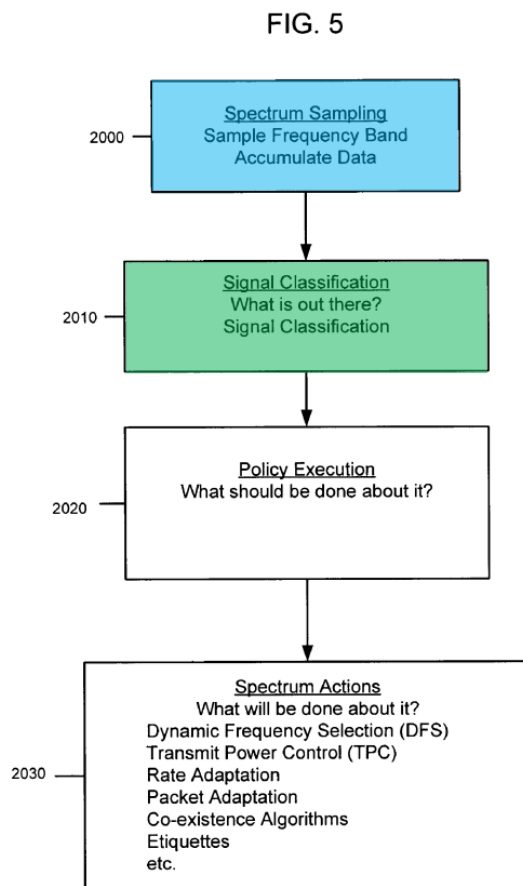
of other devices on a frequency channel such that a real-time alert may be generated to address that current condition. (*Id.* ¶205).

Additionally, Diener explains that obtaining spectrum activity information “is referred to as spectrum sampling . . . and may involve sampling radio frequency energy in the entire frequency band for a time period or scanning sub-bands of the frequency band (on demand or periodically), to determine spectral-based and time-based activity in the frequency band.” (*Id.*, 8:27-32 (emphasis added)). A POSITA would have considered scanning sub-bands periodically to determine activity to constitute monitoring. (EX1002 ¶206).

Diener discloses that the monitored data is associated with the operation of two or more communication units (i.e., wireless client devices such as a WLAN APs 1050(1) and 1050(2)). For example, Diener explains that spectrum information “describe[es] the radio frequency environment (activity in the frequency band)” and “may include information identifying signals that are occurring in the frequency band.” (EX1003, 3:60-4:2 (emphasis added); *see also id.*, 8:59-62 (the collected data “comprise[s] information related to the activity in the frequency band as a whole”); Fig. 4). Additionally, this spectrum profile or activity information (i.e., data) “is gathered at multiple devices (such as at multiple spectrum sensors of a sensor overlay network” (e.g., pertaining to “one or more APs” operating in the frequency band). (*Id.*, 8:34-40). Thus, the data is associated

with two or more communication units (e.g., WLAN APs 1050(1) and 1050(2)) which, as is explained regarding claim 1, may be associated with different networks.

The monitored spectrum activity information includes a parameter. The spectrum sampling step “accumulate[s] data” which is then classified as part of a signal classification step as shown in Figure 5:



(*Id.*, Fig. 5 (annotated)). According to Diener, signal classification “involves processing the output of the spectrum sampling step to measure and classify

signals based on characteristics such as power, duration, bandwidth, frequency hopping nature.” (*Id.*, 9:25-29 (emphasis added); *see also id.*, 15:60-16:31 (depicting a table of parameters which are received by the server)). A POSITA would have understood that the listed characteristics (power, duration, bandwidth, frequency hopping nature) to be parameters as claimed that are part of the spectrum data and obtained during spectrum sampling. (EX1002 ¶207; EX1003, 9:33-37, 15:16-21 (the parameters are “obtained directly from the signal detector output of the SAGE”)). During signal classification those parameters are used to identify the appropriate classification for “the signals/devices detected” which may be a cordless phone, microwave oven, or 802.11 WLAN devices. (EX1003, 9:29-34). Accordingly, the monitored parameters are associated with the operation of the communication units (i.e., signals from the 802.11 WLAN devices which are associated with WLAN AP 1050(1) and 1050(2)).

Thus, Diener teaches element 19(a).

iii. Element 19(b)

Diener discloses “processing, by the server, the received data.” As explained regarding element 1(d), Diener teaches a processor within the NMS which analyzes the received data. A POSITA would have understood that the analysis performed on this data as described above regarding element 1(d) to be part of the

“processing” of that data. (EX1002 ¶212; *see also* EX1003, 9:22-25 (explaining this data is “processed”)).

Thus, Diener teaches element 19(b).

iv. Element 19(c)

Diener discloses “based on the processed data, determining a policy for at least one of the two or more communication units.” This element is substantively similar to element 1(d) which is taught and/or rendered obvious by Diener. Element 19(c) is broader than element 1(d)—which recites “generat[ing]” the policy rather than “determining” it—thus, Diener discloses this element for the same reasons.

Thus, Diener teaches and/or renders obvious element 19(c).

v. Element 19(d)

Diener discloses “in response to the server detecting a degradation of network performance in at least one network within the plurality of networks, communicating the policy to at least one or more communication units that implement one or more algorithms that use the parameter at least one rule or condition for the one or more communication units to improve a performance of the one or more communication units.”

As is explained regarding element 1(e), Diener discloses communicating the policy in response to a determination of a change in performance within the first or

second network. This change in performance corresponds to a detection of interference between device signals which a POSITA would have understood to be a degradation of network performance. (EX1003, 6:2-5; EX1002 ¶217 (citing EX1003, 7:33-38); EX1002 ¶¶218-220). Diener specifically teaches “[c]ertain actions can be recommended or automatically taken based on a determine[d] cause of the performance degradation.” (*Id.*, 14:53-55 (emphasis added)). These actions are recommended as part of a policy that is transmitted to, for example, the WLAN AP 1050(1). (*See* elements 1(d)-1(e), *supra*). And Diener teaches that this policy instructs the WLAN AP 1050(1) to implement one or more algorithms, as is explained regarding claim 2. (*Id.*).

A POSITA would have understood that the one or more algorithms employed by WLAN AP 1050(1) in response to the policy would use the parameter previously received by NMS. (EX1002 ¶¶222, 225-226). As explained regarding element 19(a), the spectrum activity information received by the server includes monitored parameters such as power, duration, bandwidth, and frequency hopping nature. (EX1003, 9:25-29). Diener explains that spectrum aware drivers within the WLAN AP (*see id.*, Fig. 6) employ the controls communicated by the policy by changing “frequency[] of operation, bandwidth of operation, data rate, transmit power, etc.” (*Id.*, 11:20-33). These changes are done by applying the appropriate algorithms indicated by the policy (i.e., dynamic frequency selection,

transmit power control, rate adaptation, packet adaptation, etc.). (EX1002 ¶¶222-223, 225; EX1003, Fig. 5, 11:20-33). Accordingly, the algorithms implemented by the WLAN AP in response to the communicated policy use the parameter (e.g., frequency, bandwidth, data rate, transmit power). Diener also explains that these “operational parameters” “may affect a change in the operation of the AP as well as the STAs that are associated with that AP.” (EX1003, 11:1-19). Thus, the algorithm’s use of the parameter also improves performance of the WLAN AP (i.e., communication unit).

Diener teaches that the communicated policy includes a rule or condition associated with the WLAN AP’s implementation of the one or more algorithms to mitigate or avoid interference. A POSITA would have understood that the policies, communicated to the WLAN APs “affect changes in the one or more APs” by instructing them to employ specific interference mitigation or avoidance algorithms, include rules associated with the requisite algorithms. (EX1002 ¶227). Diener refers to those rules as “controls” which are instructions communicated by control signals to the WLAN APs dictating the specified action to be taken. (EX1003, 10:19-36). Diener explains that the controls (i.e., rules) include:

[A]ssigning a device to a different frequency sub-band or channel in the frequency band (dynamic frequency selection—DFS), network load balancing (on the basis of channel frequencies or time), **adjusting** the transmit power (transmit power control—TPC), **adjusting** the communication data rate, **adjusting** a parameter of the transmitted data

packet, executing interference mitigation or co-existence algorithms, executing spectrum etiquette procedures, executing spectrum priority schemes, or re-assigning STAs to APs in a WLAN.

(*Id.*, 9:60-10:2 (emphasis added)). A POSITA would have recognized that these controls operate as rules instructing the WLAN AP to take a specific action by implementing an algorithm (such as dynamic frequency selection, transmit power control, rate adaptation, packet adaptation, or co-existence algorithms) to comply with the policy. (*Id.*). And the rules improve the performance of the WLAN APs by allowing them to mitigate or avoid interference pursuant to the policy.

Thus, Diener teaches element 19(d). In sum, Diener teaches and/or renders obvious claim 19.

20. Claim 20

Diener discloses “the method of claim 19 wherein determining the policy comprises selecting the policy from a set of policies that are stored on the one or more communication units and wherein the communicated policy updates the one or more algorithms implemented on the one or more communication units.” Diener teaches and/or renders obvious the method of claim 19. Additionally, Diener discloses examples of specific policies which may be used by the AP. (EX1003, 73:12-17, 73:20-45, Fig. 43). Diener also provides a table which indicates types of data stored in a database, including control policies, at the AP:

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Client Station	Spectrum Profile (Identified Interferers)		Selected Client Specific Control Therapy(ies)
1	Bluetooth TM piconet	Microwave Oven	1. Hold Data Rate High 2. Dynamic Packet Fragmentation (change fragmentation threshold) 3. Packet Scheduling
2	Video Camera (constant interferer)		Reassign to a different AP (or a different channel on same AP if a multi-channel AP).
3	Cordless Phone		Maintain Data Rate High
4	Radar		Reassign to a different AP (or a different channel on same AP if a multi-channel AP).
5	Microwave Oven		1. Hold Data Rate High 2. Dynamic Packet Fragmentation (change fragmentation threshold) 3. Packet Scheduling
...			
N			

(*Id.*, 73:20-45). Diener teaches that “[n]ew or updated policies created . . . may be downloaded by the L2 policy manager 340 to the L1 policy engine.” (*Id.*, 71:41-44). The L1 policy engine is “in a host processor of the communication device.” (*Id.*, 65:11-13). A POSITA would have understood the L1 policy engine may be within the host processor of the AP (i.e., communication unit). (EX1002 ¶231).

Diener explains that a user can “select the spectrum policy to be executed”. (EX1003, 55:48-49). A POSITA would have understood that the policies would, therefore, be stored on the device such that a user could select one. (EX1002 ¶231). Additionally, a POSITA would have found it obvious, based on the teachings of Diener, to store policies on the AP (i.e., communication unit). (*Id.*).

Diener maintains desirable performance by determining an interference avoidance or mitigation policy at a server that instructs WLAN APs to implement specific actions. The generated policy is based on signal classification and Diener explains that the “signal classification database may be updated with the reference data for new devices that use the frequency band.” (*Id.*, 15:14-16). Diener further explains that policies are generated “based on conditions determined to be occurring in the frequency band” and “[t]his body of information may be updateable to account for new devices that operate in the frequency band and/or changing regulations concerning requirements for the frequency band.” (*Id.*, 19:34-40 (emphasis added)). Diener also teaches that “[n]ew or updated policies [may be created]”. (*Id.*, 71:42-44 (emphasis added)). Accordingly, a POSITA would have recognized that NMS may update the generated policy when there is a change in operation of the frequency band as indicated by new devices operating in the band or new regulations. (EX1002 ¶232).

A POSITA would have further understood that the updated policy would likewise update the algorithm to be implemented by the AP in response to the control signal. (*Id.*). As is explained regarding claim 2, Diener teaches policies that involve an implementation of an algorithm. To the extent the updated policy invoked a different algorithm or a modification to the existing algorithm (e.g., a different data rate or transmission power), a POSITA would have understood that

the updated policy would require an update to the algorithms implemented on the WLAN AP. (EX1002 ¶232).

Thus, Diener teaches and/or renders obvious claim 20.

21. Claim 21

Diener teaches and/or renders obvious the method of claim 19. The remainder of claim 21 is substantively similar to claim 11, which is taught by Diener.

Thus, Diener teaches and/or renders obvious claim 21.

22. Claim 22

Diener teaches and/or renders obvious the method of claim 19. The remainder of claim 22 is substantively similar to claim 12, which is taught by and/or obvious over Diener.

Thus, Diener teaches and/or renders obvious claim 22.

23. Claim 23

Diener discloses “the method of claim 19 wherein the at least one rule or condition comprises an adjustment to a wireless transmission band within the plurality of networks.” Diener teaches and/or renders obvious the method of claim 19. Additionally, as explained regarding element 19(d), Diener teaches “controls” (i.e., rules) that instruct the WLAN AP to take a recommended action.

One such action taught by Diener in a specific example is an adjustment to the percentage of a frequency band that may be used by a dynamic rate adapting device. (EX1003, 62:31-48). The rule instructs an AP to limit the dynamic rate adapting device to 50% or 75% of the band to allow a frequency hopping network use of the band. (*Id.*). A POSITA would have understood that rule would require the AP to adjust the device's use of the frequency band which would constitute an adjustment to wireless transmission band within the multiple networks taught by Diener. (EX1002 ¶239).

Thus, Diener teaches and/or renders obvious claim 23.

C. Ground 2: Obviousness of Claims 1-23 Based on Diener in View of Shaffer

1. Claim 1

Claim 1 is obvious over Diener in view of Shaffer.

i. Claim 1, Preamble-Element 1(c)

As explained in Ground 1, Diener teaches the preamble of claim 1 and elements 1(a)-1(c).

ii. Element 1(d)

Element 1(d) is obvious over Diener in view of Shaffer. As explained regarding element 1(d) of Ground 1, Diener teaches a processor coupled to the memory which a POSITA would have understood to generate a policy based on an analysis of the first and second sets of collected data. Diener also teaches that this

received data is used to determine actions to be taken by the wireless devices or APs (i.e., communication units) “to avoid interfering with other signals, and in general to optimize simultaneous use of the frequency band with the other signals.” (EX1003, 2:18-24). In the combined Diener-Shaffer system, a POSITA would have understood that the policy generated by the processor of Diener would include a recommended action to implement one of the two algorithms taught by Shaffer. (EX1002 ¶271).

Combination of Diener and Shaffer: As explained in Ground 1, Diener teaches determining a policy of interference mitigation or avoidance, including specific actions to be taken by the APs in response to received data and to improve the performance of the system. Diener teaches that two such actions may include “adjusting the transmit power” or “executing an RTS/CTS sequence” when interference is detected in a wireless network. (EX1003, 9:64-65, 19:41-59). Shaffer teaches “two new, non-exclusive algorithms to mitigate the hidden neighbor issue” and explains its invention is an improvement over prior RTS/CTS techniques in response to a hidden node. (EX1004, [0058], [0052]-[0053]).

In the combined system of Diener and Shaffer, a POSITA would have recognized that the policy of Diener would include spectrum actions of implementing one or both algorithms taught by Shaffer. (EX1002 ¶¶246, 271). The first algorithm is a “cost function . . . used for optimizing route selection to

minimize interference from hidden neighbors.” (*Id.*, [0058]). The second algorithm “optimizes the transmission power and/or receiver sensitivity of nodes in the mesh in order to minimize the number of hidden neighbors while attempting to have a minimal impact on the overall delay through the network.” (*Id.*).

Shaffer further discloses that the purpose of these cost protection and transmission power algorithms is to “reduce the impact of hidden nodes in wireless networks by accounting for hidden nodes wireless parameter selection and routing decisions.” (*Id.*, [0056]). In the combined Diener-Shaffer system, a POSITA would have recognized that when Diener’s NMS generates a policy, it sends a control signal to the relevant APs instructing them to implement either the first algorithm of Shaffer (i.e., cost function) or the second algorithm of Shaffer (i.e., transmission power) based on the received spectrum activity information, including parameters. (EX1002 ¶271).

Motivation to Combine Diener and Shaffer: A POSITA would have been motivated to combine the system of Diener with the two-algorithm policy taught by Shaffer. (EX1002 ¶¶244-257). Diener and Shaffer are within the same field of communications systems. (EX1003; EX1004). And, as noted, Diener teaches a “policy execution step 2020” that takes the processed spectrum activity information which may, for example, indicate an interference condition, and dictates “what, if anything, should be done” by the AP in response such, as

“adjusting the transmit power” or “executing interference mitigation or co-existence algorithms.” (EX1003, 9:22-67). Diener also acknowledged certain mitigation algorithms—such as RTS/CTS—may be needed to mitigate a hidden node issue. (EX1003, 19:41-59). By 2011, POSITAs had knowledge of these interference mitigation algorithms and the ’313 patent itself acknowledges existing protocols used to address the “Hidden Node problem”. (EX1001, 17:31-36; EX1004, [0050]-[0054], [0058] (describing prior art interference algorithms and two new algorithms to overcome the hidden node problem); EX1024, 9, 13 (describing protection mechanism algorithms, such as RTS/CTS and CTS-to-self to avoid interference)). Thus, a POSITA reading Diener’s teachings of a policy that implements transmission power and interference mitigation algorithms would have been motivated to look to other references, such as Shaffer, that discloses those specific algorithm implementations. (EX1002 ¶¶245-246, 248).

Diener and Shaffer both teach communication systems operating in wireless networks. (EX1003; EX1004). Additionally, Diener and Shaffer both utilize a “network administrator” to make determinations and recommendations to the specific devices (e.g., APs or nodes) in the network. (EX1003, 9:37-46; EX1004, [0103]). As noted, Diener teaches a “hidden node” problem that Diener’s system will attempt to address with, for example, RTS/CTS. (EX1003, 19:54-59). Shaffer teaches that its two new algorithms—which are specifically intended to address the

hidden node problem—are an improvement over conventional techniques such as RTS/CTS which may “not always [be] suitable for all types of networks”. (EX1004, [0053]).

Moreover, Diener teaches having an AP to adjust transmit power in response to a policy determined at a server and Shaffer provides two specific algorithms relating to transmission power and interference mitigation to avoid collisions with hidden node transmissions. (EX1003, 9:22-67; EX1004, [0058]). A POSITA would have known that the hidden node algorithms taught by Shaffer, including the cost function and transmission power algorithms, could be the type of transmission power adjustments and interference mitigation algorithms referenced in Diener. (EX1002 ¶250).

A POSITA would have also had a reasonable expectation of success in implementing Shaffer’s two-algorithm policy in Diener’s system. (*Id.* ¶¶253-257). Diener and Shaffer both teach systems is operable in a wireless network (specifically, a WLAN), that comprises multiple nodes. (EX1003, 5:50-52; EX1004, [0024]). And both Diener and Shaffer teach that their systems, and corresponding communication devices, are operable on the IEEE 802.11 frequency band. (EX1003, 7:45-62; EX1004, [0027]). Diener teaches a server that is communicatively coupled to the APs such that it may transmit a policy, such as a policy indicating which of the two algorithms of Shaffer the AP should implement

to best avoid a hidden node. Moreover, because both Diener and Shaffer teach a network administrator that can control an AP, a POSITA would have recognized that Shaffer's cost function and power transmission algorithms could easily be included within the controls of Diener's policies and implemented by the APs in Diener's system. (EX1002 ¶¶253-255). A POSITA would have found no technological hurdles to implementing the specific two-algorithm policy found in Shaffer within Diener's system. (*Id.* ¶¶256-257).

Thus, Diener in view of Shaffer renders obvious element 1(d).

iii. Element 1(e)

Element 1(e) is obvious over Diener in view of Shaffer. As explained regarding element 1(e) of Ground 1, Diener discloses a third interface coupled to the processor which transmits the policy in response to the determination of a change in performance in the first or second network. In the combined Diener-Shaffer system, a POSITA would have understood that the communicated policy instructs an AP to invoke the cost function algorithm and/or a power transmission algorithm of Shaffer to reduce the impact of a hidden node in the network. (EX1002 ¶273). And a POSITA would have understood that the APs implement the two algorithms in response to the policy that is communicated by the server. (*Id.*). A POSITA would also have understood that the implementation of Shaffer's two algorithms would constitute a performance-related adjustment as the

algorithms reduce the impact of a hidden node causing interference in the networks. (*Id.*).

The rationale and motivation to combine Diener and Shaffer is explained in Ground 2 regarding element 1(d). Thus, for these reasons and the reasons stated in Ground 1 regarding this element, Diener in view of Shaffer renders obvious element 1(e).

In sum, Diener in view of Shaffer renders obvious claim 1.

2. Claim 2

Diener in view of Shaffer renders obvious the communication system of claim 1 and, in the combined Diener-Shaffer system, the WLAN AP's adjustment within the first network includes implementing one of the two algorithms (cost function or power transmission algorithms) taught by Shaffer. (EX1002 ¶278).

Thus, Diener in view of Shaffer renders obvious claim 2.

3. Claims 3-18

Diener in view of Shaffer renders obvious the communication system of claim 1 and, as explained in Ground 1, Diener teaches the remaining limitations of these claims.

Thus, Diener in view of Shaffer renders obvious claims 3-18.

4. Claim 19

Diener in view of Shaffer renders obvious claim 19.

i. Claim 19, preamble-Element 19(b)

As explained in Ground 1, Diener teaches the preamble of claim 19, elements 19(a), and 19(b).

ii. Element 19(c)

This element is substantively similar to element 1(d). Thus, for the reasons discussed regarding element 1(d) in Ground 2, including the rationale and motivation to combine Diener and Shaffer, Diener in view of Shaffer renders obvious renders obvious element 19(c).

iii. Element 19(d)

As explained regarding element 19(d) in Ground 1, Diener teaches in response to the server detecting a degradation of network performance in at least one network, communicating the policy to WLAN AP 1050(1) which implements algorithms that use the parameter at least one rule or condition to improve a performance of the WLAN AP. In the combined Diener-Shaffer system, as explained in element 1(e) of Ground 2, a POSITA would have understood WLAN AP 1050(1) to specifically implement one of the two algorithms taught by Shaffer in response to the communicated policy. (EX1002 ¶327). The rationale and motivation to combine Diener and Shaffer is explained regarding element 1(d) in Ground 2.

Thus, Diener in view of Shaffer renders obvious element 19(d). In sum,
Diener in view of Shaffer renders obvious claim 19.

5. Claims 20-23

Diener in view of Shaffer renders obvious the method of claim 19 and, as
explained in Ground 1, Diener teaches the remaining limitations of these claims.

Thus, Diener in view of Shaffer renders obvious claims 20-23.

IX. SECONDARY CONSIDERATIONS

Patent Owner has not identified any evidence of secondary indicia of non-obviousness for the '313 patent. Accordingly, there is no objective evidence of non-obviousness that might warrant a finding that the Challenged Claims are patentable. (EX1002 ¶¶338-339). Should Patent Owner identify any evidence of non-obviousness in response to this Petition, Petitioner reserves the right to respond in its Reply.

X. CONCLUSION

Petitioner respectfully requests institution of review on claims 1-23 and a finding that they are unpatentable.

Petition for *Inter Partes* Review of
U.S. Patent No. 11,770,313 B2

Respectfully submitted,

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Dated: October 25, 2024

Petition for *Inter Partes* Review of
U.S. Patent No. 11,770,313 B2

CERTIFICATE OF SERVICE

Pursuant to 37 C.F.R. §§ 42.6(e) and 42.105, I hereby certify that on October 25, 2024, I caused a complete copy of this Petition for *Inter Partes* Review of U.S. Patent No. 11,770,313 and all exhibits, to be served on the Patent Owner of the subject Patent as follows:

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CERTIFICATE OF COMPLIANCE

Petitioner certifies:

1. This Petition complies with the type-volume limitations of 37 C.F.R. § 42.24(a)(1)(i) and contains 13,858 words, excluding the portions of the Petition exempted by 37 C.F.R. § 42.24(a)(1); and

2. This Petition complies with the typeface and style requirements of 37 C.F.R. §§ 42.6(a)(2)(ii), 42.6(a)(2)(iii) and has been prepared in proportionally spaced, 14-point Times New Roman font using Microsoft Word Version 2308 (2024).

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