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www.uspto.gov**ELECTRONIC ACKNOWLEDGEMENT RECEIPT**APPLICATION #
90/019,702RECEIPT DATE / TIME
06/02/2025 07:08:10 PM Z ETATTORNEY DOCKET #
USTAP030D.RE**Title of Invention**

SPECTRUM-ADAPTIVE NETWORKING

Application Information

APPLICATION TYPE Utility / ex parte reexam

PATENT # RE47720

CONFIRMATION # 8522

FILED BY JENNIFER PICINI

PATENT CENTER # 70693720

FILING DATE 10/14/2024

CUSTOMER # 134688

FIRST NAMED
INVENTOR - RE47720CORRESPONDENCE
ADDRESS -

AUTHORIZED BY James Lennon

Documents**TOTAL DOCUMENTS: 32**

DOCUMENT	PAGES	DESCRIPTION	SIZE (KB)
2025-06-02-90019702-IDS.pdf	8	Information Disclosure Statement (IDS) Form (SB08)	1316 KB
NPL_2025-04-29 03 Petition for Inter Partes Review.pdf	91	Non Patent Literature	928 KB
NPL_Ex1004 - Lansford CV.pdf	9	Non Patent Literature	274 KB
NPL_Ex1003 - Lansford Declaration.pdf	137	Non Patent Literature	1214 KB
NPL_Ex1005 - US20030043732A1 - Walton.pdf	31	Non Patent Literature	2448 KB
NPL_Ex1001-USRE47720.pdf	42	Non Patent Literature	3451 KB

NPL_Ex1002 - RE47720 File History.pdf	357	Non Patent Literature	16967 KB
NPL_Ex1006 - US20020006167A1 - McFarland.pdf	15	Non Patent Literature	1103 KB
NPL_Ex1008 - US20020102940A1 - Bohnke.pdf	21	Non Patent Literature	1222 KB
NPL_Ex1010 - US5726978 - Frodigh.pdf	20	Non Patent Literature	1626 KB
NPL_Ex1009 - 7483711 File History.pdf	166	Non Patent Literature	7321 KB
NPL_Ex1007 - IEEE-802.11a.pdf	90	Non Patent Literature	24604 KB
NPL_Ex1014 - US7046746.pdf	16	Non Patent Literature	1269 KB
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NPL_Ex1013 - US20030235147A1.pdf	28	Non Patent Literature	2017 KB
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NPL_Ex1021 - Declaration of David Ringle_Part 3 of 3.pdf	43	Non Patent Literature	13638 KB
NPL_Ex1020 - Hall-Ellis Declaration-Part 2 of 2.pdf	90	Non Patent Literature	24257 KB
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NPL_2025-04-29 03 Petition for Inter Partes Review.pdf	330D869BBED3F3980B3767A95D236BCB567922573003DED13 A709EF0CE8FDD80D20F3F04E17D60737CDEA0015644D1803 C3E8F8EA118B85EEDB07C730C914CB3
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NPL_Ex1008 - US20020102940A1 - Bohnke.pdf	0C26F73597E101DF98DEFC8C51177A9E7928826964F2BD899 37BE4A84E3C4610503ADB1725B389EA2E49610FC991920A1B F5E0961420F98EEDAB33EF341230DE
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NPL_Ex1009 - 7483711 File History.pdf	CE6C079735E5B421B98A2857058D1EEDD16AEE067B5FA5062 9190535DB2567739FA293DB55435F35754D81F7F40D11DD4E2 BD8D8827F15609A1B6346CD44ACEF
NPL_Ex1007 - IEEE- 802.11a.pdf	AC2B5BB71E59661F7CB48DDF7E20BDB04A5BE9A019BAB2D A37F4B4340B1A3257495DDFED771C51640A5CFA9AE20A63B7 1044B1F580545241DADA08BF77E14690
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NPL_Ex1021 - Declaration of David Ringle_Part 3 of 3.pdf	BEFF3183D9CC560FDFBB64651E9EA6346407BD3EF2A57C2C 93D57BDF4566E8B9BBA04B7AA9EA22E456C6941F7CA90019 C2E217250EBD27149779572F30DF07DC
NPL_Ex1020 - Hall-Ellis Declaration-Part 2 of 2.pdf	BD8BCA3841A0E163A4E798BBA5FFFA038A1E0485CC4D8229 977446D18C5AB49B7FD8F7EFC89AD31A9CA90EE136E66B8B 2777030ADEDE1D6FF487463E3DBCBFEA
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NPL_Ex1025 - US6556553.pdf	01D1A26C2EBBBEADDEB0337C28BF81B6FA2AB2DA0F37951E BE203A16C9D051C8E82233826189CCBEE0498036099B786CE 815E8228EAFD1F2BCAA3D5D58BE0CC7B
NPL_Ex1022 - Peterson - Computer Networks A Systems Approach.pdf	E96BD8DE73252ABFD4482201869A78DEFA6695C1F65EDBA1 460660C25527AED9E64A77B1405A279855475DD58CD5C53DF 53EC2BDFB0E51D341B96D8095B4270E
NPL_Young-Bae Ko-Medium Access Control Protocols.pdf	6295D2FFD1CB6CDE97111C606BD0216B8F790FD5DACBF141 B809CB8C8D544CC7F5E0BDAAE7B18F803E687A8EAAA6D79 8F0754DC3F7AB613F00AEF12316BB91D5
NPL_US_60-493937-File Wrapper.pdf	0F8FABD1FC2DA8F067235140F795BE894EB273BBB523DF4F E142CFFD53E9DE849CE40CEBD1EA04D8DD59652B2212A41F 36E498AE43C843991DF4EFC395701519
NPL_Ramanathan-On the Performance.pdf	08357796948763B4B0F15CF8258F0B919BBA9DF24E67B3F1C8 E1DC808ECDF6876907F46CAB7A03BD6256CDC51B1994605 45590F0CDE45B3A4AC15823F100BFC

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0DD7523EC6E6B0A32C3F9784C94DB9304203792442A2B741C
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	Filing Date	2024-10-14
	First Named Inventor	RE47720
	Art Unit	3992
	Examiner Name	Matthew E. Heneghan
	Attorney Docket Number	USTAP030D.RE

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	1	Petition for Inter Partes Review of US Patent No. RE47,720 (IPR2025-00838), filed April 29, 2025 (91 pages)	☐
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	3	Exhibit 1002 - Prosecution File History of U.S. Patent Application No. 15/898,404, issued as the '720 Patent (357 pages)	☐
	4	Exhibit 1003 - Declaration of James Lansford, Ph.D. under 37 C.F.R. § 1.68 (137 pages)	☐
	5	Exhibit 1004 - Curriculum Vitae of James Lansford, Ph.D. (9 pages)	☐
	6	Exhibit 1005 - U.S. Application Publication No. 2003/0043732 by J. Walton et al. (31 pages)	☐
	7	Exhibit 1006 - U.S. Application Publication No. 2002/0006167 to W. McFarland (15 pages)	☐
	8	Exhibit 1007 - IEEE Std 802.11a-1999, Part 11: Wireless LAN Medium Access Control (MAC) and Physical Layer (PHY) specifications, High-speed Physical Layer in the 5 GHz Band, Sept. 1999 (90 pages)	☐

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Examiner Name	Matthew E. Heneghan
Attorney Docket Number	USTAP030D.RE

9	Exhibit 1008 - U.S. Application Publication No. 2002/0102940 to R. Bohnke et al. (21 pages)	☐
10	Exhibit 1009 - Prosecution File History of U.S. Patent Application No. 10/689,763, issued as U.S. Patent No. 7,483,711 (166 pages)	☐
11	Exhibit 1010 - U.S. Patent No. 5,726,978 to C. Frodigh et al. (20 pages)	☐
12	Exhibit 1011 - S. Catreux et al., "Adaptive Modulation and MIMO Coding for Broadband Wireless Data Networks," IEEE Communications Magazine, pp. 108-115, June 2002 (8 pages)	☐
13	Exhibit 1012 - App. No. 90/019702, Ex Parte Reexamination of the '720 patent, Exhibit AA (88 pages)	☐
14	Exhibit 1013 - U.S. Patent Publication No. 2003/0235147 to J. Walton, et al. (28 pages)	☐
15	Exhibit 1014 - U.S. Patent No. 7,046,746 to R. Kearney et al. (16 pages)	☐
16	Exhibit 1015 - R. Van Nee and R. Prasad, OFDM for Wireless Multimedia Communications (2000), Chapters 1 and 2 (63 pages)	☐
17	Exhibit 1016 - U.S. Patent No. 7,369,841 to C. Uhlik et al. (9 pages)	☐
18	Exhibit 1017 - A. Seyedi and G. Saulnier, "A Distributed Algorithm for Dynamic Sub-Channel Assignment in a Multi-User OFDM Communication System," Proceedings of the 11th IEEE Signal Processing Workshop on Statistical Signal Processing, Aug. 8, 2001. (397 pages)	☐
19	Exhibit 1018 - Merriam Webster Collegiate Dictionary Tenth Edition, Merriam-Webster Inc. (1993) (selected pages) (7 pages)	☐

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	20	Exhibit 1019 - H. Newton, Newton's Telecom Dictionary, CMP Books (2000) (selected pages) (4 pages)	☐
	21	Exhibit 1020 - Declaration of Sylvia Hall-Ellis (250 pages)	☐
	22	Exhibit 1021 - Declaration of David Ringle (176 pages, in three files)	☐
	23	Exhibit 1022 - L. Peterson and B. Davie, Computer Networks: A Systems Approach, Morgan Kaufman Publishers, Inc. (1996) ("Peterson") (Chapter 7) (63 pages)	☐
	24	Exhibit 1024 - Lenovo Group Limited's Notice of Sotera Stipulations for U.S. Patent No. RE47,720, USTA Technology, LLC v. Lenovo Group Limited et al, 4-24-cv-00515, Dkt. 60, filed April 25, 2025 (3 pages)	☐
	25	Exhibit 1025 - U.S. Patent No. 6,556,553 to B. Palmer et al. (10 pages)	☐
	26	US Provisional Patent Application No. 60/493,937, filed August 8, 2003 (67 pages)	☐
	27	Ramanathan, "On the Performance of Ad Hoc Networks with Beamforming Antennas," ACM MobiHoc, Long Beach, CA, pp. 95-105, October 2001 (11 pages)	☐
	28	Young-Bae Ko et al. "Medium Access Control Protocols Using Directional Antennas in Ad Hoc Networks," Proceedings IEEE INFOCOM 2000. Conference on Computer Communications. Nineteenth Annual Joint Conference of the IEEE Computer and Communications Societies (Cat. No.00CH37064), Tel Aviv, Israel, 2000, pp. 13-21 vol.1, doi: 10.1109/INFOCOM.2000.832169 (9 pages)	☐

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Signature	/James M. Lennon/	Date (YYYY-MM-DD)	2025-06-02
Name/Print	James M. Lennon	Registration Number	56815

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Attorney Docket Number	USTAP030D.RE

This collection of information is required by 37 CFR 1.97 and 1.98. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 1 hour to complete, including gathering, preparing and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

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The Privacy Act of 1974 (P.L. 93-579) requires that you be given certain information in connection with your submission of the attached form related to a patent application or patent. Accordingly, pursuant to the requirements of the Act, please be advised that: (1) the general authority for the collection of this information is 35 U.S.C. 2(b)(2); (2) furnishing of the information solicited is voluntary; and (3) the principal purpose for which the information is used by the U.S. Patent and Trademark Office is to process and/or examine your submission related to a patent application or patent. If you do not furnish the requested information, the U.S. Patent and Trademark Office may not be able to process and/or examine your submission, which may result in termination of proceedings or abandonment of the application or expiration of the patent.

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3. A record in this system of records may be disclosed, as a routine use, to a Member of Congress submitting a request involving an individual, to whom the record pertains, when the individual has requested assistance from the Member with respect to the subject matter of the record.
4. A record in this system of records may be disclosed, as a routine use, to a contractor of the Agency having need for the information in order to perform a contract. Recipients of information shall be required to comply with the requirements of the Privacy Act of 1974, as amended, pursuant to 5 U.S.C. 552a(m).
5. A record related to an International Application filed under the Patent Cooperation Treaty in this system of records may be disclosed, as a routine use, to the International Bureau of the World Intellectual Property Organization, pursuant to the Patent Cooperation Treaty.
6. A record in this system of records may be disclosed, as a routine use, to another federal agency for purposes of National Security review (35 U.S.C. 181) and for review pursuant to the Atomic Energy Act (42 U.S.C. 218(c)).
7. A record from this system of records may be disclosed, as a routine use, to the Administrator, General Services, or his/her designee, during an inspection of records conducted by GSA as part of that agency's responsibility to recommend improvements in records management practices and programs, under authority of 44 U.S.C. 2904 and 2906. Such disclosure shall be made in accordance with the GSA regulations governing inspection of records for this purpose, and any other relevant (i.e., GSA or Commerce) directive. Such disclosure shall not be used to make determinations about individuals.
8. A record from this system of records may be disclosed, as a routine use, to the public after either publication of the application pursuant to 35 U.S.C. 122(b) or issuance of a patent pursuant to 35 U.S.C. 151. Further, a record may be disclosed, subject to the limitations of 37 CFR 1.14, as a routine use, to the public if the record was filed in an application which became abandoned or in which the proceedings were terminated and which application is referenced by either a published application, an application open to public inspections or an issued patent.
9. A record from this system of records may be disclosed, as a routine use, to a Federal, State, or local law enforcement agency, if the USPTO becomes aware of a violation or potential violation of law or regulation.

EXHIBIT 2001

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Patent No. : RE47720
Reexam Control No. : 90/019,702
Confirmation No. : 8522
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Title : SPECTRUM-ADAPTIVE NETWORKING

Mail Stop *Ex Parte* Reexam
Central Reexamination Unit
Commissioner of Patents
United States Patent & Trademark Office
P.O. Box 1450
Alexandria, VA 22313-1450

DECLARATION OF DR. KONSTANTINOS PSOUNIS

**37 CFR §1.8
CERTIFICATE OF TRANSMISSION**

I hereby certify that this correspondence is being transmitted via the Office electronic filing system, EFS-Web, addressed to Mail Stop Ex Parte Reexam, Central Reexamination Unit, Commissioner of Patents, United States Patent and Trademark Office, PO Box 1450, Alexandria, Virginia 22313-1450 on the date indicated below.

/Jennifer Picini/
Jennifer Picini

June 2, 2025
Date

USTA EXHIBIT 2026
IPR2025-00838

I, Konstantinos Psounis, declare as follows:

I. INTRODUCTION

1. My name is Konstantinos Psounis. I am over eighteen years of age, of sound mind, and qualified to make the statements set forth in this Declaration. With the exception of the legal principles counsel has supplied to me, all the facts and statements contained herein are within my personal knowledge and are in all respects true and correct.

2. I have been retained as an expert witness by Patent Owner USTA Technology LLC (“USTA” or “Patent Owner”). I have been asked to submit this declaration in response to a non-final office action (“Office Action” or “OA”) in Ex Parte Reexamination No. 90/019,702 instituted based on the request filed by Third Party Requester Unified Patents, LLC (“Requester”).

3. I understand that Requester challenged the validity of Claims 53-56, 64-66, 70, 76, 81-84 and 87-94 (“challenged claims”) of U.S. Patent No. RE47,720 (“the ’720 patent”) and that the Patent Office ordered reexamination in response and issued an Office Action rejecting the challenged claims on March 31, 2025.

4. I understand that the Office Action relies on the following references:

- U.S. Pat. App. Pub. No. 2004/0095907 to Agee et al. (“Agee”; Ex. 1008);
- U.S. Pat. No. 6,628,673 to McFarland et al. (“McFarland”; Ex. 1009); and
- U.S. Pat. No. 6,745,012 to Ton et al. (“Ton”; Ex. 1010).

I understand that the Office Action has rejected the challenged claims under 35 U.S.C. § 103 based on Agee in view of McFarland and Ton.

5. I have been asked to consider whether the challenged claims of the ’720 patent would have been obvious to a person of ordinary skill in the art (“POSITA”) as of the date of the

invention, which I understand is October 22, 2002, based on the grounds identified by Requester and set forth in the Office Action.

6. This declaration contains statements of my opinions and the bases and reasons for those opinions formed to date. I may offer additional opinions based on further review of materials in this proceeding, including opinions and/or testimony of other expert witnesses, or in response to subsequent communications from the Patent Office.

II. QUALIFICATIONS

7. I have summarized in this section some of my educational background, career history, publications, and other relevant qualifications. My full *curriculum vitae* is attached as Exhibit A to this expert declaration.

8. I am a Professor and prior Associate Chair of Electrical and Computer Engineering and Professor of Computer Science at the University of Southern California. I joined the University of Southern California in 2003, after completing my PhD at Stanford University as a Stanford Graduate Fellow.

9. My professional career has spanned more than 20 years. As set forth in Exhibit A, I have extensive experience in the field of networked distributed systems, including the Internet and the web, Wi-Fi and cellular wireless systems, spectrum sharing wireless systems, sensor and IoT wireless systems, mobile ad hoc and delay tolerant wireless systems, data centers and cloud systems, peer to peer systems, and autonomous vehicles/drones systems.

10. I have published more than 100 technical papers in these fields, which have been cited tens of thousands of times. I have also been awarded numerous grants and significant funding from the government and industry leaders to advance these fields. As a result, I have been named an Institute of Electrical and Electronics Engineers (IEEE) Fellow, the highest grade of membership,

for “fundamental contributions in the theory and practice of wireless networks,” and a Distinguished Member of the Association of Computing Machinery (ACM).

11. Throughout my career, I have analyzed, designed, and developed efficient networked distributed systems for the Internet and the Web, Wi-Fi and cellular wireless systems, spectrum sharing wireless systems, sensor and IoT wireless systems, mobile ad hoc and delay tolerant wireless networks, data centers and cloud systems, peer to peer systems, and autonomous vehicles/drones systems. As such, I have acquired extensive expertise in the analysis and development of those systems and associated products.

12. I have extensive experience with and made contributions specifically towards analyzing and designing efficient Wi-Fi, cellular and other wireless systems. In particular, I have received multiple funding awards from the National Science Foundation (NSF), the leading governmental agency for funding computer engineering and computer science research, to work on wireless systems, including Wi-Fi systems. I have also received multiple funding awards from the industry leaders in the area of networking and in particular wireless networking, to work on these systems. I have published several papers in the most selective academic journals and conferences on wireless systems. I have also been the faculty in charge of the entire networking curriculum at the Electrical and Computer Engineering Department at USC for more than a decade and teach networking classes and in particular the graduate wireless networking class yearly.

13. I also have extensive practical experience with networked distributed systems. For example, I was a co-founder of SpaceMUX, Inc. (whose IP was later acquired by Quantenna Communications, Inc.), where I designed and developed systems to increase the speed of wireless networked systems using modern wireless networking technologies and techniques. Also, I was the Technology Architect for Fineground Networks (later acquired by Cisco Systems, Inc.), where

I designed and developed systems to accelerate the delivery of content over the World Wide Web. In addition, for over 20 years both at Stanford University and at the University of Southern California, I have designed and implemented efficient algorithms, protocols and systems for a variety of distributed networked systems, and I have consulted for industrial leaders, and produced prototype systems. I have also applied for and been granted numerous patents, which are owned by network industry leaders and prestigious academic institutions.

14. In sum, I have extensive experience in and familiarity with the fields of networked distributed systems and in particular with wireless networking systems including Wi- Fi systems, and extensive experience and contributions towards the analysis, design and implementation of such systems.

III. MATERIALS CONSIDERED

15. I have considered the following materials in preparing the opinions set forth in this Report:

- the '720 patent (Ex. 1001);
- the Request for Reexamination and exhibits, including Agee (Ex. 1008), McFarland (Ex. 1009), Ton (Ex. 1010), the declaration of Mr. Geier (Ex. 1003), and the claim chart (Ex. AA);
- the Office Action; and
- all other materials cited herein.

16. I have also relied on my knowledge, education, and professional expertise of over 25 years in the areas of wireless communications, telecommunications, networking, and in particular Wi-Fi systems.

IV. LEGAL PRINCIPLES

17. I am not an attorney. For the purposes of this declaration, Patent Owner's counsel has informed me about certain aspects of the law that are relevant to my opinions. I have applied those legal principles in arriving at my conclusions expressed in this declaration.

A. Claim Interpretation

18. I understand that determining whether a patent claim is valid requires a two-step analysis. First, the claim must be construed. Second, the properly construed claim must be compared to the prior art.

19. I am informed that in reexamination, the claims must be given their broadest reasonable interpretation consistent with the specification from the perspective of a person of ordinary skill in the art ("POSITA") at the time of the invention. I also understand that claim construction is a matter of law and that expert testimony may provide helpful background on the technology and the knowledge of a POSITA but is not intended to supplant the Examiner's construction of the claims.

20. In this declaration and for this proceeding, I have applied the broadest reasonable interpretation from the perspective of a POSITA at the time of invention which I understand is October 22, 2002.

B. Anticipation

21. I understand that, in general, the anticipation analysis under 35 U.S.C. § 102 is limited to the use of a single reference. I further understand that portions of additional documents may be relied upon as part of the anticipation analysis if the primary reference incorporates the additional documents by reference. I understand that a reference must identify with particularity what material it incorporates and clearly indicate that it is being incorporated by reference. I also understand that a mere reference to another document is insufficient to incorporate that document

by reference and that any incorporated documents must be publicly available to be properly incorporated by reference.

22. I understand that, although not expressly disclosed, subject matter may be inherently disclosed in a prior art reference where that subject matter is necessarily present in the subject matter disclosed and would be understood to be so by those of ordinary skill in the art. I understand that the fact that a certain result or characteristic may occur or be present in the prior art is not sufficient to establish the inherency of that result or characteristic.

23. I understand that a claim is invalid if each and every element of the claim is disclosed in a single prior art reference with the elements arranged as specified in the claim, either expressly or inherently. I understand that invalidity based on the disclosure of a single prior art reference in this manner is called anticipation.

C. Obviousness

24. I understand that a claim would have been obvious under 35 U.S.C. § 103 if one or more prior art references disclose every claim limitation in such a way so as to render the claim, as a whole, obvious to a person of ordinary skill in the art at the time the purported invention was made.

25. In determining whether or not a patented invention would have been obvious, the following factors should be considered: (a) the scope and content of the prior art; (b) the differences between the prior art and the claims at issue; (c) the level of ordinary skill in the art; and (d) whatever “secondary considerations” may be present.

26. I understand that certain “secondary considerations” may be relevant in determining whether or not an invention would have been obvious, and that these secondary considerations may include commercial success of a product using the invention, if that commercial success is

due to the invention; long-felt but unsolved need for the invention; evidence of copying of the claimed invention by others; industry acceptance; initial skepticism of the invention; failure of others to solve the problem; praise of the invention by others; the taking of licenses under the patents by others; and simultaneous invention by others (which may be an indication that the claimed invention was the result of ordinary skill in the art).

27. I understand that a patent composed of several elements is not proved obvious merely by demonstrating that each of its elements was, independently, known in the prior art. While multiple prior art references or elements may, in some circumstances, be combined to render a patent claim obvious, I understand that I should consider whether there is an apparent reason to combine the prior art references or elements in the way the patent claims. To determine whether such an apparent reason exists to combine the prior art references or elements in the way a patent claims, it will often be necessary to look to the interrelated teaching of multiple patents, to the effects of demands known to the design community or present in the marketplace, and to the background knowledge possessed by a person having ordinary skill in the art.

28. I also understand that when the prior art teaches away from combining prior art references or certain known elements, discovery of a successful means of combining them is more likely to be non-obvious. A prior art reference may be said to teach away from a patent when a person of ordinary skill, upon reading the reference, would be discouraged from following the path set out in the patent or would be led in a direction divergent from the path that was taken by the patent.

29. I also understand that it is not permissible to use hindsight in assessing whether a claimed invention is obvious. Rather, I understand that, to assess obviousness, you must place yourself in the shoes of a person having ordinary skill in the relevant field of technology at the

time the inventions were made who is trying to address the issues or solve the problems faced by the inventor and ignore the knowledge you currently now have of the inventions.

30. I also understand that there are numerous ways in which to articulate the legal standard for obviousness, including: (1) combining prior art elements according to known methods to yield predictable results, (2) simple substitution of one known element for another to obtain predictable results, (3) use of a known technique to improve similar devices (methods, or products) in the same way, (4) applying a known technique to a known device, method, or product ready for improvement to yield predictable results, (5) choosing from a finite number of identified, predictable solutions with a reasonable expectation of success, (6) known work in one field of endeavor may prompt variations of it for use in either the same field or a different one based on design incentives or other market forces if the variations are predictable to one of ordinary skill in the art, and (7) some teaching, suggestion, or motivation in the prior art that would have led one of ordinary skill to modify the prior art reference or to combine prior art reference teachings to arrive at the claimed invention.

D. Person of Ordinary Skill in the Art

31. I understand that the meaning of claim terms and a patent's validity are to be determined from the vantage point of one of ordinary skill in the art at the time of the invention. In determining who would be one of such ordinary skill, I understand it is appropriate to consider criteria such as: (a) the type of problems encountered in the art; (b) prior art solutions to those problems; (c) the rapidity with which innovations are made; (d) the sophistication of the technology; and (e) the education level of active workers in the field.

V. LEVEL OF ORDINARY SKILL IN THE ART

32. For purposes of this declaration, I have been asked to apply the definition of the level of skill the art for a POSITA set forth by Requester, which is (1) an undergraduate degree in electrical engineering or physics, or a closely related field, or similar post-undergraduate education; and (2) two to three years of experience with wireless communications networks. Additional work experience can substitute for specific educational background, and vice versa. My opinions in this declaration are from the perspective of a POSITA as of October 2002.

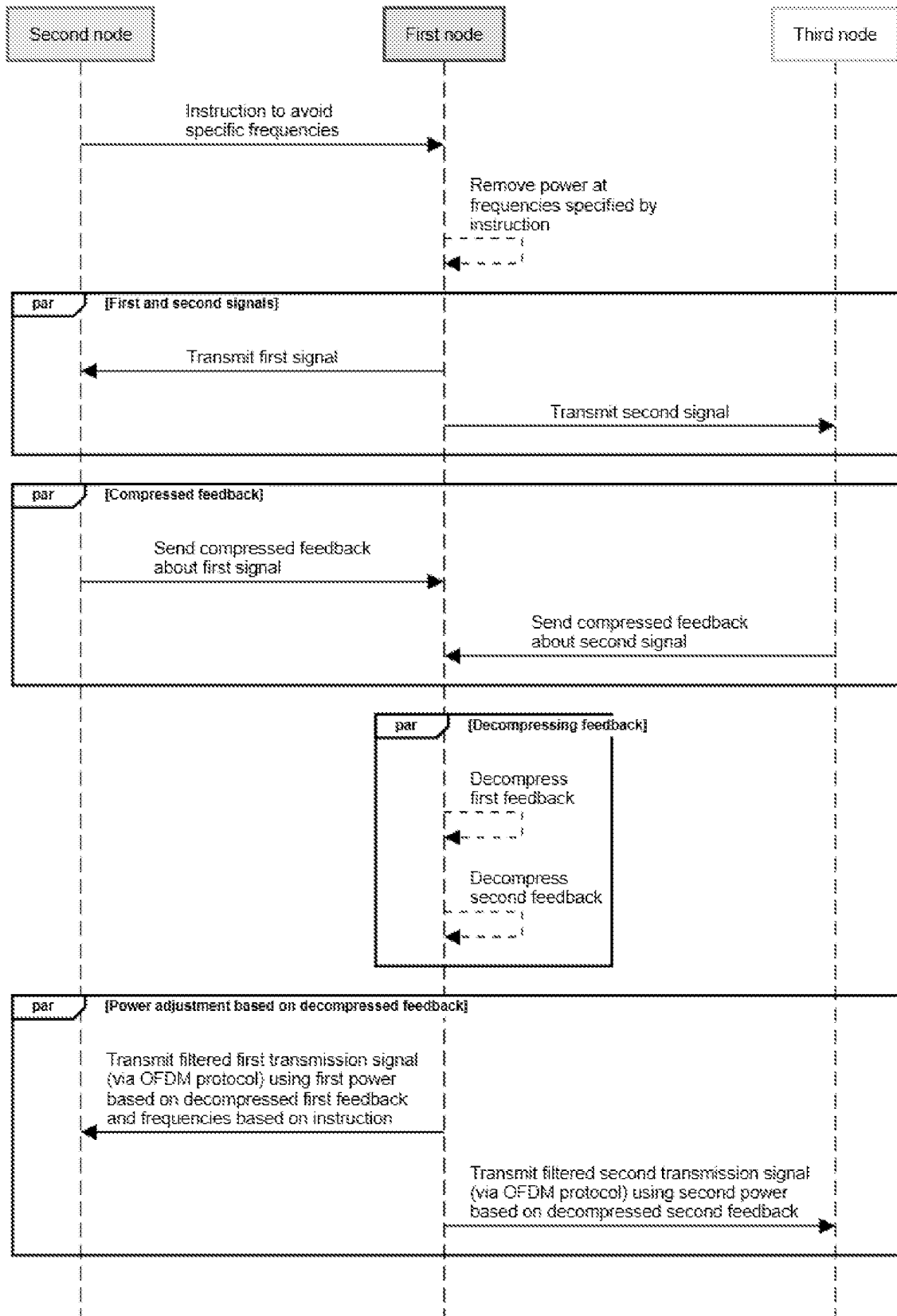
VI. ANALYSIS

33. I have reviewed the disclosures and claims of the '720 patent, the Office Action, the cited references Agee, McFarland and Ton, and the other materials that I refer to in my declaration. I disagree with the conclusion that the challenged claims would have been obvious based on the grounds identified in the Office Action.

A. Claim 53 of the '720 Patent

34. I understand that claim 53 is the only independent claim of the '720 patent that is challenged. The sequence diagram below is a visual depiction of the claimed method steps recited in claim 53 with respect to communications between the first node, second node, and third node:

Claim 53



35. In relevant part, claim 53 requires receiving at a first node an instruction from a second node to avoid using a plurality of frequencies to transmit to the second node, receiving first and second compressed feedback from second and third nodes that characterizes receipt of first and second signals sent from the first node to the second and third nodes respectively, decompressing the compressed feedbacks, filtering a transmission signal to remove power at each frequency to be avoided, transmitting a filtered first transmission signal to the second node using an 802.11-based OFDM protocol using a first power that is based on the decompressed first feedback, and simultaneously transmitting a filtered second transmission signal to the third node using an 802.11-based OFDM protocol using a second power that is based on the decompressed second feedback.

B. Claim Construction

36. In this Declaration, I apply the broadest reasonable interpretation of each claim term as understood by a POSITA in view of the claims and specification of the '720 patent. I reserve the right to supplement or revise these opinions if Patent Owner or another party proposes constructions of the claims in this or other proceedings.

C. Asserted References

1. Agee (U.S. Pat. App. Pub. No. US 2004/0095907) (Ex. 1008)

37. According to Agee's Abstract, Agee is directed to a "locally enabled global optimization of a multipoint, wireless electromagnetic communications network of communication nodes," where "each diversity-channel-capable node uses computationally efficient exploitation of pilot tone data and diversity-adaptive signal processing of the weightings and the signal to further convey optimization and channel information which promote local and thereby network-global efficiency." (Ex. 1008 at Abstract.)

2. McFarland (U.S. Pat. No. 6,628,673) (Ex. 1009)

38. McFarland teaches a method to allow channel sharing in a way that allows simple nodes such as cordless phones to transmit to a node at a low rate continuously while other high speed nodes transmit at a much higher rate simultaneously with the simple nodes to the same node. For example, the strength of each signal is adjusted at the node according to feedback signals sent to it by the base station, or by implementing an open-loop power control scheme in which the strength of each signal is adjusted at the node according to the power level of the base station signal it receives. (Ex. 1009.)

3. Ton (U.S. Patent No. 6,745,012) (Ex. 1010)

39. Ton discloses a data compression scheme for mobile telecommunications where data compression is applied to data packets so long as link quality is above a certain threshold. Because compression schemes are computationally intensive and require significant processing power, and because of the variable link quality in wireless networks, Ton discloses that a compressor associated with the transmitted signal is disabled in response to the link quality falling below this threshold. (Ex. 1010.)

D. The Challenged Claims Would Not Have Been Obvious In View of Agee, McFarland and Ton

40. In my opinion, Agee in view of McFarland and further in view of Ton, does not teach or suggest several key claim elements of the challenged claims of the '720 patent recited in claim 53 and accordingly in dependent claims 54-56, 64-66, 70, 76, 81-84 and 87-94.¹ In my opinion, the Office Action fails to consider the challenged claims as a whole and as an ordered combination of elements which are interrelated with the other elements of the challenged claims.

¹ While I address particular claim elements in this declaration, the fact that I may not address other claim elements or claims does not mean that I agree they are disclosed or would have been obvious in view of the asserted references.

41. These deficiencies are set forth below for the various claim elements recited in claim 53 and apply equally to the challenged dependent claims.

[53.1] receiving at a first node in the radio communications network an instruction transmitted from a second node in the radio communications network to avoid using a plurality of frequencies to transmit to the second node

42. Claim element [53.1] requires that a “first node” receive an “instruction” transmitted from a “second node” to “avoid using a plurality of frequencies to transmit to the second node.” In my opinion, the proposed Agee-McFarland combination does not disclose this element or render it obvious.

43. Requester’s expert, Mr. Geier, cites ¶¶179-180 of Agee for this limitation as teaching “feedback,” (see Ex. 1003, ¶75; Ex. AA at 4-5), but does not explain how anything in these paragraphs is an “instruction . . . to avoid using a plurality of frequencies.” For example, Mr. Geier does not explain how an “internode channel response,” a “rank,” or a “diversity channel distribution” correspond to the claimed “instruction.”

44. The Office Action appears to agree that Agee does not teach element [53.1]. (OA at 5.) However, it states that “McFarland discloses an analogous wireless adaptive communication system (see Abstract) in which a node may adjust the frequency used by that node (see column 7, lines 37-40 and column 3, lines 7-14) based upon feedback from a base station (see column 4, lines 34-50), which leads to the node sending requests to the base station for channel reallocation, see column 5, lines 40-57).” (OA at 5-6.)

45. In my opinion, McFarland does not teach or suggest an instruction that is sent from the second node to the first node ***that is then used by the first node to filter a plurality of frequencies for communication with the second node***, as required by claim element [53.2] for the reasons I discuss below.

46. For this claim element, Requester cites McFarland at 3:7-14 (“adjusting the frequency used by each node according to closed-loop feedback signals sent by the base station”), 4:34-50 (“When the unit 450 determines that nodes should change channels, it issues appropriate command as a data packet which is included in the transmission of base station 400”), 5:40-57 (“the unit 350’ can cause the laptop 300 to send requests to the base station 400 to change or reallocate channels. Depending on constraints imposed by other nodes, the base station 400 may or may not accept the recommendation and transmit the appropriate command”), and 7:37-40 (“frequency control may be implemented by allowing the base station 400 to feed back information to the node in the form of a command signal, adjusting the transmit frequency in a closed loop system”). (Ex. AA at 5-6.) Mr. Geier cites to column 5:40-57 in his declaration. (Ex. 1003, ¶77.) In my opinion, the Office Action’s reliance on McFarland for this claim element mischaracterizes the disclosures of McFarland.

47. First, at col. 3:7-14, McFarland describes the operation of a **base station** in “locking the frequency used by each node . . . and adjusting the frequency used by each node . . .”:

According to a second aspect of the present invention, simple low data rate nodes are allowed to use a small number of sub-channels while the more complicated nodes use the remainder, and additional means are used to ensure that adjacent sub-channels are reliably spaced apart in frequency so that they do not bleed over into one another. This may be done by, e.g., using highly accurate frequency references (such as quartz crystals) in each node; locking the frequency used by each node to a highly accurate external reference such as a Global Positioning System (GPS) satellite; **locking the frequency used by each node to the transmit frequency of the base station; and adjusting the frequency used by each node according to closed-loop feedback signals sent by the base station.**

(EX 1009 at 3:1-14.)² Additionally, at column 4:42-50, McFarland discloses that the base station's channel allocation and coding unit 450 makes channel allocation and coding decisions and may issue commands that are sent in base station transmissions. Therefore, the base station, and not any individual node such as a laptop, determines the frequencies to be used by each node.

48. This context is important with respect to the cited disclosure at column 5:40-57 of McFarland. In this context (i.e., in which the laptop is not “unilaterally making channel allocation changes”), McFarland states a laptop may “send requests to the base station 400 to change or reallocate channels”:

Channel allocation and coding unit 350' in the laptop 300 monitors the datadstreams [sic] 310' for bit errors, lost packets and the like much like its counterpart 450 in the base station 400; *however, rather than unilaterally making channel allocation changes to improve communication like the unit 450, the unit 350' can cause the laptop 300 to send requests to the base station 400 to change or reallocate channels.* Depending on constraints imposed by other nodes, the *base station 400 may or may not accept the recommendation and transmit the appropriate command.*

(Ex. 1009 at 5:40-57.) In other words, while the laptop may send a request to the base station, the base station still determines what frequencies are to be used *by the laptop*. This is consistent with the other disclosures in McFarland in which the *base station* controls other nodes' use of frequency, (column 7:33-40), timing, (column 7:63-8:4), and power, (column 8:16-33).

49. In view of this, in my opinion McFarland does not disclose an instruction from a node to the base station for the base station to avoid using a plurality of frequencies to transmit to the node in the context of claim 53. Rather, as explained further in connection with element

² All emphasis is added unless indicated otherwise.

[53.2], in McFarland, any filtering of transmissions purportedly taught by McFarland is performed at the node.

50. With respect to the Office Action, the Examiner appears to agree that Agee does not disclose this limitation. However, the Office Action states:

McFarland discloses an analogous wireless adaptive communication system (see Abstract) in which a node may adjust the frequency used by that node (see column 7, lines 37-40 and column 3, lines 7-14) based upon feedback from a base station (see column 4, lines 34-50), which leads to the node sending requests to the base station for channel reallocation, see column 5, lines 40-57). One skilled in the art would recognize that this implementation because this would allow for more efficiency by allowing nodes to manage frequencies by simply sending instructions (see James T. Grier Declaration at 50).

Therefore it would have been obvious to one of ordinary skill in the art at the time the invention was made to have implemented the invention of Agee by using McFarland's teachings to allow for instructions to be used to select channels to achieve Agee's use of certain channels for power optimization.

(OA at 5-6.) It is not clear from the Office Action what disclosure in McFarland is being relied on as allegedly teaching claim element [53.1] (e.g., feedback from the base station, a request for channel reallocation, a base station command signal, or something else?). The Office Action cites to Mr. Geier's declaration at paragraph 50, but in my opinion that does not clarify the basis for the Office Action's assertion that Agee and McFarland render this claim element obvious. In that paragraph, Mr. Geier alleges that "McFarland discloses an embodiment in which both the base station and nodes can send instructions to each other regarding what frequencies to avoid during their transmissions using feedback or 'command' signals." (Ex. 1003, ¶50.) However, as noted

above, in my opinion none of the disclosures in McFarland teach claim element [53.1], particularly when viewed in the context of the other claim elements recited in claim 53. In the event the Patent Office later articulates the specific basis for its assertion of obviousness with respect to claim element [53.1], I respectfully reserve the right to offer further opinion in response.

51. Likewise, it is not clear what the Office Action intended to convey with the following statement: “One skilled in the art would recognize that this implementation because this would allow for more efficiency by allowing nodes to manage frequencies by simply sending instructions.” (OA at 6 (citing Ex. 1003, ¶50).) The citation to Mr. Geier’s declaration is not helpful because Mr. Geier does not discuss any purported increased efficiency in that paragraph. He also does not discuss any purported increased efficiency in paragraphs 49, 51, 52 or 53 of his declaration. I also disagree with the assumption that a POSITA would have concluded that there was a benefit because as Mr. Geier admits that the proposed combination of Agee and McFarland (as best as can be ascertained) “would *not* have affected how the method of Agee would have operated.” (Ex. 1003, ¶52.)

[53.2] filtering a transmission signal to remove power from the transmission signal at each frequency in the plurality of frequencies to be avoided;

52. Claim element [53.2] requires that the “first node” filter a transmission signal to remove power at each frequency in the plurality of frequencies to be avoided. In my opinion, the proposed Agee-McFarland combination does not teach this element or render it obvious.

53. The Office Action asserts that Agee in combination with McFarland renders this claim element obvious. I respectfully disagree. Agee, alone or in combination with McFarland, does not disclose or suggest filtering a transmission signal with respect to the claimed first node to remove power at frequencies specified in a received instruction as claimed in claim 53.

54. The Office Action's analysis for this claim element is reproduced below:

Although Agee discloses the use of band pass filters (see paragraph 274 and figure 5, occurs in both directions, see paragraph 280, per node adjustments are independent of one another, see paragraph 478), Agee does not disclose a mechanism for using this to remove power from the transmission signal specifically at each frequency in the plurality of frequencies to be avoided.

McFarland elaborates on this mechanism, in which filtering is performed as required on an individual basis, and channels not to be used are zeroed (see column 2, lines 57-67; column 4, lines 51-61; and column 8, lines 16-22). One skilled in the art would find it advantageous to use McFarland's teachings to choose where to implement filtering (see Grier at 56-57).

Therefore it would have further been obvious to one of ordinary skill in the art at the time the invention was made to modify Agee by performing channel adjustments on an individual basis, as per McFarland, in order to more easily choose where to implement filtering.

(OA at 6-7.)

55. Agee's disclosure in paragraph 478 refers to adjusting transmit power using weights in reciprocal channels as is clear from the proceeding paragraphs. (Ex. 1008, ¶¶477-78.) Likewise, general disclosure of band pass filters in Agee, including in paragraphs 220 and 274, does not disclose or suggest the filtering step of claim element [53.2] in the context of claim 53.

56. Further, while the Office Action cites to Figure 5 of Agee, that appears to be a typographical error. Whether the Examiner meant to refer to Figure 15 or Figure 25, neither of these figures changes my opinions that Agee and McFarland in combination fail to disclose or render obvious claim element [53.2] in the context of claim 53.

57. The Office Action at pages 6-7 also cites disclosures in McFarland. In my opinion, the reliance on McFarland is also misplaced. McFarland's disclosure at column 4:51-67 explains that sub-channels are zeroed at the node, not the base station:

As can be seen above, this embodiment of the present invention permits multiple node devices 100-300 of varying levels of complexity to communicate with a base station 400 over a single OFDM system by allowing the simpler devices 100 and 200 to communicate on a few sub-channels 315 within the OFDM channel, and ensuring that these do not interfere with the most complex device 300 using most of the sub-channels 310 by preventing device 300 from using these sub-channels 315 (in this case, by zeroing those sub-channels 315 at the FFT 420 in the main device 300; however, other equivalent methods can of course be used). Further, the sub-channels 315 may be predetermined, or the simpler nodes 100 and 200 can communicate on any subset of channels by changing the tuning of their up-converting synthesizers, or by doing a numerical frequency offsetting in the digital domain, although a digital-to-analog converter might be needed in that case.

(EX 1009 at 4:51-67.)

58. Likewise, at column 8:16-19, McFarland describes that the base station may send signals to each node "which indicate whether each node 100-300 should transmit with more or less *power*." (Ex. 1009 at 8:16-19.) This paragraph does not disclose removing power from specific frequencies identified in an instruction received by the base station using a band pass filter. Instead, McFarland is describing scenarios where nodes transmit a signal to the base station that is too strong or too weak in which the *base station instructs each node* as to the optimal power to transmit with:

In a third operational consideration in the invention, all signals transmitted from nodes 100-300 preferably arrive at the base station 400 with similar power levels. This is because a signal that is much too strong would swamp the ADCs in the base station 400, while a signal transmitted from one of nodes 100-300 that is much too weak would be lost in the noise from the other channels and not reliably received by the base station 400.

Similar to the above closed-loop control techniques, the system may use the base station 400 to send signals to nodes 100-300 which indicate whether each node 100-300 should transmit with more or less power. The system may alternatively implement open-loop control by having each node 100-300 adjust its power based on the power level it is receiving from the base station 400.

(Ex. 1009 at 8:8-22.) Similarly, at column 2:57-60, McFarland states “[i]t is still another object of the present invention to provide such a system in which node transmission powers can be reliably controlled so that they do not cause communication errors.” But in McFarland, the reference to nodes excludes the base station. This does not disclose or suggest claim element [53.2] in the context claimed.

59. I also respectfully disagree with the Office Action’s statements that a POSITA “would find it advantageous to use McFarland’s teachings to choose where to implement filtering” and that it would have been obvious “to modify Agee by performing channel adjustments on an individual basis, as per McFarland, in order to more easily choose where to implement filtering.” (OA at 6-7.) As noted above, McFarland discloses zeroing channels at the *nodes*, ***not the base station*** that Requester equates with the first node recited in claim 53. Thus, to the extent McFarland discloses options for where to implement the purported filtering, none of those options correspond to the first node recited in claim 53, much less that the filtering of the transmission signal removes power at frequencies identified in an instruction received by the first node where the filtered transmission signal is sent to a second node. When this claim element is also considered with the other elements of claim 53, including [53.8], the deficiencies in the proposed combination of references become even more clear in my opinion.

60. I note that the Office Action cites to Mr. Geier’s declaration at ¶¶56-57 in support of the statement that a POSITA “would find it advantageous to use McFarland’s teachings to choose where to implement filtering”. (OA at 6.) However, as discussed above, McFarland does not

disclose filtering a transmission signal to remove power at frequencies identified in an instruction received by the base station before the filtered transmission signal is sent to a node in the context of claim 53.

61. Additionally, in paragraph 56 of his declaration, Mr. Geier states that:

McFarland explicitly discloses “zeroing” certain sub-channels, through power control, to ensure no interference between nodes of varying complexities. This means McFarland contemplates that nodes can filter signals by removing power from certain channels (i.e., frequencies) that are off. Given this disclosure, a POSITA would have been motivated to look to another reference, such as McFarland, that discloses a way to filter signals to remove power from certain frequencies in a transmission signal.

(Ex. 1003, ¶56.) In my opinion this argument does not make sense. Mr. Geier refers to an alleged teaching in McFarland and then states “[gi]ven this disclosure, a POSITA would have been motivated to look to another reference, such as McFarland” (Ex. 1003, ¶56.) Given the incoherent statement, the cited paragraph of Mr. Geier’s declaration does not provide support for the Office Action’s statements. Relatedly, in my opinion Mr. Geier’s statement in paragraph 58 of his declaration that the proposed modification of Agee in view of McFarland “would not have affected how the method of Agee would have operated,” does not support there being a motivation to combine Agee and McFarland as proposed.

62. In addition, in my opinion, a POSITA would not have been motivated to combine Agee and McFarland as proposed because Agee and McFarland are directed to different problems and Agee already addresses the issue of interference such that a POSITA would not have looked to McFarland for any improvement as suggested in the Office Action and by Mr. Geier. For example, Agee discloses that the issue of interference is already addressed via the diversity channels which gain the benefits of orthogonality. In contrast, McFarland discloses a number of methods to have low rate nodes pick certain sub channels to transmit while higher rate nodes use the rest of the sub

channels simultaneously, and ensures no interference by having sub channels which do not overlap. In other words, not only the two patents solve different problems, but also the problem of no interference between simultaneous transmissions is already addressed by Agee with the “orthogonality” of the spatially separated diversity based channels.

[53.3] transmitting the filtered transmission signal to the second node

63. For the same reasons noted above with respect to claim elements [53.1] and [53.2], and for the reasons set forth below in more detail with respect to at least [53.4], [53.6] and [53.8], it is my opinion that the Agee alone or in combination with McFarland and/or Ton fails to disclose claim element [53.3] which refers to “*the* filtered transmission signal” in the context of claim 53.

[53.4] receiving a compressed first feedback from the second node that characterizes receipt of a first signal sent from the first node to the second node

64. Claim element [53.4] requires that the first node additionally receive a compressed first feedback from the second node that characterizes receipt of a first signal sent from the first node to the second node. In my opinion, the proposed Agee-Ton combination does not disclose this element or render it obvious.

65. First, as set forth above in connection with elements [53.1] and [53.2], Agee does not teach the claimed “first node” and “second node,” and therefore does not describe that the first node receives a compressed feedback from the second node in the context claimed in claim 53. I note that the Office Action recognizes that “Agee in view of McFarland does not disclose [sic] that the feedback may be compressed.” (OA at 7.)

66. Ton’s disclosure does not address this deficiency. While Mr. Geier states that Ton’s “method and system for performing adaptive data compression in a wireless communication network . . . to compress at a least a portion of a data packet,” (Ex. 1003, ¶86; Ex. AA at 11) in combination with Agee meets this element, I disagree. In my opinion, these teachings of Ton are

irrelevant to whether the proposed Agee-Ton combination discloses or renders obvious the step of receiving a “compressed first feedback that characterizes receipt of a first signal” from the first node in the context of claim 53.

67. As the cited portions of Ton explain, the compression methods in Ton relate to data transmissions not feedback:

The present invention is directed in general to data compression in a mobile telecommunications system, and in particular to adapting compression for efficiently transporting data in a mobile telecommunication network.

(Ex. 1010, 1:9-12.)

There is a need, therefore, for a system and method of efficiently and effectively compressing data in a wireless telecommunication network. Preferably, such a system and method would achieve a substantially optimal balance between compression and successful data recovery. In addition, such a system and method would preferably minimize inefficient uses of processing power and memory.

(Ex. 1010, 1:44-50.)

In another embodiment of the invention, a mobile telecommunications system includes a compressor for compressing at least a portion of a data packet to be transmitted 65 via an air interface.

(Ex. 1010, 1:63-66.)

68. However, in claim 53, this claim element requires receiving compressed first feedback *that characterizes receipt of a first signal sent from the first node to the second node*. In my opinion, Ton’s disclosure would not have motivated a POSITA to compress feedback information from the second node wherein a first filtered transmission signal is sent to the second node using an OFDM-based protocol using a first power based on the compressed feedback information as recited in claim 53.

69. One of the inventive aspects of claim 53 is the use of compression specifically for feedback where the compression is applied to the control signal sent back to the node transmitting the data, and not to payload data. The idea of using compression specifically for control data was first described in the IEEE 802.11n-2009 standard, well after the earliest effective filing date of the '720 patent, and became more widespread in the IEEE 802.11ac-2013 standard for MIMO feedback. Prior IEEE 802.11 WiFi standards did not utilize compression for control data. Therefore, in my opinion, a POSITA as of the earliest effective filing date of the '720 patent would not have been aware of, and would not be motivated to, transmit compressed control data.

70. Additionally, in my opinion, the proposed Agee-Ton combination would have taught away from the transmission of compressed feedback information from the second node to the first node that specifically characterizes receipt of a first signal sent from the first node to the second node. The portions of Agee cited by Mr. Geier explain that Agee teaches the use of incorporated control and feedback information, or internalized feedback information within a node:

A second key to this approach is the minimization of secondary consequences of signaling, and a second is using internalized feedback, so that the signaling process itself conveys information crucial to the optimization. Rapid, dynamic, adaptation reactive to the changing environment and communications within and surrounding each node and the entire network is used to promote both local and global efficiency.

(Ex. 1008, ¶172.)

The incorporation of the control and feedback signal as part of the process rather than as discrete, separate, and particular parts of the signal, can decrease the complexity of apparatus by removing the need for a separate channel for network control . . . This integration allows both capacity and power control to cooperatively handle packet acknowledgement... the present form of the invention provides increased capacity and performance through dynamic, and self-moderating signal processing algorithms, with a minimal overhead.

(Ex. 1008, ¶¶249-250.)

One major difference in the present embodiment of the invention from prior art is that by making the control and feedback aspects part of the signal encoding process, and thereby eliminating or at least reducing the need for a separate channel(s) for control and feedback, the network content overhead is reduced and an additional range within the Signal dimension is available for Signal content. The LEGO reduction to single, or small, bit sized power management signals can be similarly echoed for other network management, depending on the target objective the network elects.

(Ex. 1008, ¶244.)

By using target criteria such as (1) for a cellular network, a max- min capacity criterion Subject to a power constraint, or (2) for a wireless LAN, a max-sum capacity that is subject to a power constraint, and using simple comparative operations in feedback for the network to optimize towards those criteria, this invention enables flexibility and stability for any given hardware and software combination that underlies a wireless electromagnetic communications network and improves, for the entire network and at each particular node thereof, the communication capacity and power requirements. Furthermore, the present form of the invention does not ignore but rather directly addresses and resolves both the overhead vs. content and the power vs. capacity conundrums which otherwise limit present-day state of the art approaches to optimization. It does this using the experienced environment as part of the direct feedback, rather than requiring additional control information or signalling that reduces content capacity.

(Ex. 1008, ¶193.)

71. In contrast, the '720 patent claims receiving a separate compressed feedback signal from the second node. (*See also* Ex. 1001 at 22:21-26 (“In a preferred embodiment, node 1400 would *also* provide feedback information to neighboring node 1460 to assure that the signal neighboring node 1460 sends back to node 1400 arrives with the same power level as that of every other neighbor, minimizing problems of near-far receiver masking.”).) Mr. Geier does not provide any evidence that the proposed Agee-Ton combination teaches the use of such feedback. Nor does he offer any evidence that any “feedback” described in Agee is used to determine transmit power for subsequent transmissions to the node.

72. I note that Mr. Geier does not rely on McFarland for this element, which is inconsistent with his theories regarding the other claim elements of claim 53. For example, Mr. Geier fails to acknowledge the relationship between the “instruction” of element [53.1] and the “first compressed feedback” of element [53.4] in the context of claim 53, which includes claim element [53.8]. This omission of McFarland in element [53.4] is significant because he fails to identify both an “instruction” and a “first compressed feedback” transmitted from the second node, as the claim requires.

73. The Office Action appears to overlook this discrepancy and states that “it would have been obvious to [a POSITA] to have modified the invention of Agee and McFarland by using data compression and decompression, as per Ton, to reduce the amount of bandwidth and power needed for transmitting.” (OA at 7.) However, the Office Action does not cite any evidence of the presence of both an “instruction” and a “first compressed feedback” in this proposed combination (which is different from Mr. Geier’s proposed combination and incorrect for additional reasons as I discuss).

74. Despite these deficiencies, the Office Action states:

Ton discloses the general compressing of transmissions in any node in wireless data networks and that compressed data packets require less bandwidth to transmit (see column 3, lines 31-43), as well as corresponding decompression (see column 3, line 56 to column 4, line 3). One skilled in the art would also recognize that this would also reduce the amount of power needed to transmit (see Grier at 87).

(OA at 7.) In my opinion, the Office Action’s assertion that a POSITA would have been motivated to modify Agee and McFarland by using data compression and decompression per Ton to reduce

the amount of bandwidth and power needed for transmitting does not account for the references other teachings that would discourage a POSITA from pursuing the proposed combination.

75. Ton discloses that data compression requires extensive processing resources and overhead:

Implementation of a data compression scheme, however, uses extensive processing resources. If the data compression does not work, then resources are essentially being wasted. For example, when the bit error rate in a wireless telecommunication network increases, it is likely that transmitted data will not be decompressed correctly on the receiving end of the air interface. In such a situation, the decompressor typically detects that the received packets cannot be properly decompressed and requests that the data be resent. In addition, the decompressor begins discarding received packets until the decompressor is able to resynchronize with the compression scheme. In the meantime, however, the compressor makes inefficient use of processing resources and bandwidth by trying to compress the data packets and send them over the air interface link, even though the data packets are simply being discarded by the decompressor.

(Ex. 1010 at 2:38-53.) To address these concerns, and in doing so validating their legitimacy in my opinion, Ton discloses that the compressor is disabled for a certain amount of time whenever the link quality falls below a certain threshold. (Ex. 1010 at 2:54-64.)

76. In my opinion, these disclosures and those in Agee would have taught away from the proposed combination. Agee includes repeated statements regarding the desire to minimize complexity and power consumption and reduce overhead and costs associated with its network system, as well the desire to conserve power. (*E.g.*, Ex. 1008, ¶¶15, 20, 48, 69, 96, 99, 249-252, 257, 264, 523.) Agee also discloses concerns about costs associated with additional hardware requirements, as illustrated in paragraph 237 for example:

The approaches currently described in the field, . . . require additional hardware at each node comprising one end of a channel per diversity path to exploit that diversity path. This creates a geometric growth in the hardware complexity for each particular node, and a linear growth in cost for each diverse path exploited by a given network, that rapidly renders any network attempting to exploit such diversity uneconomic. Moreover, such an approach 'muddies its own stream' in that it reduces the capacity increase by the power increase needed to power the more complex

transceiver. Exploitation of this multipath approach requires both high power (to permit data transport over the relatively weaker additional diversity path) and complex codecs (to permit data transports at high rates on the dominant path by filtering out the diversity path transmissions).

(Ex. 1008, ¶237.) A POSITA would have recognized the same concerns with respect to requiring compression and decompression schemes at each node based on the teachings of Ton and Agee as well as McFarland.

77. In my opinion, these concerns are further exacerbated because Ton discloses that its compression and decompression scheme does not function below a certain threshold link quality, (Ex. 1010 at 2:54-64), and thus may not function in a host of network environments contemplated by Agee, or with the a variety of simple node types contemplated by McFarland in contrast to the “new wireless data communication systems” contemplated in Ton, (Ex. 1010 at 2:34-36).

78. Ton also readily acknowledges that “[i]n the wireless context, however, the use of compression introduces a number of problems. First, compression schemes require high processing power, while it is typically desirable to reduce the amount of resources used in a wireless telecommunications system. For example, mobile stations generally have a limited power supply, and it is therefore beneficial to reduce the amount of power used by the processor in the mobile station.” (Ex. 1010, 1:22-30.) This is contrary to the Office Action’s assertion that modifying Agee with Ton’s teachings regarding compression and decompression would have resulted in power savings.

79. Ton also discloses that compression schemes can result in inefficient use of processing power:

Wireless networks, on the other hand, often have a higher and much more variable hit error rate caused by the combination of mobile station mobility and the use of an air interface as a transmission medium. As a result, when the wireless quality deteriorates (i.e., a high bit error rate exists), some data packets may be lost, thereby causing decompression on the receiving end to fail to regenerate the 40 packet data.

Such a situation causes an inefficient use of processing power because data packets are being compressed on the transmitting end, even though the data packets cannot be regenerated.

(Ex. 1010 at 1:33-43.) In view of these disclosures, and that the proposed modification to Agee is directed to feedback signals rather than data, it is my opinion that a POSITA would not have been motivated to combine the references as proposed, nor would they have had a reasonable expectation of success.

[53.5] receiving a compressed second feedback from a third node that characterizes receipt of a second signal sent from the first node to the third node;

80. Claim element [53.5] additionally requires the step of receiving a compressed second feedback from a third node that characterizes receipt of a second signal sent from the first node to the third node. In my opinion, the proposed combination would not have rendered this claim element obvious in the context of claim 53 for at least the same reasons identified for element [53.4] above.

[53.6] decompressing the compressed first feedback resulting in a decompressed first feedback

81. Claim element [53.6] requires the step of decompressing the compressed first feedback resulting in a decompressed first feedback.

82. For the reasons set forth for element [53.4] above, in my opinion the proposed combination would not have rendered this claim element obvious in the context of claim 53 because at a minimum the Office Action does not show the proposed combination teaches a “compressed first feedback.” In particular, Agee’s generalized references to “feedback” in combination with Ton’s disclosure of a decompressor does not render this claim element obvious because the combination does not disclose decompressing any control information that characterizes receipt of a first signal, as elements [53.6] and [53.4] require in the context of claim

53. In my opinion, the proposed combination also does not disclose that “decompressed first feedback” is the basis for the transmit power for subsequent transmission to the second node, as element [53.8] requires.

[53.7] decompressing the compressed second feedback resulting in a decompressed second feedback

83. Claim element [53.7] requires that the first node decompress the compressed second feedback resulting in a decompressed second feedback.

84. For at least the reasons identified for elements [53.5] and [53.6] above, in my opinion the proposed Agee-Ton combination would not have rendered this claim element obvious in the context of claim 53. In addition, there is no evidence of decompressing feedback that characterizes receipt of a second signal, as elements [53.7] and [53.5] require, or that is used as the basis for the transmission power for subsequent transmissions to the third node as element [53.9] requires.

[53.8] wherein the filtered transmission signal is a filtered first transmission signal that is transmitted to the second node using an 802.11-based orthogonal frequency-division multiplexing (OFDM) protocol via at least one antenna of a plurality of antennas, using a first power that is based on the decompressed first feedback; and further comprising

85. Claim element [53.8] requires that the filtered transmission signal to the second node (recited in element [53.2] above) is a filtered first transmission signal transmitted using an 802.11-based OFDM protocol via at least one antenna of a plurality of antennas, using a first power that is based on the decompressed first feedback.

86. For the reasons set forth for elements [53.1]-[53.4] and [53.6] above, in my opinion, the combination of Agee, McFarland and Ton alone or in combination does not disclose this claim element in the context of claim 53 no render it obvious. At a minimum, the proposed combination does not disclose a “decompressed first feedback” as claimed.

87. Additionally, in my opinion, Mr. Geier wrongly opines that the teaching of Locally-Enabled Network Optimization (LEGO) in Agee meets this element. (Ex. 1003, ¶96; EX AA at 25, citing EX 1008 at ¶ [0499].) LEGO requires a very specific condition called channel reciprocity: the designer must calibrate the hardware at each node such that the channel from node 1 to 2 equals that from node 2 to 1. While the medium itself (such as the air) is the same in either direction, channel reciprocity within the hardware (such as the transmit and receive circuitry at each node) requires special calibration. Such calibration to achieve channel reciprocity is technically difficult even today and rarely used in practice in WiFi, due to the low cost of hardware components. However, the description of LEGO in Agee assumes that channel reciprocity is satisfied, (Ex. 1008 at ¶¶187-189), but this is not addressed in the proposed Agee-McFarland-Ton combination.

88. Moreover, Agee teaches a very specific method to compute transmit power using “receive and transmit weights employed by all nodes in the network during uplink and downlink operations”:

LEGO is enabled by exploiting substantive reciprocity of the internode channel responses, together with appropriate normalization of transmit power measures, to design uplink and downlink network quality metrics $D_{21}(W_2, G_1)$ and $D_{12}(W_1, G_2)$ that satisfy network reciprocity property:

$$D_{12}(W, G) = D_{21}(G^*, W^*) \quad (\text{EQ. 2})$$

where (W_2, G_1) and (W_1, G_2) represent the receive and transmit weights employed by all nodes in the network during uplink and downlink operations, respectively. If equation 1 holds, then equal network quality can be achieved in each link direction by setting $G_1 = W_1^*$ and $G_2 = W_2^*$, such that each node use the receive combiner weights as transmit distribution weights during subsequent transmission operations, i.e., the network is preferentially designed and constrained such that each link is substantially reciprocal, such that the ad hoc network capacity measure can be made equal in both link directions by setting at both ends of the link.

(Ex. 1008 at ¶188-189.)

89. In my opinion, Agee teaches implicit beamforming, where the base station relies on channel reciprocity rather than feedback from a receiving node to estimate the channel. The method of channel reciprocity described in Agee relies on channel calibration, not feedback. Indeed, as Mr. Geier recognizes, Agee explains that its nodes are capable of “*independently* adjust[ing] transmit power, for example, to optimize capacity achievable at that node given the total power [available] to it, or to minimize power emitted into the network by that node given an aggregate power requirement.” (Ex 1008 ¶478; see Ex. AA at 26.) There is no explanation how Agee teaches that the transmit power is based on received compressed feedback.

90. In my opinion, the reliance on McFarland is similarly misplaced. Mr. Geier cites the same portions of McFarland he previously cites for elements [53.2] and [53.3]. Those paragraphs, reproduced below in full, explain that a base station instructs each node as to how much power to use:

In a third operational consideration in the invention, all signals transmitted from nodes 100-300 preferably arrive at the base station 400 with similar power levels. This is because a signal that is much too strong would swamp the ADCs in the base station 400, while a signal transmitted from one of nodes 100-300 that is much too weak would be lost in the noise from the other channels and not reliably received by the base station 400.

Similar to the above closed-loop control techniques, the system may use the base station 400 to send signals to nodes 100-300 which indicate whether each node 100-300 should transmit with more or less power. The system may alternatively implement open-loop control by having each node 100-300 adjust its power based on the power level it is receiving from the base station 400.

It should be noted that the above difficulties do not typically occur when a single base station transmits to all other nodes simultaneously. Because all signals are emanating from the same source, it is easy to insure that frequency sub-channels do not overlap, that all signals have their symbol transitions at the same time, and that the power level of all sub-channels is the same as transmitted and therefore as

received. However, it is possible for the base station to vary its allocation of transmit power amongst the various nodes to enhance efficiency.

(Ex. 1009 at 8:8-32; Ex. AA at 27-28.)

91. To the extent the Office Action and Mr. Geier contend that the same portions of McFarland teach an “instruction” used to determine specific frequencies for subsequent transmissions as well as feedback used to determine the power of the transmitted signal, the proposed combination does not separately identify an “instruction” and a “compressed feedback.” And as noted above, McFarland does not teach the “instruction” as claimed in element [53.1] and utilized in element [53.2].

92. Moreover, even if a POSITA would have considered McFarland in the overall combination for this claim element, McFarland’s disclosures are inapposite. As discussed above, McFarland teaches that ***the base station instructs nodes*** as to the optimal transmit power, ***not*** that the first node (here, the base station) bases its transmit power on feedback received from a second node (here, “nodes 100-300”), as element [53.8] requires. In my opinion, in teaching only one-way instructions and feedback (i.e., from the base station to nodes 100-300), McFarland teaches away from element [53.8] altogether, as exemplified by the following disclosure:

According to a fourth aspect of the invention, the sub-channels are shared between low data rate nodes and high data rate nodes as described above, and means are provided to ensure that signals from the various nodes arrive at the base station with similar power levels. This may be done by implementing ***a closed-loop power control scheme in which the strength of each signal is adjusted at the node according to feedback signals sent to it by the base station***, or by implementing an open-loop power control scheme in which the strength of each signal is adjusted at the node according to the power level of the base station signal it receives.

(Ex. 1009 at 3:28-38; Ex. AA at 28.)

93. In sum, the disclosures of Agee and McFarland teach that nodes either adjust their transmit “independently” of any received feedback (as in Agee, see Ex. 1008 ¶478) or are instructed by the base station to adjust their transmit power via open or closed-loop feedback from the base station (as in McFarland, see Ex. 1009 at 8:8-32, 3:28-38). Mr. Geier does not identify any disclosures in the prior art where a first node (such as an access point or base station) transmits to a second node using a transmit power based on feedback received from the second node in the context of claim 53.

[53.9] transmitting, using the 802.11-based OFDM protocol, a filtered second transmission signal, simultaneously with the filtered first transmission signal, to the third node using a second power that is based on the decompressed second feedback.

94. Claim element [53.9] requires transmitting, simultaneously with the filtered first transmission signal to the second node, a filtered second transmission signal to the third node using a second power that is based on the decompressed second feedback.

95. For the same reasons set forth for element [53.8] above, the proposed combination of Agee, McFarland, and Ton do not disclose this claim element in the context of claim 53 because, for example, they fail to show that the combination teaches transmitting a filtered transmission signal using a power that is based on a decompressed feedback.

96. Nor does the proposed combination disclose the claimed simultaneous transmission of the filtered first and second transmission signals as claimed. For this element, Mr. Geier relies on additional disclosures from Agee as purportedly teaching simultaneous MIMO transmissions. (*See* Ex. 1003, ¶98; Ex. AA at 28-29.) However, in my opinion these disclosures do not remedy the deficiencies identified above. For example, Agee teaches that “a subset of its nodes are MIMO-capable nodes, and that each such node can simultaneously communicate with up to as many nodes in its field of view as it has antennae.” (Ex. 1008 ¶177.) But the mere ability of the first node to

simultaneously communicate with multiple nodes says nothing about whether the first node transmits to each such node *using a power that is based on a decompressed feedback from each respective node*. Mr. Geier does not provide any evidence of this aspect of element [53.9] in Agee or his proposed combination.

97. Rather, Mr. Geier's reliance on "Locally-Enabled Network Optimization (LEGO) to manage the transmit power for each node (BS and SU) operating, dynamically," (Ex. AA at 30, citing EX 1008 ¶ [0499]), undermines his obviousness theory. As described above in connection with element [53.8], Mr. Geier does not provide any evidence that Agee's method of computing transmit power for LEGO using "weights" meets the claim requirement of transmitting a filtered second transmission signal simultaneously with the transmission of the filtered first transmission signal using a second power that is based on the "decompressed second feedback." As Mr. Geier and the Office Action acknowledge, Agee explains that its nodes are capable of "*independently* adjust[ing] transmit power, for example, to optimize capacity achievable at that node given the total power [available] to it, or to minimize power emitted into the network by that node given an aggregate power requirement." (Ex. 1008 ¶478; *see* Ex AA at 31.)

Claims 54-56, 64-66, 70, 76, 81-84 and 87-94

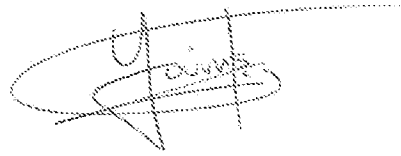
98. Claims 54-56, 64-66, 70, 76, 81-84 and 87-94 all depend on claim 53 and thus are patentable over the proposed combination for the same reasons I discuss above with respect to claim 53.

99. I reserve the right to supplement my opinions in the future to respond to any arguments that the Examiner raises and to consider new information as it becomes available to me.

I declare under penalty of perjury that all statements made in this Declaration are true and correct to the best of my knowledge.

Respectfully Submitted this 2nd day of June, 2025.

By:

A handwritten signature in black ink, appearing to read 'Konstantinos Psounis', enclosed within a large, loopy oval shape.

Konstantinos Psounis

LISTING OF CLAIMS

1. A method for managing interference in a radio communications network, comprising the steps of:
 - receiving an aggregated radio signal at a first node in the radio communications network on a plurality of frequencies;
 - determining a power level for the aggregated radio signal for each frequency in the plurality frequencies;
 - subtracting the power level for each the frequency from a power limit to produce a power differential for the each frequency; and
 - instructing a second node in the radio communications network to avoid using a transmission frequency corresponding to a non-positive power differential in the plurality of power differentials to transmit to the first node.
2. The method of claim 1, further comprising the steps of: receiving a transmission from the second node in the radio communications network; and discarding any portion of the transmission carried on the transmission frequency.
3. The method of claim 2, wherein the discarding step comprises applying a filter to the transmission.
4. The method of claim 1, wherein the step of determining a power level is carried out by:
 - acquiring a plurality of instantaneous power level measurements for each the frequency;
 - and
 - calculating an average power level based on the plurality of instantaneous power level measurements.
5. The method of claim 1, wherein the step of determining a power level is carried out by:
 - acquiring a plurality of instantaneous power level measurements for the each frequency;
 - and

calculating a median power level based on the plurality of instantaneous power level measurements.

6. The method of claim 1, further comprising the step of: sending to the second node a request to adjust a transmission power level on a frequency corresponding to a positive power differential in the plurality of power differentials.

7. The method of claim 1, further comprising the step of: instructing a plurality of other nodes in the radio communications network to avoid using the transmission frequency to transmit information to the first node.

8. The method of claim 7, further comprising the steps of:
receiving a transmission from one of the plurality of other nodes; and
discarding any portion of the second transmission carried on a frequency corresponding to a non-positive power differential in the plurality of power differentials.

9. The method of claim 8, further comprising the step of: sending to the one of the plurality of other nodes a request to adjust a transmit power level on a frequency corresponding to a positive power differential in the plurality of power differentials.

10. The method of claim 1, further comprising the steps of:
determining an updated power level for the aggregated radio signal for each frequency in the plurality frequencies;
subtracting the updated power level for each the frequency from the power limit to produce a plurality of updated power differentials; and
instructing the second node to avoid transmitting to the first node on a frequency corresponding to a non-positive updated power differential in the plurality of updated power differentials.

11. The method of claim 1, further comprising the steps of:
generating an optimal waveform profile based on the plurality of power differentials; and
reporting the optimal waveform profile to the second node.

12. The method of claim 11, wherein the reporting step is carried out using a common network configuration channel.
13. The method of claim 11, further comprising the step of compressing the optimal waveform profile prior to performing the reporting step.
14. The method of claim 11, wherein the optimal waveform profile specifies a waveform pattern.
15. The method of claim 14, wherein the waveform pattern defines a transmission signal having a power spectral density that varies over time.
16. The method of claim 14, further comprising the steps of:
generating a second optimal waveform profile based on the plurality of power differentials; and
reporting the second optimal waveform profile to a third node in the radio communications network; wherein the second optimal waveform profile specifies a second waveform pattern that is orthogonal to the waveform pattern.
17. The method of claim 1, wherein the plurality of frequencies comprises all of the frequencies in a radio frequency band.
18. The method of claim 1, further comprising the steps of: associating a unique pattern with the second node; and determining whether the transmission contains the unique pattern.
19. A method for managing interference in a radio communications network, comprising the steps of:
receiving at a first node in the radio communications network an instruction transmitted from a second node in the radio communications network to avoid using a plurality of frequencies to transmit to the second node;

filtering a transmission signal to remove power from the transmission signal at each frequency in the plurality of frequencies to be avoided;

transmitting the filtered transmission signal to the second node;

separately from the receipt of the instruction, receiving a compressed first feedback from the second node that is based on a received power and one or more frequencies of a first signal transmitted from the first node to the second node;

separately from the receipt of the instruction, receiving a compressed second feedback from a third node that is based on a received power and one or more frequencies of a second signal transmitted from the first node to the third node;

decompressing the compressed first feedback resulting in a decompressed first feedback;

decompressing the compressed second feedback resulting in a decompressed second feedback;

generating one or more data structures based on the decompressed first feedback and the decompressed second feedback;

wherein the filtered transmission signal is a filtered first transmission signal that is transmitted using a first frequency and an 802.11-based orthogonal frequency-division multiplexing (OFDM) protocol via at least one antenna of a plurality of antennas, using a first power that is based on at least one of the one or more data structures; and further comprising:

transmitting, using a second frequency and the 802.11-based OFDM protocol, a filtered second transmission signal, simultaneously with the filtered first transmission signal, to the third node, using a second power that is based on at least one of the one or more data structures.

20. A method for managing interference in a radio communications network, comprising the steps of:

receiving at a first node in the radio communications network an instruction transmitted from a second node in the radio communications network to avoid using a plurality of frequencies to transmit to the second node;

filtering a transmission signal to remove power from the transmission signal at each frequency in the plurality of frequencies to be avoided;

transmitting the filtered transmission signal to the second node;

receiving an optimal waveform profile from the second node, the optimal waveform profile being based on a plurality of power measurements for the plurality of frequencies and a power limit; and

conforming the transmission signal to the optimal waveform profile prior to performing the transmitting step.

21. The method of claim 20, further comprising the step of decompressing the optimal waveform profile prior to performing the conforming step.

22. The method of claim 19, wherein the instruction includes a first instruction, and further comprising:

receiving at the first node in the radio communications network a second instruction transmitted from the third node to avoid using a different plurality of frequencies to transmit to the third node; and

filtering a second transmission signal to remove power from the second transmission signal at each frequency in the different plurality of frequencies to be avoided, resulting in the filtered second transmission signal.

23. The method of claim 19, wherein the first power and the second power are the same.

24. The method of claim 19, wherein the first power and the second power are different.

25. The method of claim 19, wherein an update of the compressed first feedback is repeatedly received at time periods of less than one second, and the first power is repeatedly updated based on an updated decompressed first feedback at time periods of less than one second; and an update of the compressed second feedback is repeatedly received at time periods of less than one second, and the second power is repeatedly updated based on an updated decompressed second feedback at time periods of less than one second.

26. The method of claim 19, wherein the filtered first transmission signal and the filtered second transmission signal are transmitted via the same transceiver.

27. The method of claim 19, wherein the filtered first transmission signal and the filtered second transmission signal are transmitted via different transceivers.
28. The method of claim 19, wherein the instruction is received utilizing a dedicated channel.
29. The method of claim 19, wherein the instruction is received via an antenna configured for omnidirectional communication.
30. The method of claim 19, wherein the compressed first feedback and the compressed second feedback are received utilizing a dedicated channel.
31. The method of claim 19, wherein the compressed first feedback and the compressed second feedback are received via an antenna configured for omnidirectional communication.
32. The method of claim 19, wherein the decompressed first feedback and the decompressed second feedback are used to increase spatial separation among transmissions.
33. The method of claim 19, wherein the decompressed first feedback and the decompressed second feedback are used to increase spatial separation among transmissions at the same frequency.
34. The method of claim 19, and further comprising:
 - receiving a compressed third feedback from a fourth node that characterizes receipt of a third signal sent from the first node to the fourth node, the fourth node being a legacy node;
 - decompressing the compressed third feedback resulting in a decompressed third feedback;
 - transmitting, using a third frequency and another 802.11-based OFDM protocol, the third transmission signal to the fourth node using a transceiver separate from one or more other transceivers used to transmit the filtered first transmission signal and the filtered second transmission signal, and further using a third power that is based on the decompressed third feedback.

35. The method of claim 34, wherein the third transmission signal is transmitted simultaneously with the filtered first transmission signal and the filtered second transmission signal via at least one different antenna of the plurality of antennas.
36. The method of claim 19, wherein the compressed first feedback is based on a received power at a plurality of frequencies via which the first signal is received.
37. The method of claim 19, wherein the instruction is received prior to the receipt of the compressed first feedback.
38. The method of claim 19, wherein the filtered second transmission signal is transmitted simultaneously with the filtered first transmission signal via the same plurality of antennas.
39. The method of claim 19, wherein the first frequency is selected as a function of the compressed first feedback, and the second frequency is selected as a function of the compressed second feedback.
40. The method of claim 19, wherein the instruction includes a 802.11 clear to send (CTS) instruction.
41. The method of claim 19, wherein the instruction includes a 802.11 request to send (RTS) instruction.
42. The method of claim 19, wherein the filtered second transmission signal is transmitted simultaneously with the filtered first transmission signal via at least one different antenna of the plurality of antennas.
43. The method of claim 19, wherein the filtered second transmission signal is transmitted simultaneously with the filtered first transmission signal using the at least one antenna of the plurality of antennas.

44. The method of claim 19, wherein at least one of:
- the first signal includes a data signal; the first signal includes an aggregate signal;
 - the compressed first feedback is configured to ensure that transmissions from all neighbors of the first node are received at a same power level;
 - the compressed first feedback is configured to at least one of: minimize a transmit power on reliable links, maximize an ability to achieve spatial separation among transmissions on a same frequency, minimize network self-interference, improve low probability of intercept (LPI), or lower probability of detection (LPD);
 - the compressed first feedback and the compressed second feedback are received simultaneously;
 - at least one of the compressed first feedback or the compressed second feedback is received separately from the receipt of the instruction, by being received before the instruction is received;
 - at least one of the compressed first feedback or the compressed second feedback is received separately from the receipt of the instruction, by being received after the instruction is received;
 - the one or more frequencies of the first signal includes a frequency band;
 - the one or more frequencies of the second signal includes a frequency band;
 - the one or more frequencies of the first signal includes a first frequency band, and the one or more frequencies of the second signal includes a second frequency band;
 - a single data structure is generated based on the decompressed first feedback and the decompressed second feedback;
 - a first data structure is generated based on the decompressed first feedback, and a second data structure is generated based on the decompressed second feedback;
 - a first data structure is generated based on the decompressed first feedback, where the first power is based on the first data structure, and a second data structure is generated based on the decompressed second feedback, where the second power is based on the second data structure;
 - the first power and the second power differ in terms of power level;
 - the steps are performed in the order listed;
 - the radio communications network includes an 802.11 network;

the radio communications network includes an 802.11a network; the radio communications network includes an 802.11g network;

the at least one antenna includes multiple antennas;

the at least one antenna includes at least one omnidirectional antenna;

the at least one antenna includes at least one directional antenna;

the first frequency includes a first frequency band;

the second frequency includes a second frequency band;

the first frequency is part of a first frequency band;

the second frequency is part of a second frequency band;

the first frequency includes a first frequency band, and the second frequency includes a second frequency band, where the first frequency band and the second frequency band do not overlap;

interference in the radio communications network is managed;

the first node is a mobile node and the second node is a non-mobile node;

the second node is a mobile node and the first node is a non-mobile node; the instruction sets forth the plurality of frequencies to avoid using;

the instruction specifies the plurality of frequencies to avoid using;

a purpose of the instruction is to avoid using the plurality of frequencies;

a purpose of the instruction is to avoid using the plurality of frequencies, where the purpose is accomplished by specifying the plurality of frequencies to avoid using;

a purpose of the instruction is to avoid using the plurality of frequencies, where the purpose is accomplished by specifying one or more frequencies to use;

a purpose of the instruction is to avoid using the plurality of frequencies, where the purpose is accomplished by specifying one or more frequencies to use, the one or more frequencies not including the plurality of frequencies;

the instruction to avoid the plurality of frequencies sets forth one or more frequencies to use;

the instruction to avoid the plurality of frequencies specifies one or more frequencies to use;

the instruction to avoid the plurality of frequencies assigns one or more frequencies to use;

the instruction to avoid the plurality of frequencies does not specify the plurality of frequencies;

the instruction to avoid the plurality of frequencies sets forth one or more frequencies to use, thereby resulting in the avoidance of using the plurality of frequencies;

a purpose of the filtering is to remove the power from the transmission signal at each frequency in the plurality of frequencies to be avoided, where the purpose is accomplished by specifying one or more frequencies to which the power is to be applied;

a purpose of the filtering is to remove the power from the transmission signal at each frequency in the plurality of frequencies to be avoided, where the purpose is accomplished by specifying the plurality of frequencies to be avoided;

the filtering suppresses or otherwise minimizes waves or oscillations at each frequency in the plurality of frequencies to be avoided;

the filtering suppresses or otherwise minimizes waves or oscillations at each frequency in the plurality of frequencies to be avoided, thereby resulting in the removal of the power from the transmission signal at each frequency in the plurality of frequencies to be avoided;

the filtering removes all power from the transmission signal;

the filtering removes some power from the transmission signal;

the filtering discards one or more portions of the transmission signal at each of the plurality of frequencies;

the filtering utilizes transmit excision;

the filtering utilizes compression;

the filtering identifies certain one or more frequencies in connection with which power is applied, thereby resulting in the removal of the power from the transmission signal at each frequency in the plurality of frequencies to be avoided;

the removal of power from the transmission signal at each frequency in the plurality of frequencies to be avoided is accomplished by an adjustment in relation to power previously used in connection with the transmission signal;

the removal of power from the transmission signal at each frequency in the plurality of frequencies is accomplished by adjusting a processing of the transmission signal so that power that was previously used in connection with the transmission signal at each frequency in the

plurality of frequencies to be avoided, is no longer used in connection with the transmission signal at each frequency in the plurality of frequencies to be avoided;

the removal of power from the transmission signal at each frequency in the plurality of frequencies to be avoided is accomplished by setting a waveform profile that results in no power being applied in connection with the transmission signal at each frequency in the plurality of frequencies to be avoided;

the removal of power from the transmission signal at each frequency in the plurality of frequencies to be avoided is accomplished by pre-processing the transmission signal, before any power is applied, so that power, which would otherwise be applied in connection with the transmission signal at each frequency in the plurality of frequencies, is not applied in connection with the transmission signal at each frequency in the plurality of frequencies to be avoided;

the removal of power from the transmission signal at each frequency in the plurality of frequencies to be avoided is accomplished by pre-processing the transmission signal, before any power is applied, so that no power is applied in connection with the transmission signal at each frequency in the plurality of frequencies to be avoided;

the transmission signal is generated so as to not include power at each frequency in the plurality of frequencies to be avoided;

the transmission signal is generated so as to not include power at each frequency in the plurality of frequencies to be avoided, thereby resulting in the removal of the power from the transmission signal at each frequency in the plurality of frequencies to be avoided;

the transmission signal is pre-processed so as to not include power at each frequency in the plurality of frequencies to be avoided, thereby resulting in the removal of the power from the transmission signal at each frequency in the plurality of frequencies to be avoided;

the filtering is performed using an output filter;

the filtering is performed using an optimal matched filter;

the filtering is performed using a band selection filter; the filtering is performed using a median filter; or

the filtering is performed using a nonlinear filter.

45. The method of claim 19, wherein the removal of power from the transmission signal at

each frequency in the plurality of frequencies to be avoided is accomplished by adjusting a processing of the transmission signal so that certain power that was previously used in connection with the transmission signal at each frequency in the plurality of frequencies to be avoided before the instruction is received, is no longer used in connection with the transmission signal at each frequency in the plurality of frequencies to be avoided in accordance with the instruction.

46. The method of claim 19, wherein the removal of power from the transmission signal at each frequency in the plurality of frequencies to be avoided is accomplished by adjusting a processing of the transmission signal so that certain power that was previously used in connection with the transmission signal at each frequency in the plurality of frequencies to be avoided before the instruction is received, is no longer used in connection with the transmission signal at each frequency in the plurality of frequencies to be avoided in accordance with the instruction, which specifies at least one frequency to use so as to avoid using the plurality of frequencies to be avoided in order to transmit to the second node.

47. The method of claim 19, wherein network forwarding decisions are guided using instantaneous information from a media access control (MAC) layer.

48. The method of claim 47, wherein the network forwarding decisions are guided to eliminate a dominant end-to-end latency effect of channel access delay at at least one hop.

49. The method of claim 19, wherein frequency channels are reused in order to increase spatial reuse across multiple basic service sets.

50. The method of claim 19, wherein RTS/CTS signaling is extended such that frequency channels are reused in order to increase spatial reuse across multiple basic service sets.

51. The method of claim 19, wherein RTS/CTS signaling is extended such that frequency channels are reused in order to increase spatial reuse across multiple basic service sets, to accommodate legacy access points.

52. A method for managing interference in a radio communications network, comprising the steps of:

- receiving at a first node in the radio communications network an instruction transmitted from a second node in the radio communications network to avoid using a plurality of frequencies to transmit to the second node;

- filtering a transmission signal to remove power from the transmission signal at each frequency in the plurality of frequencies to be avoided;

- transmitting the filtered transmission signal to the second node;

- wherein the instruction includes a first instruction and the filtered transmission signal includes a filtered first transmission signal that is transmitted to the second node using a first power via an 802.11-based orthogonal frequency-division multiplexing (OFDM) protocol, and further comprising:

- receiving at the first node in the radio communications network a second instruction transmitted from a third node in the radio communications network to avoid using a different plurality of frequencies to transmit to the third node;

- filtering a second transmission signal to remove power from the second transmission signal at each frequency in the different plurality of frequencies to be avoided; and

- transmitting, using a second power via the 802.11-based OFDM protocol and simultaneously with the filtered first transmission signal, the filtered second transmission signal to the third node.

53. A method for managing interference in a radio communications network, comprising the steps of:

- receiving at a first node in the radio communications network an instruction transmitted from a second node in the radio communications network to avoid using a plurality of frequencies to transmit to the second node;

- filtering a transmission signal to remove power from the transmission signal at each frequency in the plurality of frequencies to be avoided;

- transmitting the filtered transmission signal to the second node;

- receiving a compressed first feedback from the second node that characterizes receipt of a first signal sent from the first node to the second node;

receiving a compressed second feedback from a third node that characterizes receipt of a second signal sent from the first node to the third node;

decompressing the compressed first feedback resulting in a decompressed first feedback;
and

decompressing the compressed second feedback resulting in a decompressed second feedback;

wherein the filtered transmission signal is a filtered first transmission signal that is transmitted to the second node using an 802.11-based orthogonal frequency-division multiplexing (OFDM) protocol via at least one antenna of a plurality of antennas, using a first power that is based on the decompressed first feedback; and further comprising:

transmitting, using the 802.11-based OFDM protocol, a filtered second transmission signal, simultaneously with the filtered first transmission signal, to the third node using a second power that is based on the decompressed second feedback.

54. The method of claim 53, wherein the instruction includes a first instruction, and further comprising:

receiving at the first node in the radio communications network a second instruction transmitted from the third node to avoid using a different plurality of frequencies to transmit to the third node; and

filtering a second transmission signal to remove power from the second transmission signal at each frequency in the different plurality of frequencies to be avoided, resulting in the filtered second transmission signal.

55. The method of claim 53, wherein the first power and the second power are the same.

56. The method of claim 53, wherein the first power and the second power are different.

57. The method of claim 53, and further comprising:

generating a first data structure based on the decompressed first feedback, where the first power is based on the first data structure; and

generating a second data structure based on the decompressed second feedback, where the second power is based on the second data structure.

58. The method of claim 57, wherein the first data structure and the second data structure are different.

59. The method of claim 57, wherein the first data structure and the second data structure are orthogonal.

60. The method of claim 57, wherein the first data structure is unique to the second node, and the second data structure is unique to the third node.

61. The method of claim 57, wherein the first data structure is a first profile, and the second data structure is a second profile.

62. The method of claim 57, wherein the first data structure is a first optimal waveform profile.

63. The method of claim 53, and further comprising:
generating a single data structure based on the decompressed first feedback and the decompressed second feedback, where both the first power and the second power are based on the single data structure.

64. The method of claim 53, wherein the filtered second transmission signal is transmitted simultaneously with the filtered first transmission signal via the same plurality of antennas.

65. The method of claim 53, wherein the filtered second transmission signal is transmitted simultaneously with the filtered first transmission signal via at least one different antenna of the plurality of antennas.

66. The method of claim 53, wherein the filtered second transmission signal is transmitted simultaneously with the filtered first transmission signal via the at least one antenna of the plurality of antennas.
67. The method of claim 53, wherein an update of the compressed first feedback is repeatedly received, and the first power is repeatedly updated based on an updated decompressed first feedback; and an update of the compressed second feedback is repeatedly received, and the second power is repeatedly updated based on an updated decompressed second feedback.
68. The method of claim 53, wherein an update of the compressed first feedback is repeatedly received in real-time, and the first power is repeatedly updated in real-time based on an updated decompressed first feedback; and an update of the compressed second feedback is repeatedly received in real-time, and the second power is repeatedly updated in real-time based on an updated decompressed second feedback.
69. The method of claim 53, wherein an update of the compressed first feedback is repeatedly received at time periods of less than one second, and the first power is repeatedly updated based on an updated decompressed first feedback at time periods of less than one second; and an update of the compressed second feedback is repeatedly received at time periods of less than one second, and the second power is repeatedly updated based on an updated decompressed second feedback at time periods of less than one second.
70. The method of claim 53, wherein the filtered first transmission signal and the filtered second transmission signal are sent via the same transceiver.
71. The method of claim 53, wherein the filtered first transmission signal and the filtered second transmission signal are sent via different transceivers.
72. The method of claim 53, wherein the compressed first feedback and the compressed second feedback are received utilizing a dedicated channel.

73. The method of claim 53, wherein the compressed first feedback and the compressed second feedback are received via an antenna configured for omnidirectional communication.
74. The method of claim 53, wherein the decompressed first feedback and the decompressed second feedback are used to increase spatial separation among transmissions.
75. The method of claim 53, wherein the decompressed first feedback and the decompressed second feedback are used to increase spatial separation among transmissions at the same frequency.
76. The method of claim 53, and further comprising:
receiving a compressed third feedback from a fourth node that characterizes receipt of a third signal sent from the first node to the fourth node, the fourth node being a legacy node;
decompressing the compressed third feedback resulting in a decompressed third feedback;
transmitting, using a third frequency and another 802.11-based OFDM protocol, the third transmission signal to the fourth node using a third power that is based on the decompressed third feedback.
77. The method of claim 53, wherein the compressed first feedback is based on a received power and one or more frequencies via which the first signal is communicated.
78. The method of claim 53, wherein the compressed first feedback is based on a received power at a plurality of frequencies via which the first signal is communicated.
79. The method of claim 53, wherein the compressed first feedback is based on a series of power values as a function of frequency.
80. The method of claim 53, wherein the compressed first feedback includes a data structure that is based on a series of power values as a function of frequency.

81. The method of claim 53, wherein the instruction is received prior to the receipt of the compressed first feedback.
82. The method of claim 53, wherein the instruction is received separately with respect to the receipt of the compressed first feedback.
83. The method of claim 53, wherein at least three transmission signals are capable of being simultaneously transmitted to at least three different devices, using the same multiple antennas.
84. The method of claim 53, wherein at least three transmission signals are capable of being simultaneously transmitted to at least three different devices, using at least one different antenna.
85. The method of claim 53, wherein the instruction includes a request to send (RTS) instruction.
86. The method of claim 53, wherein the instruction includes a 802.11 clear to send (CTS) instruction.
87. The method of claim 53, wherein the filtered first transmission signal is transmitted using a frequency band that is selected based on the instruction and the filtered second transmission signal is transmitted using the frequency band that is selected based on another instruction received from the third node, where the filtered first transmission signal is transmitted using a first frequency in the frequency band and the filtered second transmission signal is transmitted using a second frequency in the frequency band.
88. The method of claim 53, wherein the filtered first transmission signal is transmitted using a first frequency and the filtered second transmission signal is transmitted using a second frequency.
89. The method of claim 53, wherein the filtered first transmission signal and the filtered second transmission signal are transmitted using the same one or more frequencies.

90. The method of claim 53, wherein the filtered first transmission signal and the filtered second transmission signal are transmitted using the same frequency band.
91. The method of claim 53, wherein the filtered first transmission signal is transmitted using a first frequency that is based on the instruction and the filtered second transmission signal is transmitted using a second frequency that is based on another instruction received from the third node.
92. The method of claim 53, wherein the filtered first transmission signal is transmitted using a frequency that is based on the instruction and the filtered second transmission signal is transmitted using the frequency that is based on another instruction received from the third node.
93. The method of claim 53, wherein the filtered first transmission signal is transmitted using a frequency band that is selected based on the instruction and the filtered second transmission signal is transmitted using the frequency band that is selected based on another instruction received from the third node.
94. The method of claim 53, wherein at least one of:
the first signal includes a data signal;
the first signal includes an aggregate signal;
the first signal includes a first data signal, and the second signal includes a second data signal;
the first and second signals are reflected in an aggregate signal;
the compressed first feedback is combined with the instruction;
the compressed first feedback is received with the instruction;
the compressed first feedback is configured to ensure that transmissions from all neighbors of the first node are received at a same power level;
the compressed first feedback is configured to at least one of: minimize a transmit power on reliable links, maximize an ability to achieve spatial separation among transmissions on a

same frequency, minimize network self-interference, improve low probability of intercept (LPI), or lower probability of detection (LPD);

the compressed first feedback and the compressed second feedback are received simultaneously;

at least one of the compressed first feedback or the compressed second feedback is received before the instruction is received;

at least one of the compressed first feedback or the compressed second feedback is received after the instruction is received;

the steps are performed in the order listed;

the radio communications network includes an 802.11 network;

the radio communications network includes an 802.11a network;

the radio communications network includes an 802.11g network;

the at least one antenna includes multiple antennas; the at least one antenna includes at least one omnidirectional antenna;

the at least one antenna includes at least one directional antenna;

interference in the radio communications network is managed;

the first node is a mobile node and the second node is a non-mobile node;

the second node is a mobile node and the first node is a non-mobile node;

the instruction sets forth the plurality of frequencies to avoid using;

the instruction specifies the plurality of frequencies to avoid using;

a purpose of the instruction is to avoid using the plurality of frequencies;

a purpose of the instruction is to avoid using the plurality of frequencies, where the purpose is accomplished by specifying the plurality of frequencies to avoid using;

a purpose of the instruction is to avoid using the plurality of frequencies, where the purpose is accomplished by specifying one or more frequencies to use;

a purpose of the instruction is to avoid using the plurality of frequencies, where the purpose is accomplished by specifying one or more frequencies to use, the one or more frequencies not including the plurality of frequencies;

the instruction to avoid the plurality of frequencies sets forth one or more frequencies to use;

the instruction to avoid the plurality of frequencies specifies one or more frequencies to use;

the instruction to avoid the plurality of frequencies assigns one or more frequencies to use;

the instruction to avoid the plurality of frequencies does not specify the plurality of frequencies;

the instruction to avoid the plurality of frequencies sets forth one or more frequencies to use, thereby resulting in the avoidance of using the plurality of frequencies;

a purpose of the filtering is to remove the power from the transmission signal at each frequency in the plurality of frequencies to be avoided, where the purpose is accomplished by specifying one or more frequencies to which the power is to be applied;

a purpose of the filtering is to remove the power from the transmission signal at each frequency in the plurality of frequencies to be avoided, where the purpose is accomplished by specifying the plurality of frequencies to be avoided;

the filtering suppresses or otherwise minimizes waves or oscillations at each frequency in the plurality of frequencies to be avoided;

the filtering suppresses or otherwise minimizes waves or oscillations at each frequency in the plurality of frequencies to be avoided, thereby resulting in the removal of the power from the transmission signal at each frequency in the plurality of frequencies to be avoided;

the filtering removes all power from the transmission signal;

the filtering removes some power from the transmission signal;

the filtering discards one or more portions of the transmission signal at each of the plurality of frequencies;

the filtering utilizes transmit excision;

the filtering utilizes compression;

the filtering identifies certain one or more frequencies in connection with which power is applied, thereby resulting in the removal of the power from the transmission signal at each frequency in the plurality of frequencies to be avoided;

the removal of power from the transmission signal at each frequency in the plurality of frequencies to be avoided is accomplished by an adjustment in relation to power previously used in connection with the transmission signal;

the removal of power from the transmission signal at each frequency in the plurality of frequencies is accomplished by adjusting a processing of the transmission signal so that power that was previously used in connection with the transmission signal at each frequency in the plurality of frequencies to be avoided, is no longer used in connection with the transmission signal at each frequency in the plurality of frequencies to be avoided;

the removal of power from the transmission signal at each frequency in the plurality of frequencies to be avoided is accomplished by setting a waveform profile that results in no power being applied in connection with the transmission signal at each frequency in the plurality of frequencies to be avoided;

the removal of power from the transmission signal at each frequency in the plurality of frequencies to be avoided is accomplished by pre-processing the transmission signal, before any power is applied, so that power, which would otherwise be applied in connection with the transmission signal at each frequency in the plurality of frequencies, is not applied in connection with the transmission signal at each frequency in the plurality of frequencies to be avoided;

the removal of power from the transmission signal at each frequency in the plurality of frequencies to be avoided is accomplished by pre-processing the transmission signal, before any power is applied, so that no power is applied in connection with the transmission signal at each frequency in the plurality of frequencies to be avoided;

the transmission signal includes a plurality of packets;

the transmission signal includes a plurality of different transmissions;

the transmission signal includes a plurality of transmissions to the second node;

the transmission signal includes a plurality of differently-timed transmissions to the second node;

the transmission signal includes a plurality of transmission components to the second node, each with different power levels;

the transmission signal includes a plurality of transmission components to the second node, each with different power levels as a result of different instances of the filtering;

the transmission signal is generated so as to not include power at each frequency in the plurality of frequencies to be avoided;

the transmission signal is generated so as to not include power at each frequency in the plurality of frequencies to be avoided, thereby resulting in the removal of the power from the transmission signal at each frequency in the plurality of frequencies to be avoided;

the transmission signal is pre-processed so as to not include power at each frequency in the plurality of frequencies to be avoided, thereby resulting in the removal of the power from the transmission signal at each frequency in the plurality of frequencies to be avoided;

the filtering is performed using an output filter;

the filtering is performed using an optimal matched filter;

the filtering is performed using a band selection filter;

the filtering is performed using a median filter; or

the filtering is performed using a nonlinear filter.

95. A method for managing interference in a radio communications network, comprising the steps of:

receiving at a first node in the radio communications network an instruction transmitted from a second node in the radio communications network to avoid using a plurality of frequencies to transmit to the second node;

filtering a transmission signal to remove power from the transmission signal at each frequency in the plurality of frequencies to be avoided;

transmitting the filtered transmission signal to the second node;

separately from the receipt of the instruction, receiving a particular signal at the first node that is transmitted from the second node;

generating a feedback based on a received power and one or more frequencies via which the particular signal is received;

compressing the feedback; and

transmitting the compressed feedback from the first node to the second node, for use by the second node in determining a transmit power with which the second node transmits to the first node via at least one antenna of a plurality of antennas, while simultaneously transmitting to one or more other nodes;

wherein the filtered transmission signal is transmitted to the second node using an 802.11-based orthogonal frequency-division multiplexing (OFDM) protocol;

wherein an update of the compressed feedback is repeatedly generated, compressed, and transmitted at time periods of less than one second; so that the transmit power is repeatedly updated based thereupon at time periods of less than one second.

96. The method of claim 95, wherein the instruction includes a first instruction and the filtered transmission signal includes a filtered first transmission signal, and further comprising:

receiving at the first node in the radio communications network a second instruction transmitted from a third node in the radio communications network to avoid using a different plurality of frequencies to transmit to the third node;

filtering a second transmission signal to remove power from the second transmission signal at each frequency in the different plurality of frequencies to be avoided; and

transmitting the filtered second transmission signal to the third node.

EXHIBIT A

CURRICULUM VITAE

Education	STANFORD UNIVERSITY	Stanford, CA
	<i>Ph.D. degree in Electrical Engineering</i>	Jan. 1999 - Dec. 2002
	Thesis title: “Probabilistic Methods for Web Caching and Performance Prediction of IP Networks and Web Farms”, supervised by Prof. Balaji Prabhakar.	
	STANFORD UNIVERSITY	Stanford, CA
	<i>M.S. degree in Electrical Engineering</i>	Sep. 1997 - Jan. 1999
	GPA: 4.0/4.0.	
	NATIONAL TECHNICAL UNIVERSITY OF ATHENS	Athens, Greece
	<i>Diploma in Electrical and Computer Engineering</i>	Sep. 1992 - June 1997
	GPA: 9.74/10.0. (Graduated ranking 1st in the class of '97.)	
Work in Academia	UNIVERSITY OF SOUTHERN CALIFORNIA	Los Angeles, CA
	Electrical and Computer Engineering (ECE) and (by courtesy) Computer Science dept.	
	<i>Professor</i>	Nov. 2017 - now
	<i>Associate Chair of ECE department</i>	July 2021 - June 2024
	<i>Associate Chair of ECE department</i>	Jan. 2019 - Aug 2019
	<i>Associate Professor</i>	May. 2009 - Nov. 2017
	<i>Assistant Professor</i>	Sep. 2003 - Apr. 2009
	Research interests: Modeling, performance analysis, algorithm design, and system design and implementation for efficient, AI-enabled and privacy-preserving networked, distributed systems, including the Internet and the web, data centers and cloud systems, wireless systems (e.g. WiFi, cellular, IoT, spectrum sharing, delay tolerant, mobile ad hoc), augmented and virtual reality systems, autonomous robotic/vehicle/drone systems, and peer to peer systems.	
	STANFORD UNIVERSITY	Stanford, CA
	<i>Visiting Associate Professor</i>	Aug. 2009 - Dec. 2009
	STANFORD UNIVERSITY	Stanford, CA
	<i>Postdoctoral Research Fellow</i>	Jan. 2003 - Aug. 2003
Technical Work outside academia		
	ADANT TECHNOLOGIES	
	<i>Technical Consultant</i>	Jan. 2017 - May 2018
	WiFi 802.11ax and smart antennas.	
	QUANTENNA COMMUNICATIONS	
	<i>Technical Consultant</i>	Jan. 2015 - 2016
	Advanced MAC and PHY layer techniques applied to next generation wireless networks.	
	HONEYWELL	
	<i>Technical Consultant</i>	Sep. 2013 - Jun. 2014
	Sensor-network based fire alarm systems.	

SPACEMUX, INC. <i>Co-founder and CEO</i> Increasing wireless bandwidth and speed tenfold.	May 2013 - Dec. 2014
CISCO SYSTEMS <i>Technical Consultant</i> Vehicular multi-technology wireless connectivity.	San Jose, CA Sep. 2009 - Dec. 2009
FINEGROUND NETWORKS INC. <i>Technology Architect</i> Accelerating web downloads using delta encoding.	Cambell, CA Sep. 2000 - June 2001

Expert Witness
Ongoing Work

LUNA ET AL. V. GOOGLE <i>Case No. 24CV434093 (N.D. Cal.)</i> Representing defendant Google.	Apr. 2025 - now
MARKELS V. AARP <i>Case No. 4:22-cv-05499-YGR (N.D. Cal.)</i> Representing defendant AARP. <i>Reports:</i> Initial expert report	Dec 2024 - now Apr. 15, 2025
GOOGLE RTB CONSUMER PRIVACY LITIGATION <i>Case No. 4:21-cv-02155-YGR-VKD (N.D. Cal.)</i> Representing defendant Google. <i>Reports:</i> Initial expert report Supplemental expert report <i>Court Appearances:</i> Deposition re initial expert report Deposition re initial supplemental report	July 2023 - now Sep. 29, 2023 Jan. 31, 2025 Oct. 16, 2023 Feb. 18, 2025
JP MORGAN CHASE V. CHARLIE JAVICE Representing defendant for issues related to Google Analytics and Data Synthesis and Augmentation Expert Disclosure	July. 15, 2024

Expert Witness
Completed Recent Work

BROWN V. GOOGLE LLC <i>Case No. 4:20-cv-03664-YGR-SVK (N.D. Cal.)</i> Representing defendant Google, judge only certified an injunctive class, case settled. <i>Reports:</i> First rebuttal expert report Second rebuttal expert report <i>Declarations:</i> First declaration	Apr. 2022 - Jan. 2024 June 7, 2022 Aug. 30, 2023 Nov. 30, 2022
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Second declaration Feb. 10, 2023
Court Appearances:
Deposition re first rebuttal expert report Aug. 19, 2022
Deposition re second rebuttal expert report Oct. 9, 2023

ATLAS GLOBAL TECHNOLOGIES VS ASUSTeK COMPUTER INC.
Case No. 6:21-cv-00820-ADA (E.D. Texas) Sep. 2022 - Dec. 2023
Representing plaintiff Atlas, case settled.
Reports:
Rebuttal expert report re validity of multiple patents July 14, 2023
Court Appearances:
Deposition re validity of multiple patents Aug. 1, 2023

ATLAS GLOBAL TECHNOLOGIES V. ONEPLUS TECHNOLOGY (SHENZHEN) CO., LTD
Case No. 6:21-CV-01217-ADA (W. D. Texas) Mar. 2023 - Dec. 2023
Representing plaintiff Atlas, case settled.
Declarations:
Declaration re claim construction for multiple patents Nov. 18, 2022

ZYXEL COMM AND NETWORKS CORPORATION V. ATLAS GLOBAL TECHNOLOGIES
Case No IPR2023-00877 Mar. 2023 - Oct. 2023
Representing patent owner Atlas. PTAB denied institution of IPR. Case settled.
Declarations:
Declaration re validity of a patent Aug. 11, 2023

ZYXEL COMM AND NETWORKS CORPORATION V. ATLAS GLOBAL TECHNOLOGIES
Case No IPR2023-00863 Mar. 2023 - Oct. 2023
Representing patent owner Atlas. PTAB denied institution of IPR. Case settled.
Declarations:
Declaration re validity of a patent Aug. 11, 2023

ATLAS GLOBAL TECHNOLOGIES V. SERCOM CORP.
Case No. 6:21-cv-00818-ADA (E.D. Texas) Oct. 2022 - Oct. 2023
Representing plaintiff Atlas, case settled.
Reports:
Rebuttal expert report re validity of multiple patents July 14, 2023
Court Appearances:
Deposition re validity of multiple patents Aug. 1, 2023

SERCOMM CORP. V. ATLAS GLOBAL TECHNOLOGIES
Case No. IPR2022-01519 Sep. 2022 - Apr. 2023
Representing patent owner Atlas, PTAB denied institution of IPR.
Declarations:
Declaration re validity of a patent Jan. 19, 2023

SERCOMM CORP. V. ATLAS GLOBAL TECHNOLOGIES
Case No. IPR2022-01520 Sep. 2022 - Apr. 2023
Representing patent owner Atlas, PTAB denied institution of IPR.
Declarations:

Declaration re validity of a patent Jan. 19, 2023

ATLAS GLOBAL TECHNOLOGIES VS TP-LINK TECH., CO, ET AL.
Case No. 2:21-cv-00430-JRG (E.D. Texas) Sep. 2022 - Sep. 2023

Representing plaintiff Atlas. Atlas was granted the full requested damages amount.

Reports:

Rebuttal expert report re validity of multiple patents May 23, 2023

Court Appearances:

Deposition on opinions rendered re validity of multiple patents June 5, 2023

BROADCOM V. NETFLIX

Case No. 3:20-cv-04677-JD (N.D. Cal.) Jan. 2021 - Apr. 2022

Representing defendant Netflix. Judge ordered the case to stay.

CA AND AVAGO V. NETFLIX

Case No. 2:21-CV-00080-JRG-RSP (E.D. Texas) Jan. 2021 - Apr. 2022

Representing defendant Netflix. Judge ordered the case to stay.

Reports:

Opening expert report re invalidity of patents Dec. 20, 2021

Supplemental opening expert report re invalidity of patents Dec. 27, 2021

Rebuttal expert report re infringement of patents Jan. 11, 2022

Declarations:

Declaration re claim construction for patents Aug. 30, 2021

Court Appearances:

Deposition re invalidity and non-infringement of patents Jan. 19, 2022

**PhD Student
Supervision**

- Dimitris Andreadis (Aug. 2024 - now)
- Ryan Swift (Aug. 2024 - now)
- Jike Zhong (Aug. 2024 - now)
- Stavros Damianakis (Aug. 2024 - now)
- Rohan Sequeira (Aug. 2023 - now)
- Te Yi Kan (Jan. 2023 - now)
- Tina Esmailzadeh (Aug. 2022 - now)
- Namo Asavisanu (Aug. 2021 - now)
- Jiang Zhang (Aug. 2019 - May 2024, currently at *Facebook*)
- Lillian Clark (co-advised with Prof. Bhaskar Krisnamachari, Sep. 2018 - March 2023, currently at *SpaceX*)
- Hang Qiu (primary advisor Prof. Ramesh Govindan, Jan. 2015 - June 2021, currently *Assistant Professor at the University of California, Riverside*)
- Po-Han Huang (Sep. 2015 - Jan. 2020, currently at *Facebook*)
- Kaidong Wang (Sep. 2014 - Dec. 2019, currently at *Qualcomm*)
- Yonglong Zhang (Sep. 2013 - Dec. 2018, currently at *Facebook*)
- Matthew Clark (Sep. 2013 - Dec. 2017, currently at *Aerospace Corporation*)
- Weng Chon Ao (Sep. 2012 - Dec. 2017, currently at *Qualcomm*)
- Antonios Michaloliakos (Aug. 2010 - Sep. 2016, currently at *Enfabrica, California*)

- Ranjan Pal (co-advised with Prof. Leana Golubchik, Jan. 2009 - Aug. 2014, currently *Research Scientist at MIT*)
- Vlad Horia Balan (Sep. 2007 - Aug. 2013, currently at *Google*)
- Wei-Cherng Liao (Sep. 2004 - Dec. 2008, currently at *MediaTek, Taiwan*)
- Apoorva Jindal (Sep. 2003 - Dec. 2008, currently at *Uber*)
- Fragkiskos Papadopoulos (Sep. 2003 - Dec. 2007, currently *Associate Professor at Cyprus University of Technology, Cyprus*)
- Thrasyvoulos Spyropoulos (Sep. 2003 - Jun. 2006, currently *Professor at Technical University of Crete, Greece*)

Proposals Funded	AMAZON GRANT	Sep. 2023
	Proposal title: Private labelling and learning for voice assistants with cameras.	
	AMAZON GRANT	Sep. 2022
	Proposal title: Federated learning with secure aggregation: Accessing and improving its privacy.	
	CA-SANTA MONICA MOUNTAINS CONSERVANCY GRANT	Dec. 2021
	Proposal title: Wildfire Detection and Fighting Using a Network of Collaborative Drones.	
	NSF SATC GRANT	Oct. 2020 - Sep. 2025
	National Science foundation (NSF) award under the Secure and Trustworthy Computing (SaTC) call.	
	Proposal title: SaTC: Frontiers: Collaborative: Protecting Personal Data Flow on the Internet.	
	NSF CNS GRANT	Oct. 2020 - Sep. 2023
	National Science foundation (NSF) award under the Computer and Networked Systems (CNS) call.	
	Proposal title: CNS Core: Medium: Network-Enabled Cooperative Perception for Future Autonomous Vehicles.	
	NSF NETS GRANT	Sep. 2019 - Aug. 2022
	National Science foundation (NSF) award under the Networking Technology and Systems (NeTS) call.	
	Proposal Title: CNS Core: Medium: Collaborative Research: Privacy-Preserving Mobile Crowdsourcing.	
	CISCO SYSTEMS GRANT	April 2019
	Proposal Title: Virtual and augmented reality over next generation WiFi.	
	CISCO SYSTEMS GRANT	Dec 2016
	Proposal Title: Data-driven formal optimization of data centers.	
	NSF NETS GRANT	Sep. 2016 - Aug. 2020
	National Science foundation (NSF) award under the Networking Technology and Systems (NeTS) call.	
	Proposal Title: Spectrum Sharing Systems for Wireless Networks: Performance and Privacy Challenges.	
	ADANT TECHNOLOGIES GRANT	June 2016
	Proposal Title: Using reconfigurable antenna systems with WiFi communication devices.	
	HUAWEI GRANT	May 2016
	Proposal Title: Addressing wireless bandwidth demand via asynchronously coordinated multi-cell deployments.	

ADANT TECHNOLOGIES GRANT Dec. 2015
Proposal Title: Asynchronous coordination of WiFi transmitters equipped with smart antennas for enhanced spectral efficiency.

NSF EARS GRANT Sep. 2014 - Aug. 2019
National Science foundation (NSF) award under the Enhancing Access to the Radio Spectrum (EARS) crosscutting program.
Proposal Title: Future Wireless Broadband Access: Cross-Optimizing Hardware, Physical and Network Layers.

CISCO SYSTEMS GRANT May 2014
Proposal Title: Rateless encoded UDP for error-resilient wireless links.

ARMY RESEARCH LABORATORY (ARL) GRANT Sep. 2009 - Aug. 2014
CTA: Communications and Networking Academic Research Center.
Proposal Title: QUANTA: Quality of Information-Aware Networks for Tactical Applications.

DoCoMo LABS GRANT Sep. 2011 - 2013
Proposal Title: MIMO systems with TDD

CISCO SYSTEMS GRANT Sep. 2011 - 2013
Proposal Title: Efficient airtime allocation in wireless networks.

MING HSIEH INSTITUTE (MHI) GRANT May 2011 - 2013
Proposal Title: Large-Scale Software-Radio Testbed.

METRANS TRANSPORTATION CENTER GRANT Aug. 2009 - Aug. 2010
Proposal title: End-to-end performance in vehicular networks with an emphasis on safety and security applications.

CISCO SYSTEMS GRANT Sep. 2008
Proposal Title: Neighborhood centric transport for home networking environments.

NSF NETS GRANT Aug. 2008 - Aug. 2011
National Science foundation (NSF) award under the Networking Technology and Systems (NeTS) call.
Proposal title: Contention-Awareness in Mesh Transport: Theory and Practice.

CISCO SYSTEMS GRANT Apr. 2008
Proposal Title: TCP challenges in multi-hop wireless networks. From the networking workshop "The Future of TCP: Train-wreck or Evolution?".

VSoE INNOVATIVE RESEARCH FUND GRANT Dec. 2007 - Dec. 2008
Proposal title: Establishing a New USC Invited Workshop on Theory and Practice in Wireless Networks.

METRANS TRANSPORTATION CENTER GRANT Oct. 2007 - Dec. 2008
Proposal title: Efficient Routing for Safety Applications in Vehicular Networks.

NSF NETS GRANT Aug. 2005 - Aug. 2008
National Science foundation (NSF) award under the Networking Technology and Systems (NeTS) call.
Proposal title: Efficient Routing in Delay Tolerant Networking.

ZUMBERGE FACULTY RESEARCH AND INNOVATION GRANT July 2005 - June 2006
Proposal title: Routing in Intermittently Connected Mobile Networks.

Awards

ACM DISTINGUISHED MEMBER Nov. 2019
The ACM Distinguished Member program recognizes up to 10 percent of ACM worldwide membership with at least 15 years of professional experience who have achieved significant accomplishments or have made a significant impact on the computing field.

IEEE FELLOW Jan. 2018
The IEEE Grade of Fellow is conferred by the IEEE Board of Directors upon a person with an outstanding record of accomplishments in any of the IEEE fields of interest. The total number selected in any one year cannot exceed one-tenth of one- percent of the total voting membership. IEEE Fellow is the highest grade of membership and is recognized by the technical community as a prestigious honor and an important career achievement.

DISTINGUISHED MEMBER OF 2018 IEEE INFOCOM TPC AWARD 2018
The IEEE Communications Society awards annually a select number of TPC members of its flagship conference IEEE Infocom with a Distinguished Member award.

DISTINGUISHED MEMBER OF 2016 IEEE INFOCOM TPC AWARD 2016
The IEEE Communications Society awards annually a select number of TPC members of its flagship conference IEEE Infocom with a Distinguished Member award.

ACM NOTABLE ARTICLE IN COMPUTING - BEST OF 2013 2014
Selection of paper "Modelling BitTorrent-like systems with many classes of users", W.-C. Liao, F. Papadopoulos, K. Psounis, and C. Psomas, ACM Transactions on Modelling and Computer Simulation, Vol. 23, Issue 2, Article No. 13, May 2013.

MEPC BUSINESS PLAN COMPETITION - 2ND PLACE 2013
Presentation of SpaceMUX Inc., a USC spinoff startup specializing in advanced physical layer techniques applied to next generation wireless networks.

ACM SENIOR MEMBER AWARD Jan. 2009
The Senior Member grade recognizes those ACM members with at least 10 years of professional experience and 5 years of continuous professional membership who have demonstrated performance that sets them apart from their peers.

IEEE SENIOR MEMBER AWARD Nov. 2008
Qualifications for this distinction are at least ten years of professional practice and five years of significant performance as demonstrated by substantial engineering responsibility or achievement, publication of engineering and technical papers, books or inventions, and the development and teaching of engineering courses.

FUTURE OF TCP BEST PRESENTATION AWARD Apr. 2008
"Best and Most Compelling Presentation and Demonstration Award" at the networking workshop "The Future of TCP: Train-wreck or Evolution?" held at Stanford University and sponsored by Cisco Systems.

ZUMBERGE FACULTY RESEARCH AND INNOVATION AWARD July 2005
The James H. Zumberge faculty research and innovation award is granted to a selected number of Professors at the University of Southern California.

CHARLES LEE POWELL SCHOLARSHIP AWARD Dec. 2003
The Charles Lee Powell award is granted to a selected number of Assistant Professors at the University of Southern California.

ILLEANA AND ERIC BENHAMOU STANFORD GRADUATE FELLOWSHIP 1997 - 2002
Fellowship is awarded for four years to a very select number of PhD students based on academic merit.

BEST-STUDENT NATIONAL TECHNICAL UNIVERSITY OF ATHENS AWARD 1997
Awarded yearly to the student that graduates with the highest GPA across all departments of National Technical University of Athens.

OTHER GRADUATE STUDIES AWARDS 1997 - 1998
Regent's Fellowship by University of California Berkeley, Charles Lee Powell Foundation Graduate Fellowship by Caltech, Gordon Y. S. Wu Fellowship in Engineering by Princeton University, Sage Fellowship by Cornell University.

Publications CONFERENCE, PEER-REVIEWED, FULL-LENGTH PAPERS

1. M Li, J Zhong, T Chen, Y Lai, K Psounis, "EEE-Bench: A Comprehensive Multi-modal Electrical And Electronics Engineering Benchmark", in *Proceedings of CVPR*, 2025.
2. J. Zhang, R. Sequeira, K. Psounis, "SpinML: Customized Synthetic Data Generation for Private Training of Specialized ML Models", in *Proceedings of PETS*, 2025.
3. T. Khezresmaeilzadeh, E. Zhu, D. J. Dubois, K. Psounis, D. Choffnes, "Echoes of Privacy: Uncovering the Profiling Practices of Voice Assistants", in *Proceedings of PETS*, 2025.
4. Jiang Zhang, Qiong Wu, Yiming Xu, Cheng Cao, Zheng Du, and Konstantinos Psounis, "Efficient Toxic Content Detection by Bootstrapping and Distilling Large Language Models", in *Proceedings of AAAI*, 2024.
5. Y. Hu, X. Ye, Y. Liu, S. Kundu, G. Datta, S. Mutnuri, N. Asavisanu, N. Ayanian, K. Psounis, and P. Beerel, "FireFly A Synthetic Dataset for Ember Detection in Wild-fire", in *Proceedings of the 5th Workshop on Artificial Intelligence for Humanitarian Assistance and Disaster Response, at ICCV*, 2023.
6. J. Zhang, H. Askari, K. Psounis, and Z. Shafiq, "No Video Left Behind: A Utility-Preserving Obfuscation Approach for YouTube Recommendations", in *Proceedings of PETS*, 2023.
7. A. Elkordy, J. Zhang, Y. Ezzeldin, K. Psounis, and S. Avestimehr, "How Much Privacy Does Federated Learning with Secure Aggregation Guarantee?", in *Proceedings of PETS*, 2023.
8. H. Qiu, P.-H. Huang, N. Asavisanu, X. Liu, K. Psounis, and R. Govindan, "Auto-Cast: Scalable Infrastructure-less Cooperative Perception for Distributed Collaborative Driving", in *Proceedings of ACM MobiSys* 2022.
9. J. Zhang, K. Psounis, H. Muhammad, and Z. Shafiq, "HARPO: Learning to Subvert Online Behavioral Advertising", in *Proceedings of NDSS*, 2022.
10. L. Clark, C. Andre, J. Galante, B. Krishnamachari, and K. Psounis, "TEAM: Trilateration for Exploration and Mapping with Robotic Networks", in *Proceedings of the 18th International Conference on Ubiquitous Robots*, July 2021.
11. L. Clark, J. Galante, B. Krishnamachari, and K. Psounis, "A Queue-Stabilizing Framework for Networked Multi-Robot Exploration", in *Proceedings of IEEE International Conference on Robotics and Automation (ICRA)*, May 2021.
12. P.-H. Huang and K. Psounis, "Efficient User-Cell Association for 360 Video Streaming over Wireless Networks", in *Proceedings of IFIP Networking*, June 2020.

13. A. Petropulu, K. Psounis, and A. Al Hilli, "MIMO Radar Privacy Protection Through Gradient Enforcement in Shared Spectrum Scenarios", in *Proceedings of IEEE International Symposium on Dynamic Spectrum Access Networks (DySPAN)*, Newark, NJ, November 2019.
14. E. Alimpertis, A. Markopoulou, C. T. Butts and K. Psounis, "City-Wide Signal Strength Maps: Prediction with Random Forests", in *Proceedings of WWW*, San Francisco, CA, May 2019. (acceptance rate 15%)
15. A. Dimas, M. Clark, B. Li, K. Psounis and A. Petropulu, "On Radar Privacy in Shared Spectrum Scenarios", in *Proceedings of the International Conference on Acoustics, Speech, and Signal Processing (ICASSP)*, Brighton, UK, May 2019.
16. K. Wang and K. Psounis. "Scheduling and Resource Allocation in 802.11ax", in *Proceedings of IEEE Infocom*, Honolulu, HI, April 2018. (acceptance rate 19.2%)
17. M. Clark and K. Psounis. "Achievable Privacy-Performance Tradeoffs for Spectrum Sharing with a Sensing Infrastructure", in *Proceedings of the 14th Annual Conference on Wireless On-Demand Network Systems and Services (IFIP WONS)*, 8 pages (no pp. avail.), Isola, France, February 2018.
18. Y. Zhang and K. Psounis. "Efficient MU-MIMO via Switched-beam Antennas", in *Proceedings of ACM MOBIHOC*, 10 pages (no pp. avail.), Madras, India, July 2017. (acceptance rate 17%)
19. M. Clark and K. Psounis. "Designing Sensor Networks to Protect Primary Users in Spectrum Access Systems", in *Proceedings of the 13th Annual Conference on Wireless On-Demand Network Systems and Services (IFIP/IEEE WONS)*, 8 pages (no pp. avail.), Jackson, WY, February 2017. (acceptance rate 30%)
20. P.-H. Huang and K. Psounis. "Efficient mmwave wireless backhauling for dense small-cell deployments", in *Proceedings of the 13th Annual Conference on Wireless On-Demand Network Systems and Services (IFIP/IEEE WONS)*, 8 pages (no pp. avail.), Jackson, WY, February 2017. (acceptance rate 30%)
21. W. Chon Ao and K. Psounis. "An Efficient Approximation Algorithm for Online Multi-Tier Multi-Cell User Association", in *Proceedings of ACM MOBIHOC*, 10 pages (no pp. avail.), Paderborn, Germany, July 2016. (acceptance rate 18.7%)
22. H. Qiu, K. Psounis, G. Caire, K. Chugg and K. Wang. "High-Rate WiFi Broadcasting in Crowded Scenarios via Lightweight Coordination of Multiple Access Points", in *Proceedings of ACM MOBIHOC*, 10 pages (no pp. avail.), Paderborn, Germany, July 2016. (acceptance rate 18.7%)
23. M. Clark and K. Psounis. "Can the Privacy of Primary Networks in Shared Spectrum be Protected?", in *Proceedings of IEEE INFOCOM*, 9 pages (no pp. avail.), San Francisco, April 2016. (acceptance rate 18.2%)
24. G. Zois, A. Michaloliakos, K. Psounis, V. Vassalos and I. Mourtos. "Non-asymptotic performance bounds for downlink MU-MIMO scheduling", in *Proceedings of the 12th Annual Conference on Wireless On-Demand Network Systems and Services (IFIP WONS)*, 8 pages (no pp. avail.), Italy, January 2016. (acceptance rate 30%)
25. W. Chon Ao and K. Psounis. "Distributed Caching and Small Cell Cooperation for Fast Content Delivery", in *Proceedings of ACM MOBIHOC*, pp. 127–136, Hangzhou, China, June 2015. (acceptance rate 14.8%)
26. M. Clark and K. Psounis. "Efficient Resource Scheduling for a Secondary Network in Shared Spectrum", in *Proceedings of IEEE INFOCOM*, pp. 1257–1265, Hong Kong, April 2015. (acceptance rate 19.0%)
27. R. Pal, L. Golubchik, K. Psounis, and P. Hui. "Will Cyber-Insurance Improve Network Security? A Market Analysis", in *Proceedings of IEEE INFOCOM*, pp. 235–243, Toronto, Canada, April 2014. (acceptance rate 19.4%)

28. E. N. Ciftcioglu, A. Michaloliakos, K. Psounis, T. La Porta, and A. Yener. "Power Minimization with Quality-of-Information Outages", in *Proceedings of the IEEE Wireless Communications and Networking Conference (WCNC)*, pp. 1655–1660, Istanbul, Turkey, April 2014.
29. R. Pal, L. Golubchik, K. Psounis, and P. Hui. "On A Way to Improve Cyber-Insurer Profits: When A Security Vendor Becomes the Cyber-Insurer", in *Proceedings of IFIP NETWORKING*, 9 pages (no pp. avail.), New York, May 2013. (acceptance rate 26.2%)
30. H. V. Balan, M. Segura, S. Deora, A. Michaloliakos, R. Rogalin, K. Psounis and G. Caire. "USC SDR, an easy-to-program, high data rate, real time software radio platform", in *Proceedings of the ACM SIGCOMM workshop of Software Radio Implementation Forum (SRIF 2013)*, pp. 25–30, Hong Kong, China, August 2013.
31. A. Michaloliakos, R. Rogalin, H. V. Balan, K. Psounis and G. Caire. "Efficient MAC for distributed multiuser MIMO systems", in *Proceedings of the 10th Annual Conference on Wireless On-Demand Network Systems and Services (IFIP/IEEE WONS)*, pp. 52–59, Alberta, March 2013.
32. H. V. Balan, R. Rogalin, A. Michaloliakos, K. Psounis and G. Caire, "Achieving High Data Rates in a Distributed MIMO System", in *Proceedings of ACM MOBICOM*, pp. 41–52, Istanbul, Turkey, August 2012. (acceptance rate 15.1%)
33. M. Mongiovi, A. Singh, X. Yan, B. Zong, and K. Psounis, "Efficient multicasting for delay tolerant networks using graph indexing", in *Proceedings of IEEE INFOCOM*, pp. 1386–1394, Orlando, Florida, March 2012. (acceptance rate 18.0%)
34. R. Pal, L. Golubchik, and K. Psounis. "Aegis: A Novel Cyber-Insurance Model", in *Proceedings of the 2nd Conference on Decision and Game Theory for Security (GameSec 2011)*, pp. 131–150, College Park, Maryland, November 2011.
35. E. N. Ciftcioglu, A. Yener, R. Govindan, and K. Psounis. "Operational Information Content Sum Capacity: Formulation and Examples", in *Proceedings of the 14th International Conference on Information Fusion (FUSION)*, pp. 1–7, Chicago, July 2011.
36. K.-Y. Jang, K. Psounis, and R. Govindan. "Simple Yet Efficient, Transparent Airtime Allocation for TCP in Wireless Mesh Networks", in *Proceedings of ACM CoNEXT*, article no. 28, 12 pages, Philadelphia, December 2010. (acceptance rate 19%)
37. A. Jindal and K. Psounis. "Making the Case for Random Access Scheduling in Wireless Multi-hop Networks", in *Proceedings of IEEE INFOCOM*, (mini-conference), pp. 1–5, San Diego, California, March 2010. (acceptance rate 24%)
38. S. Rangwala, A. Jindal, K.-Y. Jang, K. Psounis, and R. Govindan. "Understanding Congestion Control in Multi-hop Wireless Mesh Networks", in *Proceedings of ACM MOBICOM*, pp. 291–302, San Fransisco, California, September 2008. (acceptance rate 12%)
39. F. Papadopoulos and K. Psounis. "Scaling Properties of IEEE 802.11 Wireless Networks", in *Proceedings of the 6th Intl. Symposium on Modeling and Optimization in Mobile, Ad Hoc and Wireless Networks (WiOpt)*, 8 pages (no pp. avail.), Berlin, Germany, March 2008.
40. W.-C. Liao, F. Papadopoulos and K. Psounis. "Performance Analysis of BitTorrent-like Systems with Heterogeneous Users", in *Proceedings of the 26th International Symposium on Computer Performance, Modeling, Measurements and Evaluation (IFIP Performance)*, pp. 876–891, Cologne, Germany, October 2007. (acceptance rate 23%)
41. W.-J. Hsu, T. Spyropoulos, K. Psounis and A. Helmy. "Modeling Time-variant User Mobility in Wireless Mobile Networks", in *Proceedings of IEEE INFOCOM*, pp. 758–766, Anchorage , Alaska , USA, May 2007. (acceptance rate 18%)

42. A. Jindal, and K. Psounis. "Contention-Aware Analysis of Routing Schemes for Mobile Opportunistic Networks", in *Proceedings of ACM MOBISYS, on the 1st International Workshop on Mobile Opportunistic Networking (MobiOpp)*, pp. 1–8, San Juan, Puerto Rico, June 2007.
43. F. Papadopoulos and K. Psounis. "Predicting the Performance of Mobile Ad hoc Networks Using Scaled-down Replicas", in *Proceedings of IEEE International Conference on Communications (ICC)*, pp. 3928–3935, Glasgow, Scotland, June 2007.
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Citations

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**Teaching
experience**

- Co-creator and instructor for the USC graduate class EE597: “Wireless Networks”. Content: Introduction to current and next generation wireless networking technologies, detailed exploration of fundamental architectural and design principles used at all layers.
- Instructor for the USC graduate class EE503: “Probability for Electrical and Computer Engineering”. Content: Probability, discrete and continuous time Markov chains, basic queueing theory.
- Instructor for the USC undergrad class EE465: “Probabilistic Methods in Computer Systems Modelling”. Content: Probability, Markov chains, simulations.
- Creator and instructor for the USC graduate class EE650: “Advance Topics in Computer Networks: Mathematical tools for analyzing wired and wireless networks”. Content: Applications to networking problems of probability, queueing, Lyapunov functions, fluid limits, bipartite matchings, stable marriages, random walks on graphs, deterministic and stochastic optimization, statistical analysis, information theory, game theory.

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US Patent No. 7,324,442, issued Jan. 2008.

**Selected
Professional
Service**

INTERNATIONAL CONFERENCES - ORGANIZING/EXECUTIVE COMMITTEE

- Steering Committee, IFIP/IEEE WONS, 2017 - now.
- General Chair, ACM SIGMETRICS, 2018.
- General Chair, IFIP/IEEE WONS, 2017.
- Program Chair, IFIP/IEEE WONS, 2016.
- Program Chair, IEEE DCOSS workshop on Wireless Sensor Networks (PWSN), 2014.
- Program Chair, ACM MOBICOM workshop on Challenged Networks (CHANTS), 2008.
- Workshop Chair, ACM SIGMETRICS 2008.
- Workshop Chair, USC Workshop on Theory and Practice in Wireless Networks, 2008.
- Publication Chair, ACM SIGMETRICS 2007.
- Panel Chair, ACM MOBIHOC, 2009.
- Panel Chair, IEEE CCW, 2008.

INTERNATIONAL CONFERENCES - TECHNICAL PROGRAM COMMITTEE

- IFIP/IEEE WONS 2013 - 2014, 2018, 2022
- IEEE INFOCOM 2005 - 2020.
- ACM SIGMETRICS 2008, 2014, 2015, 2017, 2020.
- ACM MOBIHOC, 2008 - 2010, 2017-2020.

- WiOpt 2016-2017.
- IEEE SECON 2007 - 2010.
- IFIP NETWORKING 2006 - 2010.
- ACM MOBICOM, 2009.
- IEEE ICNP 2009.
- IEEE WOWMOM workshop on Autonomic and Opportunistic Communications (AOC), 2008 -2009.
- IEEE ICDCS workshop on Delay Tolerant Mobile Networks (DTMN), 2008.
- ACM MOBISYS workshop on Mobile Opportunistic Networks (MOBIOPP), 2007.
- IEEE PERCOM workshop on Intermittently Connected Mobile Ad hoc Networks (ICMAN), 2007.

JOURNALS

- Editorial Board, IEEE/ACM Transactions on Networking (ToN), 2015 - 2020.
- Editorial Board, IEEE Transactions on Mobile Computing (TMC), 2009 - 2019.
- Editorial Board, Computer Networks Journal, Elsevier, 2009 - 2010.
- Editorial Board, International Journal of Autonomous and Adaptive Communications Systems (IJAACS), 2008.
- Reviewer of IEEE/ACM Transactions on Networking, IEEE Journal on Selected Areas in Communication, IEEE Transactions on Parallel and Distributed Systems, IEEE Transactions on Mobile Computing, ACM Transactions on Sensor networks, Elsevier Computer Networks Journal, Elsevier Performance Evaluation Journal, Elsevier Ad Hoc Networks Journal, Transportation Research Journal Part C, IEEE Transactions on Automatic Control.

GOVERNMENTAL AGENCIES

- NSF ML panel, 2020.
- NSF CAREER panel, 2019.
- NSF EARS meeting, 2016.
- NSF Future Internet Architecture Summit participant, 2009.
- NSF CRI panel member, 2008.
- NSF Wireless mobile workshop participant, 2007.
- NSF NeTS-NOSS panel member, 2005.
- Reviewer of NSF NeTS proposals.

Professional Associations

- Institute of Electrical and Electronic Engineers (IEEE):
IEEE Fellow, 2018 - now.
Senior Member, 2008 - 2017.
Member, 1998 - 2008.
- Association for Computing Machinery (ACM):
ACM Distinguished Member, 2019 - now.
Senior Member, 2009 - 2018.
Member, 2001 - 2008.
- Technical Institution of Greece (TEE), 1997 - now.

Languages

English, Greek, French.

Personal

Married, three children.

EXHIBIT 2002



Oral History of Jerry Burchfiel

Interviewed by:
Marc Weber

Recorded June 5, 2009
Cambridge, Massachusetts

CHM Reference number: X5405.2009

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Marc Weber: I'm Mark Weber of the Computer History Museum and I'm here today it's Friday June 5, 2009, with Jerry Burchfiel networking pioneer at BBN, and we're here at BBN. And thank you very much for sitting down with me.

Jerry Burchfiel: Well, thank you for having me. I've been here at BBN for 41 years now came directly here from MIT just moved up the street, and never moved on. I like to say that I came to BBN before we invented dirt, and everything else since then.

Weber: Going back to the very beginning, where were you born and raised?

Burchfiel: I was born in Tulsa, Oklahoma, and raised there -- went to MIT never went back.

Weber: And were you interested in technical things as a child, what lead you toward computing?

Burchfiel: I was doing all kinds of electrical hobbies when I was back in junior high school and from then on building citizens band radios they called them children's band radios in those days. But I'd always liked the electronics. So I went into it when I went into MIT.

Weber: Were either of your parents involved in technical field?

Burchfiel: No, well my father was a reporter, so that's some kind of technical field.

Weber: So you knew you wanted to be an engineer?

Burchfiel: Yes.

Weber: Then in high school did you do a lot of science courses?

Burchfiel: Science fair projects, yeah.

Weber: What was your major at MIT?

Burchfiel: It was electrical engineering. Those were the days before there was such a thing as computer science. Nowadays they're still electrical engineering department, but it's all computer science. They don't bother with voltage current, that kind of stuff anymore, passé.

Weber: When did you first get interested in computers?

Burchfiel: Actually it was when I was working on my doctorate I was working part-time out at MIT Lincoln Lab, and trying to develop a program for calculating electromagnetic waves, and wave guides. And in those days it was punch cards old Fortran, job controlled decks, and it was utter misery. So I decided if something really needed work it was the computers not the electrical engineering part.

Weber: What was the first computer you remember?

Burchfiel: Well it was PDP-1 here at BBN when I came. They use to play Space War on that and developed an initial early time-sharing system. Then once I was here I worked with Ray Tomlinson, and Dan Murphy on a new time-shared operating system called TENEX that was both economical, could run on a half a million dollar machine as opposed to a \$5 million machine like some of the other time sharing systems. And it was highly networkable. In fact that was one of the first big jobs was getting TENEX onto the Arpanet. Actually I want to say a word about the Arpanet as long as I've got that topic open. Some people say that the Arpanet was developed to help the country survive nuclear war, but it wasn't that at all. I got to talk with Bob Taylor who was the Director of IPTO, Information Processing Techniques Office down at DARPA at the time who was the force behind it. And his complaint was that outside his office in the hall he had a Model 35 teletype to talk to SRI and a different teletype to talk to UCLA and a different teletype to talk to BBN. And the hall was filling up with stupid teletypes, so he wanted to have one machine he could use to talk to all his contractors, and that was the genesis of the Arpanet.

Weber: And also <inaudible>[perhaps Licklider] had done there was the intergalactic network idea which I guess fed into that.

Burchfiel: Yeah, he was working at Project Mac at MIT, and they had kind of competing operating system the Multics, but it was running on computers 10 times more expensive. So we were getting an affordable solution it was the first time that virtual memory paging was put into a PDP-10 computer then later became DEC's Tops-20 operating system.

Weber: Give me the chronology of it, so you went to Lincoln Lab right as soon as you graduated?

Burchfiel: No, I was at Lincoln Lab part-time in the summers. And I actually had a Radar Group out there, and part-time here as well.

Weber: As a student?

Burchfiel: Yes, and then I went full-time once I got my degree in '68.

Weber: And so you got PhD?

Burchfiel: ScD actually at MIT it went straight through Bachelor, Master, Doctorate. They call that a lifer.

Weber: So how many years then?

Burchfiel: Just over eight.

Weber: Still three degrees. So you've done a number of summers at Lincoln Lab, and here?

Burchfiel: Yes.

Weber: So you knew people at both places?

Burchfiel: Oh, yeah.

Weber: And why did you choose BBN or why did they choose over Lincoln Lab?

Burchfiel: BBN was much more exciting with all of the new technology bubbling up in the computer field. Lincoln was kind of a slower pace, and they had a \$100 million a year out of the Government no matter what. Whereas at BBN it was kind of dog-eat-dog, you had to compete it made it much more exciting.

Weber: The cultures, what were the two institutions like were their differences in the two places?

Burchfiel: Well for many, many years BBN was a place of gentlemen scholars. Walk down the hall, and everyone you bump into has a doctorate. Lincoln wasn't quite that way it was more engineers building radar systems, so it was more intellectual here.

Weber: So the kinds of conversations would be different, chatting in the cafeteria?

Burchfiel: Sure, engineering versus technology and science.

Weber: So then you took the job at BBN, and tell me what happened then.

Burchfiel: Well, as I said the first project was this TENEX time sharing system Bob Taylor successor at DARPA it was actually it was ARPA in those days, and only became DARPA later on, was Larry Roberts, and he was the guy who was sponsoring our TENEX work, and also pushing the Arpanet at the same time. So that all worked out very well together, in fact, we two groups here at BBN that were somewhat synergistic that on this side of the building was the Arpanet group building the network. And over on that side of building was the host group TENEX, for instance, building computers to go on the network. It was kind of a love/hate relationship, and saying that, "Hey we need more out of the network. Hey those shouldn't be doing that kind of a thing."

Weber: Ray Tomlinson said that TENEX originally conceived as kind of an internal support function in a way, you needed a system like that.

Burchfiel: Yeah, it was for the speech research there weren't any computers big enough or affordable enough to do the amount of computing that they needed to do for us with understanding. So we used PDP-10, and then turned it into--the trouble in those days was that it was impossible to get enough memory to do these big problems. A 16k words memory unit was the size of a refrigerator, so it was all impossible to get enough real memory. So that's why the push was on for virtual memory that let us keep all the big data out on disc, and automatically bring it in for processing as needed. And that was one of the first big projects on there was speech understanding.

Weber: Who initiated TENEX, were you asked to do it?

Burchfiel: Well, it was kind of mutual between us, and ARPA coming up with ideas, and then negotiating back and forth, what could we do, what schedule, what money, and we agreed that this was worth a shot.

Weber: And so it was you, and Ray that were assigned?

Burchfiel: Ray and I and Dan Murphy were the three people that worked on TENEX.

Weber: And your respective roles?

Burchfiel: I was focusing on hardware, Dan Murphy was on software, and as usual Ray did everything-- he was on both sides.

Weber: And what was like working with those guys?

Burchfiel: Oh, terrific. In fact Ray was amazing. Developed a lot of new hardware, and in the evenings often would come in to try and debug it, and get it working. And so the most powerful tool that we had in those days to debug the hardware was a quart bottle of Miller beer, and that's what we used in the evenings. So we had fun.

Weber: And so you became friends with these guys?

Burchfiel: Oh, yeah.

Weber: And you were all single grad students, just first job?

Burchfiel: Yeah, that was also the time when I got to start working with Bob Kahn. In fact he was here at BBN I was in the office next to him, and we were always talking about host computers, networking, how to make it all work together. And many evenings we would-- I was commiserating with him, he was really concerned about his architecture, and algorithm and protocol design on the Arpanet that there was--he saw a flaw in it there was a danger that the host or sorry the IMP (interface message processor supporting the host) could hang up with reassembly buffers that couldn't be put together in order, A can't be done until B done, B can't be done until C is done, C can't be done until A done. One IMP hangs up then it would immediately spread, and hang up the whole network. Bob came up with that. Other people viewed that as just a theoretical problem nothing to really worry about, but of course Bob was right, and then there was a great Christmas crash that brought down the whole network with exactly that reassembly buffer lock-up. And at that point then everyone decided, well this is more than just theory it's something we've got to fix, so Bob was vindicated.

Weber: And so you came in '68, and so yeah that was really when the, I mean, the IMPs finished in the fall of '69 [were] first installed. But you were really there during the most intense period you were over in the other building?

Burchfiel: Right doing host side at the same time as the network side was coming together, and then trying to make it work together.

Weber: Any particular memories of seeing the IMP team work were they very frantic?

Burchfiel: On some things we worked closely together; like Dave Walden, you mentioned, was working on the TIP Terminal Interface Processor, that lets you hook up terminals directly to this device on the network without an intervening host. And Dave and I were going back and forth on the protocols all the time would see reliability problems, hang ups, and so on. And so we were working from both sides of the interface figuring out how to cure the problems, and coming up with new standards that then would propose to the IETF Internet Engineering Task Forces [undoubtedly Jerry was really talking about the Network Working Group at that early time], standards documents, and it carried a lot more weight when both of showed up talking about both sides of the interface how to fix the problem, so that worked out well.

Weber: And after TENEX what was your, well I guess that continued for quite awhile.

Burchfiel: Well TENEX got proliferated; Larry Roberts was pushing to see general use of the technology he developed, and TENEX actually got propagated to 12 different sites on the Arpanet, universities, researchers. And so it was the most populous system on the Internet [ARPANET]. And at least in that sense big success and Larry was behind it all the way pushing that he saw that this was an opportunity for computer to computer communications which was the way he viewed the Arpanet, so what that was going to do for him. When Bob Kahn, two years later, went down to DARPA himself he then founded the packet radio project that was BBN, Rockwell Collins, and SRI working together on different components of that system. The packet radio project went on and on had incredible life in different guises became the low cost packet radio, became SURAN, Survival Radio Networks. And then it grew into military applications with NTDRm, Near Term Digital Radio, the DARPA, SUOR Small Unit Operations Radio, and now those same algorithm are in the JTRS Joint Tactical Radio System that's being deployed as we speak. So we've got a 35 year long genetic path from the algorithm here to the algorithm there.

Weber: The last one is Ray Tomlinson was saying there's a current project for extending a network from without any central host of any kind just by putting in the little nodes is that the...

Burchfiel: That was the philosophy of the Arpanet in the first place there was no central control where everything is completely distributed.

Weber: But there's a current radio project like that, that's not what you're...

Burchfiel: Oh, you're right the initial packet radio project did have centralized controller called the station, but then as soon as we went to these successive generations it became fully distributed because that's a lot more reliable.

Weber: But there's a current project doing something similar?

Burchfiel: Well, all of the projects for decades now that BBN has done have been using fully distributed protocols because they're a lot more survivable. Now you mentioned Ray: one kind of a significant event happening he was working on, not only on, the TENEX operating system but on applications for it. And after a long weekend I came back, and Ray said, "Come over here I want to show you something." And

he demonstrated a message, an e-mail message, going from one computer to another one across the Arpanet, and I said, "Oh my God, don't tell anyone we're not supposed to be doing that under this contract. Don't let the information leak out that you've got that kind of a thing." But of course it did leak out, and it was really fault of Larry Roberts. Ray wrote the send message program for generating the e-mail figured out the character to use to separate user names, and host names by looking around his keyboard, and right there on the top row was the at sign so he put that in. And then Larry Roberts wrote... started receiving this e-mail, and he needed to organize it, and so he wrote a program called "read mail" that would let him sort and file and so on. Those were the days when a DARPA program manager would jump right in and write code, and distribute it to everyone. Larry did a lot more than write the code he decreed for any of his PIs to get funding they had to communicate with him via e-mail. So suddenly the whole world jumped on e-mail, and that ignited the virus.

Weber: Do you remember when that was roughly?

Burchfiel: Seventy-one or seventy-two something like that.

Weber: Wow, okay, and the client he wrote he distributed them?

Burchfiel: Yeah, that was just an application that ran on TENEX.

Weber: And is that any idea of any surviving code from any of this?

Burchfiel: No, the machines turn over every few years, and the old punch cards and deck tapes and reel-to-reel mag tapes all get trashed.

Weber: Or printed source code sometime.

Burchfiel: That too, after Ray did that first e-mail system then Larry sponsored us to do some deliver[able] e-mail [system] rather than accidental. And we did a system called Hermes Internet mail, and military message system where we installed it out in Hawaii for the military to use. And then we got into the standards business working with the IETF RFC 822 standardizing mail formats. And then it really became Internet standard.

Weber: And the ARC lab at SRI was also using e-mail a lot where they contributing to the standard?

Burchfiel: Yes, almost all of the DARPA researches were working on the standards, and giving contributions there. We were the ones that were actually writing the code and distributing it although, they did as I remember make a few changes to it in their copy of it.

Weber: This is from many, many years ago when I interviewed Doug Engelbart, and I remember him talking about sort of e-mail wars in the '70s. There were some people wanted much longer headers, and shorter headers.

Burchfiel: Well, that was all finally standardized in that RFC 822 that we had put into the IETF, and that kind of nailed down the text, and header formats that everyone adopted after that. As I remember SRI did

some key innovations, one of them was a predecessor to the mouse it was a little like five finger key board, and you could play cords on that, and put in inputs; and they had a thing called NLS Online System that was a predecessor to the web; you could click on a link, and it would take you there, so it set up the web idea in the first place. So they've made some nice contributions.

Weber: Leading up to the final standardization do you remember some of those issues that people were, what were the different camps around e-mail?

Burchfiel: There were some arguments over whether it should be in binary form or text form, and we won that one because everyone wanted to be able read anything that came to them instead of having binary interpreter. I don't remember fights so much as just a polishing, and refinements there were endless meetings, and lots of people contributing ideas. And they mostly worked their way into the standard, so it's gotten better and better over the years. And now it brings us hair re-growers, and body re-shapers, and everything you could want.

Weber: Who was working on the standard?

Burchfiel: Okay, for e-mail by that time I was running the Interactive Systems Department had about 25 people working on variety of programs many of them were applications of TENEX. And actually we had a group that was working on the e-mail stuff the Hermes group, and they were actually pushing ahead with standards not only the IETF, but also at the International Standards Organization ISO, and they had pretty much parallel development on the standards.

Weber: Did you go to Geneva, and stuff?

Burchfiel: No, but some of the people in the group did attend at all of those meetings.

Weber: And so you had become a manager by this point.

Burchfiel: Yeah.

Weber: Tell me a little bit just the path of your career, so you came in and who were you working for first?

Burchfiel: Jerry Elkind was my first boss here, terrific guy. Maybe that was the reason I came here instead of Lincoln Lab was Jerry, inspirational.

Weber: Had you known him before when you came in the summers?

Burchfiel: Yeah, from summers, I finally decided hey if I'm going to work full-time this is the guy.

Weber: What's he like?

Burchfiel: Very smart, very pleasant.

Weber: And so it was you and Ray and the third fellow?

Burchfiel: Dan Murphy.

Weber: Dan Murphy were all working for him?

Burchfiel: Yeah.

Weber: How long did you stay in that role?

Burchfiel: I don't know it was the early '70s that I became a department manager and then collected like 25 people an assortment of projects including the packet radio which was a Bob Kahn initiative when he was at DARPA, and seeded that here.

Weber: But there were steps in between that because that's a four year period, right, three or four years?

Burchfiel: Oh you're reaching back into the dim mists of antiquity now. One other guy that I should mention that I enjoyed working with was Vint Cerf. I remember when he was a Professor at Stanford. And at one point I got to actually give him tutorial on how to write a DARPA proposal, all the hints and techniques and so on to suck them into giving you their money. And I had no idea that two years Vint would be down at DARPA those days reviewing my proposals with a great deal of skepticism, so I'm not sure that worked out right.

Weber: You met him when you were out there on a visit?

Burchfiel: Part of the TENEX program we were going around to all of the sites nationwide. Vint was certainly involved in the Stanford work.

Weber: I mean a lot of important things happened at these meetings, and travels. So what were some of the main offside events that you went to where you met the Arpanet community?

Burchfiel: We had a kind of traveling road show once every six months to a year we would go around, and visit the various TENEX sites, and the researchers would come in and tell us what they liked, and what they didn't like. Spent a lot more time telling us what they didn't like then what they did like. And so that gives us a lot of suggestions for the next round, and of course that could get turned into the next DARPA proposal as well, so that all worked out pretty well.

Weber: So how many of you would go around usually?

Burchfiel: Two or three depending on whether it was big meeting or smaller meeting.

Weber: And then you had TENEX regular conferences or larger meetings rotating or different places?

Burchfiel: Yeah, well it was telephone, and e-mail mostly I mean now that we had the network why not use it. Why not avoid some of that travel.

Weber: And early use of e-mail do you remember when things you did early on with e-mail?

Burchfiel: It was DARPA projects, Larry had sort of forced all his PIs on to that, and of course Bob Kahn, Vint Cerf followed up with that e-mail was the way DARPA did its business, did all of its communicating and proposal acceptance, and so on by e-mail, so it was very efficient. At that point after Vint went to DARPA he took over as program manager down there of the packet radio project. And so he was sponsoring us as we were doing packet radio, and then a little later towards the mid '70s got into the Internet we were calling it gateway, but today it's called a router connectivity between multiple heterogeneous networks. And Ginny Travers was involved in that, and created the first router, and installed it over in Norway in 1976.

There we were struggling with the concepts, first question was, what if we want to get traffic back and forth between these multiple different networks do we build a node on this network and a node on that network and then somehow hook them back to back with twist pairs to push the data through? Well that wasn't what we did. After some struggling we went with a layered approach. So we had in one box the gateway router, a layer two module that would talk to this net, layer two module that would talk to that net, and then layered on top of those was IP; the layer three module that would carry packets back and forth between the two networks and also talk with its peers to do routing to figure out how to get across network, network, network, to the far end.

Weber: And who came up with that design?

Burchfiel: Ginny Travers, and me, and Ray Tomlinson we were all working on how to connect those multiple different networks together. But she was the one that actually implemented it and installed it. Now Vint Cerf was the theoretician oh, and Kahn, theoreticians behind that deciding what should be done and they came up with the TCP/IP protocol. And of course, we had a lot of kibitzing and inputs to that. And in fact, one personal role there was at one point Vint asked me how big should we make the IP address? And I said, "Vint, 32 bits, no one will ever want more than 4 million hosts." So now the world has me to blame for this IPv6 mess of having all the torment of trying to go to a bigger address. But I did do one good thing, at that point TCP and IP were all interleaved into one single protocol, and I convinced Vint to pull them apart so that we had an IP network layer and TCP separate module that would do the end-to-end reliability. And that architecture survived since then gave us the advantage of having a place to put UDP, the transaction protocol, also on top of IP and parallel to TCP. So that was one good thing I did at least.

Weber: To make up for the...

Burchfiel: ...to make up for the 32 bit addresses that I talked him into.

Weber: And so you would've been talking to him, when you say talking, probably over e-mail and occasional meetings?

Burchfiel: Yes. I would meet every few months about in person but multiple e-mails daily. I had the theory that Vint was sitting right by his computer at all times waiting for an e-mail to show up so he could answer it instantly. So any time I sent him an e-mail then within a few minutes there was an e-mail back saying, "Now do this, now do that." So I kind of deliberately slowed down my inputs to Vint because he had such a fast turnaround on them.

Weber: In the '76 and '70s there was the two-network and the three-network experiment. So did you go out for any of those?

Burchfiel: Yes, we had a big meeting in '76 in Oslo, Norway, and that was an excellent meeting. There were people there from all over Europe, representatives from the University, College, London, Norwegian Defense Research Establishment, and people from all over Europe and the U.S. representing all three of those networks for the first time working together.

Weber: Right. And why was--I mean I've interviewed Paal Spilling from NDRE but why were they part of the first?

Burchfiel: Well that was where one of the early routers was being installed in Oslo, Norway.

Weber: But why was it being installed there?

Burchfiel: Actually I don't know. It might have been part of foreign military sales, corporations, Hands Across the Sea, DARPA, and foreign military, oh, both part of NATO, so they may have been pushing that as a NATOism.

Weber: Because in '76, in California, there was a connection of two networks together and in '77 the three network experiment with the SRI packet radio event. So you were very involved in that.

Burchfiel: Oh, yeah. I got to ride around out there in Menlo Park in their bread truck watching the radio signals come and go about like that on an oscilloscope.

Weber: Because we have the bread truck you know that?

Burchfiel: Yeah. It's like an e-ride at Disney World. You get to ride in the bread truck.

Weber: Vint sort of described it being filled with generals.

Burchfiel: Well sure. That was at demo time and just before then it was full of nerds trying to get the connections to work.

Weber: Because the description was this unmarked truck full of strange equipment and men in uniforms sort of cruising through the streets. Do you remember it like that as a sort of...

Burchfiel: Maybe I wasn't there when it was demonstrated for the generals but they were certainly doing that day in, day out trying to get the reliability of the network up and it succeeded. It worked okay. Another project that we worked on that had some legs was called by a strange acronym of BCR, black-crypto-red. It was a IP internet encryptor and the idea behind it is that a user packet would come in on the red side, it would get encrypted in the crypto, the whole IP packet, and then the encrypted result would get encapsulated in the data portion of a new IP packet over on the black side, and then wiz off across the network. The nice thing was that it was end-to-end and so even if some intermediate nodes got captured or subverted, the user net traffic was still safe. It had been encrypted and stayed encrypted all the way through until it gets to its alternate destination. Now since then, that grew. That was for DARPA, an intelligence agency, and since then that grew into Steve Kent's standard for IP Sec., IP security, that's now used all over the internet and subsequently grew into NSA's HAIPE, High Assurance IP Encryptor. It's providing type one security in the GIG, Global Internet Grid. Yes, Global Internet Grid that's used for military applications world wide securely, type one security. So that was another thing that got incubated here and then now it's grown to worldwide use.

Weber: And the dates roughly for...

Burchfiel: Seventy-four about when the BCR project got started. And, as I said, it's got a genetic thread to goes through till today. Another project that we did was called Cronos and the idea there was to create a distributed operating system. We had all of these different TENEX systems so the opportunity was try to make them work like one single computer across the internet and that was Harry Forsdick and Bob Thomas that came up with the protocols that let you write a program and let you initiate it in one place and then the program would effectually run on all of these machines in parallel. So the user would be unaware of exactly that this function was being done here and that function there. Today it's turned into something like cloud computing and the protocols have evolved into what's called COBRA today, Common Object Broker Request Architecture, for distributing computing. So that's another one that grew and grew.

Weber: And again dates?

Burchfiel: That was in the late '70s maybe early '80s when that was going on. And then in the '90s, one big, big project that we had here was called SIMNET, Simulation Networking. And the purpose of that was to help train the army people who are going to be fighting in tanks and helicopters through simulation. So one of our co-contractors created a mock-up of the inside of a tank and what we did was network multiple of these together in multiple sites so that when you fired a round out the main gun, then that calculation would get distributed everywhere and a tank somewhere else, maybe at some other site, an enemy tank would blow up. And it was typically opposing force and your force fighting against each other, and it was all in real-time, and it all required multi-casting. Because anything I do could potentially be seen by anyone out there so everyone had to be aware of that. As that project evolved, it moved into classified information, what are the newest weapons and the techniques for using them. And so we developed a classified version of that that was similar to the BCR in that it was using a red side crypto, black side. But in this case the crypto was developed by Motorola and it was type one so we were able to do real classified, real secure, real-time exercises that were stretched across the globe. No one had ever done that before. And in fact to do that the internet at that point wasn't quite up to the job so we created yet another network called DSI, Defense Simulation Internet, that was optimized for doing high speed propagation for the real-time interactions so that you were able to interact with another vehicle in milliseconds. And almost everything was multi-cast. When you do something, everyone's got to see it

anyone who at least conceivably could be affected by it. So that was a different flavor of network. In fact, we had our own protocol. They called that IPv5 which is unknown today. No one has every heard of it.

Weber: But that's why it's six.

Burchfiel: That's why they skipped over and went to six with the next generation because we had IPv5 along the way. The SIMNET also became standardized in the DIS protocol. There's an IEEE standard. There's an organization called SISO, S-I-S-O, standards organization that helped develop the IEEE standard run by Duncan Miller who used to be my boss here at BBN. And so distributed simulation now has a standard as well that grew right out of SIMNET.

Weber: I saw in some of the materials Jennie Connolly is giving us there's some brochures with tank simulations...

Burchfiel: Oh, that was us.

Weber: That would be it. And I'll ask about the software. Is that around?

Burchfiel: I don't think so. When the computers go obsolete and you chuck them, then the software decays in a hurry too. Talking about networks, one other thing that happened here was getting in on the commercialization of networks. There was the NSF network that was bringing together regionals and we started one of the regionals called NEARnet, New England Academic and Research Network with MIT, and BU, and Harvard. We had originally called it New England Research and Development Network but the name NERDnet didn't fly at MIT for some reason so we had to rename it NEARnet. And that collected a lot of users here in the Boston area and other regionals were popping up all over the place. At one point the NEARnet had welded together a dozen or so of these regionals into one big net. And then BBN acquired the NEARnet renamed it Planet and started providing internet service for pay, and that eventually became the Genuity Internet Service, and then that eventually became the dot.com crash. I'd just assume you not give me credit for that one.

Weber: Not if you don't want it. In the '80s when it was NSF that really built the internet up and...

Burchfiel: Well they built their own separate one.

Weber: NSF did.

Burchfiel: The Internet really grew out from the ARPANET adding more different networks all around the sides. Oh, actually I should say it split into two. There was the ARPANET and then at one point the military was concerned about having all these crazy researchers on their network so they created a parallel network called the MILNET and then put blocking gateways in between the two to make sure that their traffic stayed their traffic.

Weber: But were you connected to-- there was the backbone, yeah, that was the NSF backbone right?

Burchfiel: Yeah, BBN was on all those networks. I remember the ARPANET grew up to about 64 nodes. They were having a hard time there with scaling algorithms, efficiency problems, and even six bits in a header kind of problem, they were exceeding the format. And the MILNET grew up to 256. And so that's why I felt really confident of telling Vint that 4 million's going to be plenty, don't worry about it. But as usual I was wrong.

Weber: And then after that any...

Burchfiel: Just an ongoing stream of smaller projects and some of these had fall out that continues today like JTRS. BBN is working on the networking protocols through multiple generations of that; the JTRS2C that we did. The networking is a sub to BAE. And then the JTRS GMR, Ground Mobile Radio, where we were subbed to Boeing to provide the networking protocols. And that's still going on. They just ran a big exercise this last weekend. SPAWAR ran an exercise this weekend in Charleston with 30 nodes running around and communicating, and I heard it was a success. So the JTRS is finally moving up. It's interesting to see all these threads that stretch over maybe decades from a crazy idea to actually getting out in the field.

Weber: Yeah, that sounds like out. So you had the group starting in the early '70s and just give a brief kind of overview of your career, your positions.

Burchfiel: At one point I was part of the BBN communications company and there the hope was to commercialize the military technology; the various switches and routers that the military was using hopefully sell them commercially as well. And that project went on for some number of years but didn't really catch on commercially so much until Cisco picked it up and ran with it. So we could've been rich if we had done the right thing but somehow we didn't.

Weber: And how much do you see that-- Well I mean Ginny did really the first router.

Burchfiel: Yes.

Weber: Between the kind of '76, '77 period and Cisco's emergence, so go into more detail on this.

Burchfiel: Well I think Cisco really cranked up in '85 or so. So a lot <inaudible>

Weber: So if you could go into a little more detail on the birth of the router, the period between '76 or so and the early '80s.

Burchfiel: Well it gradually spread wherever there was a piece of ARPANET and somebody wanted some other network like even an Ethernet attached to it which pretty soon everyone wanted. That was '82 I think that Intel, Xerox, and DEC came out with the Ethernet standard. So that began proliferating like crazy because it was so cheap and such a great high bandwidth way to hook up hosts that pretty soon everyone said we've got all these hosts and we've got this Ethernet and this ARPANET, we want to get them together and what was needed in the middle was of course the router. So that was the early initial use on that. The protocols stabilized after a few years. Vint Cerf was of course the great theoritian deciding what should be done, how it should work. We gave him some back pressure on practicality, implementation, performance, and so on, and so some of things got twiddled along the way. But then

with the TENEX's out on these 12 research sites and everyone wanting Ethernets, then the routers started rolling out to all of those locations or locations with some other network like at SRI where they had the Packet Radio Network, over in Europe where they had the Atlantic Satellite Network, any place anyone had two networks in the shop, they needed a router in between and so they proliferated. As usual we were doing things that were 15 years or so ahead of their time so this didn't take off commercially at that point. It was just a tool for the researchers to build an internet and the early internet was used mainly for e-mail communications between the DARPA and the researchers. It wasn't until some time in the early '80s that Cisco took off and started providing commercial products. And everyone knows the rest of that story we got the internet.

Weber: And did any of the early routers survive that you know of?

Burchfiel: The earliest were on LSI 11's, which of course like all computers became obsolete in a few years, so I doubt that there's any of those around unless you find Tony Michelle's [ph?] junk box. Who knows what's in the bottom of that.

Weber: Yeah. I'll ask him. And we're actually going to have some sort of a display on the SRI van. We have the thing itself but its kind of big to put inside the building. What would you say to a sort of target museum goer which could be someone who's not technical, they might be down to eighth or ninth grade, just why was this important? What are some of the key features?

Burchfiel: Well the...

Weber: I don't mean just the van but...

Burchfiel: It's hard to say much about the network because it's invisible. If it's working well, it's just like that power plug in the wall. You don't worry about what's behind it. What you care about is what's up on your screen? How long does it take to download that next page of web information? So it was an enabling technology that then permitted the web to sprout and take over the world. So pointing at the network people will wind up scratching their heads probably saying what is this for? And you say, "Well do you use the web?" "Do you browse?" Without the network you wouldn't.

Weber: And the importance of interneting?

Burchfiel: Oh, connecting different kinds of networks. Well one big important thing is fixed infrastructure. There's a worldwide GIG, Global Internet Grid. The land part of it is built on fiber now so it's a very high communication across the military bases across all the continents. There's a satellite part of it so that they're running IP bouncing it off the satellites and back. And now more recently there's the technical IG [ph?] out in the front where the troops are with mobile radios where things are much tougher. You can't afford high bandwidth. Things are noisy. There's interference. There's jamming. And the internet protocol still ties them all together whether they're out in the mobile tactical arena, or back in the strategic, or just commercial; that they're all working over the same IP. IPv4, some day IPv6, to fix my mistake.

Weber: Any advice you would give to young people considering a career in related subject?

Burchfiel: Yes. Go to work in a place that's full of crazy people just like BBN. That's what attracted me here to the— Newton had some comment about standing on the shoulders of giants, I haven't done that but I've gotten to rub shoulders with all of the giants of the Internet and it's been great.

Weber: Anything else in particular you'd like to talk about?

Burchfiel: No, I made it through my thoughts. I'm dry. Come back in another 40 years.

Weber: All right. Well thank you very much. It was really good.

Burchfiel: You're very welcome.

END OF THE INTERVIEW

UNITED STATES
PATENT AND TRADEMARK OFFICEP.O. Box 1450
Alexandria, VA 22313 - 1450
www.uspto.gov**ELECTRONIC ACKNOWLEDGEMENT RECEIPT**APPLICATION #
90/019,702RECEIPT DATE / TIME
06/02/2025 09:03:23 PM Z ETATTORNEY DOCKET #
USTAP030D.RE**Title of Invention**

SPECTRUM-ADAPTIVE NETWORKING

Application Information

APPLICATION TYPE Utility / ex parte reexam

PATENT # RE47720

CONFIRMATION # 8522

FILED BY JENNIFER PICINI

PATENT CENTER # 70695464

FILING DATE 10/14/2024

CUSTOMER # 134688

FIRST NAMED
INVENTOR - RE47720CORRESPONDENCE
ADDRESS -

AUTHORIZED BY James Lennon

Documents**TOTAL DOCUMENTS: 4**

DOCUMENT	PAGES	DESCRIPTION	SIZE (KB)
2025-06-02-90019702- Response to OA-as filed.pdf	77	Response after non-final action-owner timely	935 KB
Exhibit 2001-Declaration of Dr. Psounis.pdf	81	Reexam Miscellaneous Incoming Letter	1307 KB
Exhibit 2002-Burchfiel oral history.pdf	17	Reexam Miscellaneous Incoming Letter	213 KB
2025-06-02-90019702-Cert of Service-as filed.pdf	1	Reexam Certificate of Service	144 KB

Digest

DOCUMENT

MESSAGE DIGEST(SHA-512)

2025-06-02-90019702- Response to OA-as filed.pdf	E29E75CEFA9BE5B2F208D6210414E76E70D46BB42034F5C1F 0F7D65BAD4BB592A995ACB2C857E9FE06A0B3D24C3B44FC3 81D2B8CD0AD8FB1652A3174977C4E83
Exhibit 2001-Declaration of Dr. Psounis.pdf	583BE9379EBBBEFD52FD6C75448D661C944677A3629BCA880 C8C6E88B9D2FAEFD55B594BD61D85BB4BC6A54B0E339367E BE8F634C11C4458FB42A53D775A710F
Exhibit 2002-Burchfiel oral history.pdf	C005C9D0E06F10BE33752F2BEAFC2A28800DAD1A5B00C79B C23D2F0B1DCDD698B341CCC6F4B48DE70AF400C4E11BD95 45000D9B54E1111FD93601DDCBD5C6074
2025-06-02-90019702-Cert of Service-as filed.pdf	7D32460665EA70E12073526A44227A5A9403C437D367AC043C 4E96CEF1F8448111F535B2C50C92F432A8DCE6F02BF9E471F 0C40A2D6BA3F442559E018B504B90

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New Applications Under 35 U.S.C. 111

If a new application is being filed and the application includes the necessary components for filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application

National Stage of an International Application under 35 U.S.C. 371

If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course.

New International Application Filed with the USPTO as a Receiving Office

If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Patent No. : RE47720
Reexam Control No. : 90/019,702
Confirmation No. : 8522
Filed : October 14, 2024
TC/A.U : 3992
Examiner : Heneghan, Matthew E.
Docket No. : USTAP030D.RE
Customer No. : 134688
Title : SPECTRUM-ADAPTIVE NETWORKING

Mail Stop "Ex Parte Reexam"
Central Reexamination Unit
Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

CERTIFICATE OF SERVICE

Pursuant to 37 C.F.R. 1.550(f), the undersigned certifies that on June 3, 2025, copies of:

- (1) Response to Office Action;
- (2) Exhibit 2001;
- (3) Exhibit 2002;
- (4) Information Disclosure Statement; and
- (3) Certificate of Service

were served in their entirety by first class mail on the third party requester, Unified Patents, LLC, at the following address of record:

Unified Patents, LLC
Attn: Andrea Shoffstall
4445 Willard Avenue, Suite 600
Chevy Chase, MD 20815

Date: June 2, 2025

Respectfully submitted,

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IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Patent No. : RE47720
Reexam Control No. : 90/019,702
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Mail Stop *Ex Parte* Reexam
Central Reexamination Unit
Commissioner of Patents
United States Patent & Trademark Office
P.O. Box 1450
Alexandria, VA 22313-1450

RESPONSE TO OFFICE ACTION

Dear Sir:

This Response is in reply to the Office Action dated March 31, 2025 and is being timely filed in conformance with 37 C.F.R. § 1.550. Please consider the following:

Notification of Concurrent Proceedings beginning on page 2 of this paper;

Remarks beginning on page 3 of this paper; and

Listing of Claims beginning on page 54 of this paper; and

**37 CFR §1.8
CERTIFICATE OF TRANSMISSION**

I hereby certify that this correspondence is being transmitted via the Office electronic filing system, EFS-Web, addressed to Mail Stop Ex Parte Reexam, Central Reexamination Unit, Commissioner of Patents, United States Patent and Trademark Office, PO Box 1450, Alexandria, Virginia 22313-1450 on the date indicated below.

/Jennifer Picini/
Jennifer Picini

June 2, 2025
Date

USTA EXHIBIT 2026
IPR2025-00838

NOTIFICATION OF CONCURRENT PROCEEDINGS

Pursuant to 37 C.F.R. § 1.565(a), Patent Owner identifies the following concurrent proceedings involving U.S. Patent No. RE47720:

- *USTA Technology, LLC v. AsusTek Computer Inc.*, No. 4-24-cv-00512 (EDTX)
- *USTA Technology, LLC v. AT&T Inc. et al.*, No. 4-24-cv-00513 (EDTX)
- *USTA Technology, LLC v. Lenovo Group Limited*, No. 4-24-cv-00515 (EDTX)
- *Intel Corp. et al. v. USTA Technology, LLC*, IPR2025-00838 (PTAB)

REMARKS

Claims 53-56, 64-66, 70, 76, 81-84 and 87-94 of U.S. Patent No. RE47,720 (“the ‘720 patent”) are subject to reexamination and stand rejected. Original claims 1-52, 57-63, 67-69, 71-75, 77-80, 85-86 and 95-96 of the ‘720 patent are not subject to reexamination. No claims have been cancelled. Accordingly, claims 53-56, 64-66, 70, 76, 81-84 and 87-94 are pending. USTA Technology, LLC (“USTA” or “Patent Owner”) respectfully requests reconsideration of the rejections and a finding that the pending claims are patentable in view of these remarks.¹

High-Level Description of the ‘720 Patent

The ‘720 patent resulted from the pioneering efforts of Jerry D. Burchfiel (hereinafter “the Inventor”) in the area of spectrum management in wireless networking systems. Dr. Burchfiel has been at the forefront of technological advances in networking going back to at least the 1960s through his work at Lincoln Labs at MIT and then at BBN.² The ‘720 patent represents another example of his innovations in the area of networking, and in particular, wireless networking.³

His efforts resulted in the development of a method and apparatus for increasing the available spectrum in a wireless network by sharing existing allocated (and in-use) portions of the RF spectrum in a manner that will minimize the probability of interfering with existing legacy users in 2002. At the time of these pioneering efforts, there was increasing demand for spectrum-

¹ Nothing contained herein should be construed as adopting or advancing a particular claim construction unless expressly noted otherwise and Patent Owner reserves the right to propose or challenge any constructions under the *Phillips* standard applicable in any other proceeding. Additionally, Patent Owner is not admitting or conceding the cited references disclose or would have rendered obvious any claims or claim limitations that are not specifically addressed herein and reserves all rights to present additional or different arguments in support of patentability and/or validity.

² See generally Ex. 2002 (Burchfiel Oral History). BBN has been part of GTE, Verizon and Raytheon over the years.

³ *Id.*

based services and devices to address decreasing wireless communications network bandwidth. Moreover, managing interference levels was made particularly difficult by the greater density, mobility and variability of “next generation” (XG) radio frequency emitters. (*See* ’720 patent at 1:19-34.)

While the then-existing solutions for spectrum management to address increasing demand for spectrum-based services and devices sought to assign locally unoccupied portions of the RF spectrum to XG users, the FCC Spectrum Management Policy Task Force recommended that secondary users of a band are required to accept interference from primary users, and must cause no “harmful” interference to the primary users. The Task Force policy permitted secondary (e.g., unlicensed) users to radiate only enough power in an area of interest to raise the interference temperature in the band to a specified threshold T_0 for the band, service, and locality, and would create an opportunity to “underlay” existing primary applications with low-power, low-impact opportunistic applications that operate below the threshold. (*See* ’720 patent at 1:35-53.)

However, the Spectrum Policy Task Force Report did not address how to build and configure networks and devices that comply with the proposed rules. Accordingly, the Inventor conceived of the inventions in the ’720 patent as a way to describe tools, devices and applications users can build, configure and deploy in order to take advantage of the proposed spectrum policies. (*See* ’720 patent at 1:54-62.)

For example, the Inventor conceived of a node of a network communications system that could be configured to:

- (a) Continuously carry out real-time sensing and characterization of the local spectrum usage by (potentially interfering) narrowband and-wideband emitters;

- (b) Dynamically and autonomously adapt (on a time scale of milliseconds) to the local spectrum environment by selecting and controlling the waveforms (power spectral density (PSD) and Media Access Control (MAC) protocols) that its network neighbors use when transmitting to this node;
- (c) Automatically carry out a closed loop power control algorithm with each neighbor to throttle back on unnecessarily high power levels, thereby enhancing Low Probability of Detection (LPD);
- (d) Apply transmission security ("TRANSEC") parameters to the spread spectrum modulation process in order to enhance Low Probability of Intercept (LPI); and/or
- (e) Carry out packet forwarding (routing) in a way that balances aggregate network throughput against average end-to-end delay. (This results in real time traffic, e.g., voice, being sent with higher power, minimizing latency due to channel access delays at multiple hops, and bulk traffic being sent with lower power, minimizing network self-interference, maximizing spatial reuse of frequencies and enhancing LPI/LPD).

(See '720 patent at 2:12-38.)

The inventions of the '720 patent also provide a way to underlay new services on then-existing bandwidth allocations with minimal or no interference to, and from, existing legacy users, by underlaying spectrum-efficient megabit rate networking onto bands allocated for other purposes, while providing up to 30 times greater throughput than then-current spectrum management systems. (See '720 patent at 2:7-11.) For example, military networking could underlay any narrowband-channelized spectrum where individual channels have less than 100% duty cycle, such as in commercial cellular, without interfering with existing legacy users of these bands. At the same time, the flexible hardware and software made possible by the inventions of

the '720 patent will also operate in other frequencies without hardware modification when necessary, such as in overseas locations and in wartime. (*See id.* at 2:49-64.)

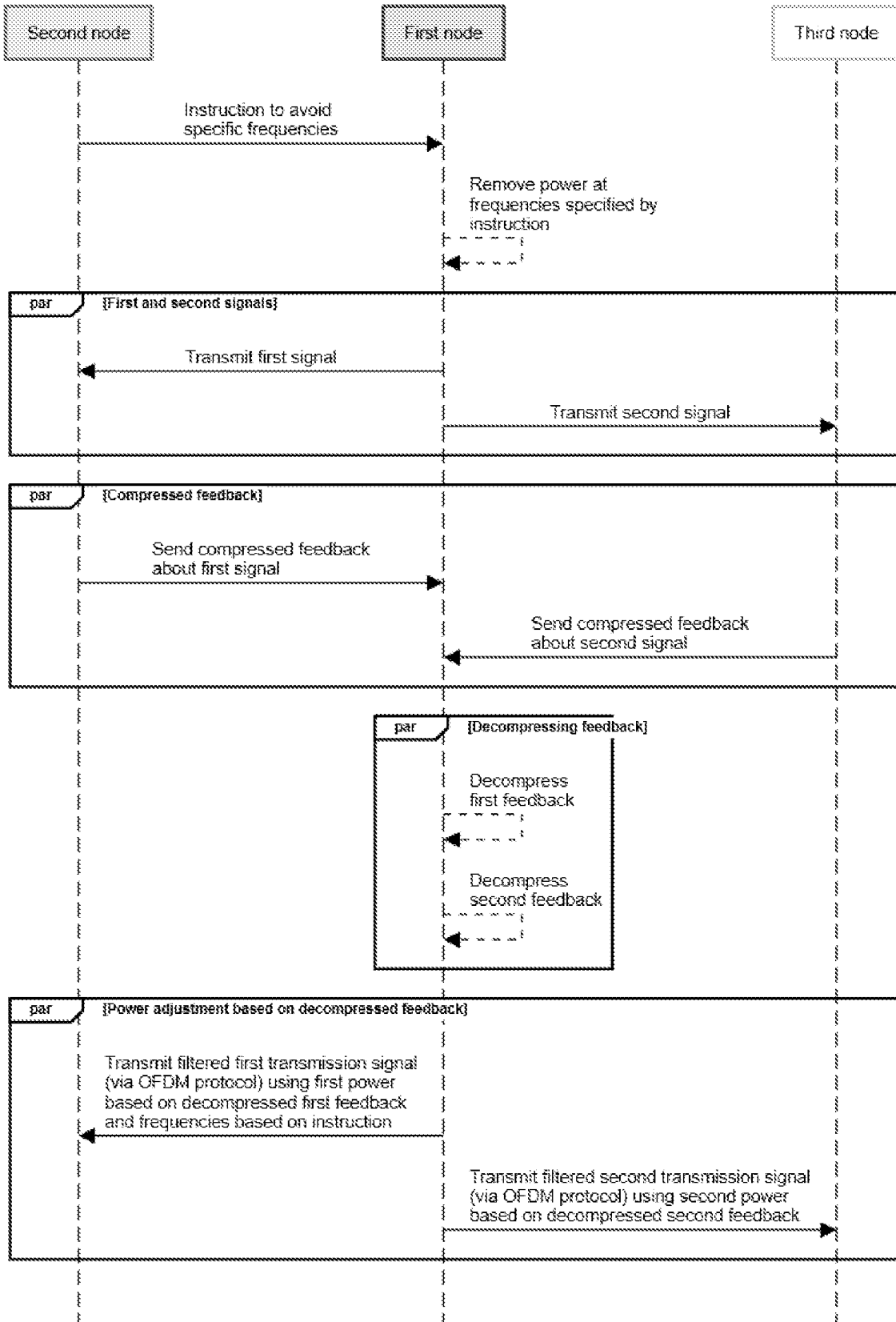
The inventions of the '720 patent address individual spectrum management devices and provide an integrated system concept for dynamic, adaptive, radio frequency spectrum assignment and use. The result is far greater spectrum efficiency, providing megabit/sec rate communications networks that can extend far beyond the capabilities of then-existing wireless networking systems and devices. (*See* '720 patent at 1:66-2:7.)

Moreover, the design of the highly advanced networking communications architecture described and claimed by the '720 patent combines dynamic spectrum management techniques with matching adaptive networking and full exploitation of multiple transceivers per communications node. The inventions of the '720 patent thus provide increased flexibility and scalability, and may be easily adapted for use with other forward-looking wireless communications systems and technologies. (*See* '720 patent at 2:39-48.) The inventions of the '720 patent overcome problems specifically arising out of how to design and develop tools, devices and applications that take advantage of the spectrum management policies proposed by the FCC Spectrum Management Policy Task Force. (*See* '720 patent at 1:54-62.)

The sequence diagram below is a visual depiction of the method recited in claim 53:⁴

⁴ Patent Owner's paraphrasing of claim 53 in this diagram is for convenience only. For the avoidance of doubt, the language of claim 53 controls.

Claim 53



In relevant part, and as illustrated above, claim 53 requires that the first node (shown in blue above) receives an instruction from a second node, receives compressed feedback from the second and third nodes that characterizes receipt of first and second signals sent by the first node to the second and third nodes respectively, decompresses the compressed feedback from the second and third nodes, and simultaneously transmits filtered transmission signals to the second and third nodes using a first and second power respectively.

Overview of the Asserted References

Agee (U.S. Pat. App. Pub. No. US 2004/0095907) (Ex. 1008)

According to Agee's Abstract, Agee is directed to a "locally enabled global optimization of a multipoint, wireless electromagnetic communications network of communication nodes," where "each diversity-channel-capable node uses computationally efficient exploitation of pilot tone data and diversity-adaptive signal processing of the weightings and the signal to further convey optimization and channel information which promote local and thereby network-global efficiency." (Ex. 1008 at Abstract.)

McFarland (U.S. Pat. No. 6,628,673) (Ex. 1009)

McFarland teaches a method to allow channel sharing in a way that allows simple nodes such as cordless phones to transmit to a node at a low rate continuously while other high speed nodes transmit at a much higher rate simultaneously with the simple nodes to the same node. For example, McFarland teaches a system which implements multi-frequency communication but allows channel sharing between users in a way that would allow simple nodes such as a 32 kb/s cordless phone to transmit continuously at a low rate while other high speed nodes such as 20 Mb/s video streams communicate at a much higher data rate. Further, McFarland teaches that the transmit nodes use OFDM, where simpler nodes use a few subcarriers/subchannels whereas high

speed nodes use most of the subcarriers. The subcarriers are designed to be non-interfering. One method of assigning subcarrier in this manner involves adjusting the transmission of packets at the nodes according to closed-loop feedback signals sent by the base station. For example, the strength of each signal is adjusted at the node according to feedback signals sent to it by the base station, or by implementing an open-loop power control scheme in which the strength of each signal is adjusted at the node according to the power level of the base station signal it receives. (Ex. 1009.)

Ton (U.S. Patent No. 6,745,012) (Ex. 1010)

Ton discloses a data compression scheme for mobile telecommunications where data compression is applied to data packets so long as link quality is above a certain threshold. Because compression schemes are computationally intensive and require significant processing power, and because of the variable link quality in wireless networks, Ton discloses that a compressor associated with the transmitted signal is disabled in response to the link quality falling below this threshold. (Ex. 1010.) (Psounis Dec., ¶39.)

Claim Rejections - 35 U.S.C. § 103

Claims 53-56, 64-66, 70, 76, 81-84, and 87-94 are rejected under pre-AIA 35 U.S.C. § 103 as being unpatentable over U.S. Pat. App. Pub. No. 2004/0095907 to Agee et al. (“Agee”) in view of U.S. Pat. No. 6,628,673 to McFarland et al. (“McFarland”) further in view of U.S. Pat. No. 6,745,012 to Ton et al. (“Ton”).

For the reasons set forth below and supported by the expert declaration of Patent Owner’s expert Dr. Konstantinos Psounis (Ex. 2001 (“Psounis Dec.”)), Agee in view of McFarland and further in view of Ton does not teach or suggest multiple claim limitations of the challenged claims of the ’720 patent and neither Requester nor the Office Action have established a prima facie case

of obviousness, including demonstrating that a POSITA would have been motivated to combine the references as proposed, much less in the ordered combination of steps recited in the claimed methods.

In his Declaration (Ex. 1003), Requester's expert Mr. Geier states that he considered a "claim chart comparing claims 53-56, 64-66, 70, 76, 81-84, and 87-94" (Ex. AA) in forming his opinions. Accordingly, while Patent Owner addresses the opinions in Mr. Geier's Declaration, Patent Owner will also address the opinions and evidence cited in Ex. AA where relevant. Similarly, to the extent the Examiner adopts Mr. Geier's opinions in his Declaration or claim chart in its Office Action, Patent Owner's arguments below are intended to address the Office Action as well. To the extent the Examiner's reasoning diverges from Mr. Geier's opinions, Patent Owner separately addresses those points as well.

As an initial matter, the Office Action fails to make a prima facie case of obviousness as to each element of each challenged claim. As will be demonstrated in further detail in the subsequent pages, for many elements, neither the Office Action nor Mr. Geier identify specific disclosures in the asserted references at all that purportedly correspond to the limitations of the claims. To the extent they identify particular teachings in the asserted references for some claim elements, they fail to consider the challenged claims as a whole and as an ordered combination of elements each of which are related to other elements of the claims. Instead, they assume that the claims as a whole are obvious merely because some elements, standing alone, were purportedly taught by the references or allegedly would have been obvious to a POSITA. But analyzing the claims on a limitation by limitation basis without considering the claims as a whole is insufficient to show obviousness as a matter of law.

The deficiencies in the Office Action's analysis are set forth below with respect to claim 53. Because the remaining challenged claims all depend on claim 53, they are patentable for at least the same reasons.⁵

[53.1] receiving at a first node in the radio communications network an instruction transmitted from a second node in the radio communications network to avoid using a plurality of frequencies to transmit to the second node

Claim element [53.1] requires that a “first node” receive an “instruction” transmitted from a “second node” to “avoid using a plurality of frequencies to transmit to the second node.” For this claim element, the Office Action and Mr. Geier rely on both Agee and McFarland in combination. However, they fail to provide sufficient evidence that the proposed Agee-McFarland combination teaches this element or renders it obvious in the context of claim 53. (Psounis Dec. ¶ 42.)

Requester's expert, Mr. Geier, cites ¶¶ 179 and 180 of Agee for this limitation as teaching “feedback,” (*see* Ex. 1003, ¶75; Ex. AA at 4-5), but does not explain how anything in these paragraphs is an “instruction . . . to avoid using a plurality of frequencies.” For example, Mr. Geier does not explain how an “internode channel response,” a “rank,” or a “diversity channel distribution” correspond to the claimed “instruction.” (Psounis Dec. ¶ 43.)

The Office Action appears to agree that Agee does not teach element [53.1]. (OA at 5.) However, it then goes on to state that “McFarland discloses an analogous wireless adaptive communication system (see Abstract) in which a node may adjust the frequency used by that

⁵ USTA only addresses claim 53 for purposes of responding to the non-final office action but is not conceding that any limitations not addressed herein are disclosed by the asserted references and reserves the right to present additional arguments. Likewise, USTA is not proposing any claim constructions in this response but reserves the right to present claim construction arguments in the future in this or in other proceedings and nothing contained herein should be interpreted as adopting a particular construction under the Phillips standard for claim construction.

node (see column 7, lines 37-40 and column 3, lines 7-14) based upon feedback from a base station (see column 4, lines 34-50), which leads to the node sending requests to the base station for channel reallocation, see column 5, lines 40-57).” (OA at 5-6.) (Psounis Dec. ¶ 44.)

McFarland does not teach or suggest an instruction that is sent from the second node to the first node *that is then used by the first node to filter a plurality of frequencies for communication with the second node*, as required by claim element [53.2]. (Psounis Dec. ¶ 45.) For this claim element, Requester cites McFarland at 3:7-14 (“adjusting the frequency used by each node according to closed-loop feedback signals sent by the base station”), 4:34-50 (“When the unit 450 determines that nodes should change channels, it issues appropriate command as a data packet which is included in the transmission of base station 400”), 5:40-57 (“the unit 350’ can cause the laptop 300 to send requests to the base station 400 to change or reallocate channels. Depending on constraints imposed by other nodes, the base station 400 may or may not accept the recommendation and transmit the appropriate command”), and 7:37-40 (“frequency control may be implemented by allowing the base station 400 to feed back information to the node in the form of a command signal, adjusting the transmit frequency in a closed loop system”). (Ex. AA at 5-6.) Mr. Geier cites to column 5:40-57 in his declaration. (Ex. 1003, ¶77.) (Psounis Dec. ¶ 46.)

Requester and Mr. Geier mischaracterize the disclosures of McFarland. First, at col. 3:7-14, McFarland describes the operation of a *base station* in “locking the frequency used by each node . . . and adjusting the frequency used by each node . . .”:

According to a second aspect of the present invention, simple low data rate nodes are allowed to use a small number of sub-channels while the more complicated nodes use the remainder, and additional means are used to ensure that adjacent sub-channels are reliably spaced apart in frequency so that they do not bleed over into one another. This may be done by, e.g., using highly

accurate frequency references (such as quartz crystals) in each node; locking the frequency used by each node to a highly accurate external reference such as a Global Positioning System (GPS) satellite; **locking the frequency used by each node to the transmit frequency of the base station; and adjusting the frequency used by each node according to closed-loop feedback signals sent by the base station.**

(Ex. 1009 at 3:1-14.)⁶ Additionally, at column 4:42-50, McFarland discloses that the base station's channel allocation and coding unit 450 makes channel allocation and coding decisions and may issue commands that are sent in base station transmissions. Therefore, the base station, and not any individual node such as a laptop, determines the frequencies to be used by each node. (Psounis Dec. ¶ 47.)

This context is important with respect to the cited disclosure at column 5:40-57 of McFarland. Specifically, it is in this context (i.e., in which the laptop is not “unilaterally making channel allocation changes”) that McFarland states a laptop may “send requests to the base station 400 to change or reallocate channels”:

Channel allocation and coding unit 350' in the laptop 300 monitors the datadstreams [sic] 310' for bit errors, lost packets and the like much like its counterpart 450 in the base station 400; ***however, rather than unilaterally making channel allocation changes to improve communication like the unit 450, the unit 350' can cause the laptop 300 to send requests to the base station 400 to change or reallocate channels.*** Depending on constraints imposed by other nodes, the ***base station 400 may or may not accept the recommendation and transmit the appropriate command.***

(Ex. 1009 at 5:40-57.) In other words, while the laptop may send a request to the base station, the base station still determines what frequencies are to be used by the laptop. This is consistent with the other disclosures in McFarland in which the base station controls other

⁶ All emphasis is added unless indicated otherwise.

nodes' use of frequency, (column 7:33-40), timing, (column 7:63-8:4), and power, (column 8:16-33). (Psounis Dec. ¶ 48.)

In view of this, McFarland does not disclose an instruction from a node to the base station for the base station to avoid using a plurality of frequencies to transmit to the node. Rather, as explained further in connection with element [53.2], in McFarland, any filtering of transmissions purportedly taught by McFarland is performed *at the node*. (Psounis Dec. ¶ 49.)

This aspect of McFarland's operation is further exemplified by the claims of McFarland, which demonstrate that only a base station is capable of instructing nodes in a communication system as to specific frequencies to be used by those nodes:

10. A communication system comprising:

a base station for transmitting a signal representative of a plurality of non-overlapping sub-channels conveying information, a plurality of groups of sub-channels each corresponding to one of a plurality of nodes;

wherein the nodes are for simultaneously receiving the signal transmitted by the base station and processing it to generate, for each information-conveying sub-channel corresponding to the node, a data stream representative of the information conveyed thereby,

the base station is for using multiple sub-channels simultaneously to transmit to at least one of the nodes,

the base station is for intelligently changing an assignment of nodes to sub-channels used by those nodes for optimal reception of transmitted signals, and *the base station* is for intelligently changing the assignment of nodes to channels to minimize at least one of fading and interference.

6. A communication system comprising:

a base station for transmitting a signal representative of a plurality of non-overlapping sub-channels conveying information, a plurality of groups of sub-channels each corresponding to one of a plurality of nodes, *the base station* including means for generating and transmitting a command signal to the at least one node based on the power of signals from the at least one node as received by the base station;

frequency controlling means for controlling the frequencies of *signals transmitted by the at least one* node; and,

power control means for controlling power of signals sent by the at least one node, the power control means being disposed in the at least one node and being responsive to command signals from the base station transmitted to the at least one node;

wherein the nodes are for simultaneously receiving the signal transmitted by the base station and processing it to generate, for each information-conveying sub-channel corresponding to the node, a data stream representative of the information conveyed thereby.

In summary, neither Requester nor Mr. Geier identify any teachings in Agee, McFarland, or in the proposed Agee-McFarland combination of the claim requirement that a second node transmit an instruction to a first node, which the first node then uses to filter frequencies used to communicate with the second node.⁷ Therefore, Requester and Mr. Geier have failed to make a prima facie case of obviousness as to element [53.1] in the context of claim 53.

With respect to the Office Action, the Examiner appears to agree that Agee does not disclose this limitation. However, the Office Action states:

McFarland discloses an analogous wireless adaptive communication system (see Abstract) in which a node may adjust the frequency used by that node (see column 7, lines 37-40 and column 3, lines 7-14) based upon feedback from a base station (see column 4, lines 34-50), which leads to the node sending requests to the base station for channel reallocation, see column 5, lines 40-57). One skilled in the art would recognize that this implementation because this would allow for more efficiency by allowing nodes to manage frequencies by simply sending instructions (see James T. Grier Declaration at 50).

⁷ While Requester and Mr. Geier do not advance this theory, it is similarly implausible that the base station in McFarland could serve as the claimed “second node” and the “laptop 350” as the claimed “first node.” As demonstrated above, claim 53 specifically recites that the “first node” be capable of simultaneous transmission to a “second node” and a “third node.” There is no teaching or suggestion in McFarland that a laptop could satisfy this requirement.

Therefore it would have been obvious to one of ordinary skill in the art at the time the invention was made to have implemented the invention of Agee by using McFarland's teachings to allow for instructions to be used to select channels to achieve Agee's use of certain channels for power optimization.

(OA at 5-6.) However, it is not clear from the Office Action what disclosure in McFarland is being relied on as allegedly teaching claim element [53.1] (e.g., feed back from the base station, a request for channel reallocation, a base station command signal, or something else?).

The Office Action cites to Mr. Geier's declaration at paragraph 50, but that does not clarify the basis for the Office Action's assertion that Agee and McFarland render this claim element obvious. In that paragraph, Mr. Geier alleges that "McFarland discloses an embodiment in which both the base station and nodes can send instructions to each other regarding what frequencies to avoid during their transmissions using feedback or 'command' signals." (Ex. 1003, ¶50.) (Psounis Dec. ¶ 50.) However, as noted above, none of the disclosures in McFarland teach claim element [53.1], particularly when viewed in the context of the other claim elements recited in claim 53.⁸

Likewise, it is not clear what the Office Action intended to convey with the following statement: "One skilled in the art would recognize that this implementation because this would allow for more efficiency by allowing nodes to manage frequencies by simply sending instructions." (OA at 6 (citing Ex. 1003, ¶50).) The citation to Mr. Geier's declaration is not helpful because Mr. Geier does not discuss any purported increased efficiency in that paragraph. He also does not discuss any purported increased efficiency in paragraphs 49, 51, 52 or 53 of his declaration. Moreover, his assumption that a POSITA would have concluded that there was a

⁸ In the event the Patent Office later articulates the specific basis for its assertion of obviousness with respect to claim element [53.1], Patent Owner respectfully reserves the right to offer further argument in response.

benefit is unsupported. (Psounis Dec. ¶ 51.) Even Mr. Geier admits that the proposed combination of Agee and McFarland (as best as can be ascertained) “would *not* have affected how the method of Agee would have operated.” (Ex. 1003, ¶52.)

[53.2] filtering a transmission signal to remove power from the transmission signal at each frequency in the plurality of frequencies to be avoided;

Claim element [53.2] requires filtering a transmission signal to remove power at each frequency in the plurality of frequencies to be avoided. The Office Action and Mr. Geier fail to provide sufficient evidence that the proposed Agee-McFarland combination teaches this element. (Psounis Dec. ¶ 52.)

The Office Action asserts that Agee in combination with McFarland renders this claim element obvious. The Office Action’s analysis for this claim element is reproduced below:

Although Agee discloses the use of band pass filters (see paragraph 274 and figure 5, occurs in both directions, see paragraph 280, per node adjustments are independent of one another, see paragraph 478), Agee does not disclose a mechanism for using this to remove power from the transmission signal specifically at each frequency in the plurality of frequencies to be avoided.

McFarland elaborates on this mechanism, in which filtering is performed as required on an individual basis, and channels not to be used are zeroed (see column 2, lines 57-67; column 4, lines 51-61; and column 8, lines 16-22). One skilled in the art would find it advantageous to use McFarland’s teachings to choose where to implement filtering (see Grier at 56-57).

Therefore it would have further been obvious to one of ordinary skill in the art at the time the invention was made to modify Agee by performing channel adjustments on an individual basis, as per McFarland, in order to more easily choose where to implement filtering.

(OA at 6-7.) (Psounis Dec. ¶¶ 53-54.)

As discussed above, Agee's disclosure in paragraph 478 refers to adjusting transmit power using weights in reciprocal channels as is clear from the proceeding paragraphs. (Ex. 1008, ¶¶477-78.) Likewise, as discussed earlier, the general disclosure of band pass filters in Agee, including in paragraphs 220 and 274, does not disclose or suggest the filtering step of claim element 53.2 in the context of claim 53. (Psounis Dec. ¶ 55.) Agee, alone or in combination with McFarland, does not disclose or suggest filtering a transmission signal with respect to the claimed first node to remove power at frequencies specified in a received instruction. Further, while the Office Action cites to Figure 5 of Agee, that appears to be a typographical error. Whether the Examiner meant to refer to Figure 15 or Figure 25, neither of these figures changes the fact that Agee and McFarland in combination fail to disclose or render obvious claim element 53.2 in the context of claim 53. (Psounis Dec. ¶ 56.)

The Office Action at pages 6-7 also cites the same disclosures in McFarland discussed above and for the same reasons these disclosures when considered in combination with Agee do not disclose or render obvious claim element 53.2 in the context of claim 53. (Psounis Dec. ¶ 57.)

The Office Action at pages 6-7 also cites disclosures in McFarland. However, the cited paragraph explains that the filtering (or removal) of frequencies occurs at node 300, not at the base station (i.e., not at the first node alleged by Requester):

As can be seen above, this embodiment of the present invention permits ***multiple node devices 100-300 of varying levels of complexity to communicate with a base station 400 over a single OFDM system*** by allowing the simpler devices 100 and 200 to communicate on a few sub-channels 315 within the OFDM channel, and ensuring that ***these do not interfere with the most complex device 300 using most of the sub-channels 310 by preventing device 300 from using these sub-channels 315 (in this case, by zeroing those sub-channels 315*** at the FFT 420 in the main device 300; however, other equivalent methods can of course be used). Further, the sub-channels 315 may be predetermined, or the simpler nodes 100 and 200 can communicate on any subset of channels by changing the tuning of their up-

converting synthesizers, or by doing a numerical frequency offsetting in the digital domain, although a digital-to-analog converter might be needed in that case.

(Ex. 1009 at 4:51-67.) (Psounis Dec. ¶ 57.)

As previously explained, there is no teaching in McFarland that any removal of power at specific frequencies occurs at the base station corresponding to the frequencies identified in an instruction received at the base station. Indeed, in the same paragraph the Examiner relies on, McFarland goes on to clarify that “the sub-channels 315 may be *predetermined*, or the simpler nodes 100 and 200 can communicate on any subset of channels by *changing the tuning of their up-converting synthesizers*, or by doing a numerical frequency offsetting in the digital domain.” (Ex. 1009 at 4:61-67.) Nothing in this paragraph would have suggested to a POSITA that a base station would remove power from any frequencies identified in a received instruction in the context claimed. (Psounis Dec. ¶¶ 59-60.)

The Examiner is similarly mistaken that a POSITA “would find it advantageous to use McFarland’s teachings to choose where to implement filtering” and that it would have been obvious “to modify Agee by performing channel adjustments on an individual basis, as per McFarland, in order to more easily choose where to implement filtering.” (OA at 6-7.) (Psounis Dec. ¶ 59.) As noted above, McFarland discloses zeroing channels at the *nodes*, *not the base station* that Requester equates with the first node recited in claim 53. Thus, to the extent McFarland discloses options for where to implement the purported filtering, none of those options correspond to the first node recited in claim 53, much less that the filtering of the transmission signal removes power at frequencies identified in an instruction received by the first node where the filtered transmission signal is sent to a second node. When this claim element is also considered with the other elements of claim 53, including [53.8], the deficiencies in the proposed combination of references become even more clear. (Psounis Dec. ¶ 59.)

The Office Action cites to Mr. Geier's declaration at ¶¶56-57 in support of the statement that a POSITA "would find it advantageous to use McFarland's teachings to choose where to implement filtering". (OA at 6.) However, as discussed above, McFarland does not disclose filtering a transmission signal to remove power at frequencies identified in an instruction received by the base station before the filtered transmission signal is sent to a node in the context of claim 53. (Psounis Dec. ¶ 60.)

Additionally, in paragraph 56 of his declaration, Mr. Geier states that:

McFarland explicitly discloses "zeroing" certain sub-channels, through power control, to ensure no interference between nodes of varying complexities. This means McFarland contemplates that nodes can filter signals by removing power from certain channels (i.e., frequencies) that are off. Given this disclosure, a POSITA would have been motivated to look to another reference, such as McFarland, that discloses a way to filter signals to remove power from certain frequencies in a transmission signal.

(Ex. 1003, ¶56.) This argument does not make sense. Mr. Geier refers to an alleged teaching in McFarland and then states "[gi]ven this disclosure, a POSITA would have been motivated to look to another reference, such as McFarland" (Ex. 1003, ¶56.) This internally incoherent statement does not provide support for the Office Action's statements. (Psounis Dec. ¶ 61.)

In addition, a POSITA would not have been motivated to combine Agee and McFarland as proposed because Agee and McFarland are directed to different problems and Agee already addresses the issue of interference such that a POSITA would not have looked to McFarland for any improvement as suggested in the Office Action and by Mr. Geier. For example, Agee discloses that the issue of interference is already addressed via the diversity channels which gain the benefits of orthogonality. (Ex. 1008, ¶ 176.) In contrast, McFarland discloses a number of methods to have low rate nodes pick certain sub channels to transmit while higher rate nodes use the rest of

the sub channels simultaneously, and ensures no interference by having sub channels which do not overlap. In other words, not only the two patents solve different problems, but also the problem of no interference between simultaneous transmissions is already addressed by Agee with the “orthogonality” of the spatially separated diversity based channels. (Psounis Dec. ¶ 62.)

Mr. Geier alleges that “a POSITA would have been motivated to look at another reference *such as McFarland*” and that “a POSITA would have been motivated to make such a combination because the disclosure of restricting channels or frequencies of transmissions in Agee *could have caused them to look to McFarland* for how to implement filtering of the signals to remove power from the frequencies to be avoided.” (Ex. 1003, ¶56.) Likewise, in paragraph 57, Mr. Geier states “It is my opinion that a POSITA would have been motivated to make such a combination because the disclosure of using a band pass filter to filter transmission signals in Agee could have caused them to look to McFarland for how to better operate a system that utilizes feedback across nodes in a network to instruct the band pass filtering in Agee accordingly.” (Ex. 1003, ¶57.) Mr. Geier’s statements in paragraphs 56 and 57 of his declaration are insufficient to support a finding that a POSITA would have been motivated to combine Agee and McFarland as proposed. (Psounis Dec. ¶ 61.)

Specifically, Mr. Geier is arguing that a POSITA “could have” considered combining Agee with other references that could include McFarland. As noted below, that is insufficient as a matter of law. *See Belden Inc. v. Berk-Tek LLC*, 805 F.3d 1064, 1073 (Fed. Cir. 2015) (“obviousness concerns whether a skilled artisan *not only could have made but would have been motivated* to make the combinations or modifications of prior art to arrive at the claimed invention.”)

Relatedly, with respect to Mr. Geier’s statement in paragraph 58 of his declaration that the proposed modification of Agee in view of McFarland “would not have affected how the method

of Agee would have operated,” (OA at 6-7), this statement undermines rather than supports there being a motivation to combine, even if Mr. Geier is making the statement in the context of whether a POSITA would have had a reasonable expectation of success in combining the references. (Psounis Dec. ¶ 61.)

The remaining disclosures Mr. Geier cites are even further removed from this element. For example, Mr. Geier cites 8:16-19 (*see* Ex. AA at 8; Ex. 1003, ¶78), which describes that the base station may send signals to each node “which indicate whether each node 100-300 should transmit with more or less *power*.” (Ex. 1009 at 8:16-19.) This paragraph has nothing to do with removing power from specific frequencies identified in an instruction received by the base station using a band pass filter. Instead, McFarland is describing scenarios where nodes transmit a signal to the base station that is too strong or too weak. Accordingly, the *base station instructs each node* as to the optimal power to transmit with:

In a third operational consideration in the invention, all signals transmitted from nodes 100-300 preferably arrive at the base station 400 with similar power levels. This is because a signal that is much too strong would swamp the ADCs in the base station 400, while a signal transmitted from one of nodes 100-300 that is much too weak would be lost in the noise from the other channels and not reliably received by the base station 400.

Similar to the above closed-loop control techniques, the system may use the base station 400 to send signals to nodes 100-300 which indicate whether each node 100-300 should transmit with more or less power. The system may alternatively implement open-loop control by having each node 100-300 adjust its power based on the power level it is receiving from the base station 400.

(Ex. 1009 at 8:8-22.) Similarly, at column 2:57-60, McFarland merely states “It is still another object of the present invention to provide such a system in which node transmission powers can be reliably controlled so that they do not cause communication errors.” (*See* Ex. 1003, ¶78.) In

McFarland, the reference to nodes excludes the base station. This does not disclose or suggest claim element [53.2] in the context claimed. (Psounis Dec. ¶ 58.)

Moreover, Agee does not teach or suggest an instruction sent from the second node to the first node to avoid using a plurality of frequencies to transmit to the second node. The Examiner appears to agree. (OA at 5.) Nevertheless, Mr. Geier appears to rely on Agee as teaching element [53.2]. (Ex. 1003, ¶¶78-81; Ex. AA at 6-8.) But because Agee fails to teach element [53.1], it also does not teach that any “filtering” of a transmission signal to remove power “in the plurality of frequencies to be avoided,” which in turn is specified by the “instruction” of element [53.1]. Each of Mr. Geier’s opinions based on Agee fails for at least this reason.

Mr. Geier also asserts that “[a] POSITA would have understood that one way to achieve the desired result of the band pass filter in Agee is to ‘remove power’ from certain frequencies outside of a defined range of frequencies set by the filter.”⁹ (Ex. 1003 at ¶ 80; Ex. AA at 7; *see also* Ex. 1003, ¶78 (citing Ex. 1008, ¶¶220, 274).) However, a generic description in Agee of a “band pass filter” does not support a finding of obviousness for the specific limitations recited in claim 53 even where band pass filters were known to a POSITA because Agee does not teach, and Mr. Geier does not identify any disclosures, that band pass filtering in Agee is applied to a transmission signal to remove power at frequencies specified in an instruction received by the first node as required by claim 53.

In another paragraph cited by Mr. Geier, Agee is merely discussing the capability to independently adjust power using weights in reciprocal channels that may be substantively nulling as the preceding paragraph makes clear. (*See* Ex. AA at 8, citing Ex. 1008 ¶¶ 477-78 (“this

⁹ It is not clear what Mr. Geier means by “the desired result of the band filter,” (Ex. 1003, ¶80), but it suggests that Mr. Geier is relying on improper hindsight using the claims as a roadmap to pick and choose from the references’ disclosures.

capability *allows nodes to independently adjust transmit power directed to other nodes in the network*, for example, to optimize capacity achievable at that node given the total power [available] to it, or to minimize power emitted into the network by that node given an aggregate power requirement.”).) This general discussion of adjusting transmit power does not refer to filtering a transmission signal to remove power at each frequency of a plurality of frequencies identified in a received instruction in the context of claim 53.

For at least these reasons, Requester and Mr. Geier have failed to make a prima facie case of obviousness as to element [53.2].

[53.3] transmitting the filtered transmission signal to the second node

For the same reasons noted above with respect to claim elements [53.1] and [53.2], and for the reasons set forth below in more detail with respect to [53.4], [53.6] and [53.8], Agee alone or in combination with McFarland and/or Ton fail to disclose claim element [53.3] which refers to “*the* filtered transmission signal” in the context of claim 53. (Psounis Dec. ¶ 63.)

[53.4] receiving a compressed first feedback from the second node that characterizes receipt of a first signal sent from the first node to the second node

Claim element [53.4] requires that the first node additionally receive a compressed first feedback from the second node that characterizes receipt of a first signal sent from the first node to the second node. Requester and Mr. Geier fail to provide sufficient evidence that the proposed Agee-Ton combination¹⁰ teaches this element, for at least four reasons. (Psounis Dec. ¶ 64.)

First, as set forth above in connection with elements [53.1] and [53.2], Agee does not teach the claimed “first node” and “second node,” and therefore does not describe that *the first node* receives a compressed feedback from *the second node* in the context claimed in claim 53. (Psounis

¹⁰ Mr. Geier does not rely on McFarland for this element. (See Ex. 1003, ¶¶84-87; Ex. AA at 11-14.)

Dec. ¶ 65.) The Office Action recognizes that “Agee in view of McFarland does not disclose [sic] that the feedback may be compressed.” (OA at 7.) (Psounis Dec. ¶ 65.)

Mr. Geier makes a sweeping generalization regarding Agee, stating it “teaches feedback across all nodes in the network” in an attempt to overcome these deficiencies:

Agee teaches dynamic feedback across all nodes in the network—in other words, feedback in Agee is not only sent by the base station (*first node*) to SUs (*second node*) it can also be sent from an SU (*second node*) to a base station (*first node*) as well as other nodes in the network. Ex. 1008, ¶ [0172]. The capability of all nodes in the network to send feedback without restriction is a problem Agee attempts to solve over the prior art. *See id.* (“the feedback is neither limited to BSs only, nor effectively independent of the continual, real-world, signal and network environmental adaptation.”).

(Ex. 1003, ¶85; Ex. AA at 11.) However, the “antecedent bases” for the first node and the second node recite the specific functionality performed by each node, and Mr. Geier is not free to disregard these particularized requirements, nor the requirements set forth in the latter claimed steps of claim 53.

However, that is precisely what Mr. Geier has done. (Ex. 1003, ¶¶84-87.) For example, Mr. Geier does not identify any teachings in Agee regarding receiving a compressed feedback from *the same* “second node” that the first node receives an instruction from regarding avoiding a plurality of frequencies as set forth in [53.1] where the compressed feedback from the second node “characterizes receipt of a first signal sent from the first node to the second node” as required by element [53.4].

While Mr. Geier cites ¶172 of Agee to opine that “feedback is [not] limited to BSs only,” (see Ex. 1003, ¶85; Ex. AA at 12), nothing in that paragraph corresponds to any receiving of an instruction from “a second node” by “the first node” “to avoid using a plurality of frequencies to transmit to the second node” or receiving “a compressed first feedback from the second node that

characterizes receipt of a first signal sent from the first node to the second node” as also recited in claim 53. Mr. Geier simply assumes that these vague and generalized statements in Agee would have sufficiently informed a POSITA of the “first node” and “second node” elements of the claim; however, he does not provide any evidence of this assumption. Therefore, Requester and Mr. Geier fail to support their assertion that claim 53 would have been obvious.

Second, Mr. Geier does not provide any evidence in the Agee-Ton combination of a “compressed first feedback that characterizes receipt of a first signal sent from the first node to the second node” as required by this claim element in the context of claim 53. Mr. Geier and the Examiner recognize that “Agee in view of McFarland does not disclose [sic] that the feedback may be compressed.” (OA at 7.) Mr. Geier relies on Ton instead, opining that Ton’s “method and system for performing adaptive data compression in a wireless communication network . . . to compress at least a portion of a data packet,” (Ex. 1003, ¶86; Ex. AA at 11) in combination with Agee meets this element. However, these teachings of Ton are irrelevant to whether the proposed Agee-Ton combination discloses or renders obvious the step of receiving a “compressed first feedback that characterizes receipt of a first signal” from the first node in the context of claim 53. (Psounis Dec. ¶ 68.)

As the cited portions of Ton explain, the compression methods in Ton relate to *payload* data, not control data as the claim requires. (Psounis Dec. ¶ 69.)

The present invention is directed in general to **data compression in a mobile telecommunications system**, and in particular to **adapting compression for efficiently transporting data** in a mobile telecommunication network.

Ton (Ex. 1010), 1:9-12.

There is a need, therefore, for a system and method of efficiently and effectively compressing data in a wireless telecommunication network. Preferably, such a system and method would **achieve a substantially optimal balance between**

compression and successful data recovery. In addition, such a system and method would preferably **minimize inefficient uses of processing power and memory.**

Id., 1:44-50.

In another embodiment of the invention, **a mobile telecommunications system includes a compressor for compressing at least a portion of a data packet to be transmitted 65** via an air interface.

Id., 1:63-66; see also 2:7-9 ("The mobile station includes a compressor.")

However, this claim element requires receiving compressed first feedback *that characterizes receipt of a first signal sent from the first node to the second node*, which is understood by a POSITA to describe *control data* transmitted from the second node to the first node. (Psounis Dec. ¶ 69.)

This control data (i.e., the "compressed first feedback" is recited in elements [53.6] and [53.8] to control the transmit power to the second node and a third node. Mr. Geier does not offer any evidence that Ton's teachings of compressing payload data would have motivated a POSITA to compress feedback information from the second node wherein a first filtered transmission signal is sent to the second node using an OFDM-based protocol using a first power based on the compressed feedback information as recited in claim 53. (Psounis Dec. ¶ 67.)

Indeed, data compression was known for decades prior to the inventions of the '720 patent. One of the inventive aspects of claim 53 is the use of compression specifically for feedback from a node receiving payload data (here, the "second node") to the node that sent the payload data (here, the "first node"). (Psounis Dec. ¶ 69.) The compression is applied to the control signal sent back to the node transmitting the data, and not to the payload data sent from the node actually transmitting payload data (such as an HTML web page, email, etc.) The idea of using compression specifically for control data was first described in the IEEE 802.11n-2009 standard, well after the

earliest effective filing date of the '720 patent, and became more widespread in the IEEE 802.11ac-2013 standard for MIMO feedback. Prior IEEE 802.11 WiFi standards did not utilize compression for control data. (Psounis Dec. ¶ 69.) Therefore, a POSITA as of the earliest effective filing date of the '720 patent would not have been aware of, and would not be motivated to, transmit compressed control data. (Psounis Dec. ¶ 69.)

Third, to the extent a POSITA would be motivated to compress control data in view of Ton, the proposed Agee-Ton combination would teach away from the transmission of compressed feedback information from the second node to the first node that specifically characterizes receipt of a first signal sent from the first node to the second node. (Psounis Dec. ¶ 70.) The portions of Agee cited by Mr. Geier explain that Agee teaches the use of incorporated control and feedback information, or internalized feedback information within a node:

A second key to this approach is the minimization of secondary consequences of signaling, and a second is *using internalized feedback, so that the signaling process itself conveys information crucial to the optimization*. Rapid, dynamic, adaptation reactive to the changing environment and communications within and surrounding each node and the entire network is used to promote both local and global efficiency.

Ex. 1008, ¶172.

The incorporation of the control and feedback signal as part of the process rather than as discrete, separate, and particular parts of the signal, *can decrease the complexity of apparatus by removing the need for a separate channel for network control*. .. This integration allows both capacity and power control to cooperatively handle packet acknowledgement... the present form of the invention provides increased capacity and performance through dynamic, and self-moderating signal processing algorithms, with a minimal overhead.

Id., ¶¶249-250.

One major difference in the present embodiment of the invention from prior art is that by *making the control and feedback aspects part of the signal encoding*

process, and thereby eliminating or at least reducing the need for a separate channel(s) for control and feedback, the network content overhead is reduced and an additional range within the Signal dimension is available for Signal content. The LEGO reduction to single, or small, bit sized power management signals can be similarly echoed for other network management, depending on the target objective the network elects.

Id., ¶244.

By using target criteria such as (1) for a cellular network, a max- min capacity criterion Subject to a power constraint, or (2) for a wireless LAN, a max-sum capacity that is subject to a power constraint, and using simple comparative operations in feedback for the network to optimize towards those criteria, this invention enables flexibility and stability for any given hardware and software combination that underlies a wireless electromagnetic communications network and improves, for the entire network and at each particular node thereof, the communication capacity and power requirements. Furthermore, the present form of the invention does not ignore but rather directly addresses and resolves both the overhead vs. content and the power vs. capacity conundrums which otherwise limit present-day state of the art approaches to optimization. ***It does this using the experienced environment as part of the direct feedback, rather than requiring additional control information or signalling that reduces content capacity.***

Id., ¶193.

In contrast, the '720 patent claims and describes receiving a separate compressed feedback signal from the second node. (Ex. 1001 at 22:21-26 (“In a preferred embodiment, node 1400 would ***also*** provide feedback information to neighboring node 1460 to assure that the signal neighboring node 1460 sends back to node 1400 arrives with the same power level as that of every other neighbor, minimizing problems of near-far receiver masking.”).) Mr. Geier does not provide any evidence that the proposed Agee-Ton combination teaches the use of such feedback. Nor does he offer any evidence that any “feedback” described in Agee is used to determine transmit power for subsequent transmissions to the node. (Psounis Dec. ¶ 71.)

Fourth, Mr. Geier does not rely on McFarland for this element. (*See* Ex. 1003, ¶¶ 84-87; Ex. AA at 11-14.) This omission is inconsistent with his theories as to elements [53.1] and [53.2]. (Psounis Dec. ¶ 72.) There, Mr. Geier appears to rely on McFarland as a necessary element for teaching an “instruction” transmitted from the second node to the first node, while also relying on Agee’s disclosure of “feedback.” (*See* Ex. 1003, ¶¶ 74-81; Ex. AA at 3-8.) Mr. Geier then relies on the same “feedback” in Agee as also meeting the “first compressed feedback” of element [53.4]. (Ex. 1003, ¶¶ 84-85; Ex. AA at 11-13.) But in doing so, Mr. Geier fails to acknowledge the relationship between the “instruction” of element [53.1] and the “first compressed feedback” of element [53.4]. Nor does Mr. Geier explain how, without McFarland, the proposed Agee-Ton combination teaches both the “instruction” and the “first compressed feedback” elements of the claim. His omission of McFarland in element [53.4] is therefore fatal to his obviousness theory because he fails to identify **both** an “instruction” and a “first compressed feedback” transmitted from the second node, as the claim requires. (Psounis Dec. ¶ 72.)

The Examiner appears to overlook this discrepancy and states that “it would have been obvious to [a POSITA] to have modified the invention of Agee **and McFarland** by using data compression and decompression, as per Ton, to reduce the amount of bandwidth and power needed for transmitting.” (OA at 7.) However, the Examiner similarly fails to cite any evidence of the presence of **both** an “instruction” and a “first compressed feedback” in this proposed combination (which is different from Mr. Geier’s proposed combination and incorrect for additional reasons as discussed herein). (Psounis Dec. ¶ 73.) Despite these deficiencies, the Office Action also states:

Ton discloses the general compressing of transmissions in any node in wireless data networks and that compressed data packets require less bandwidth to transmit (see column 3, lines 31-43), as well as corresponding decompression (see column 3, line 56 to column 4, line 3). One skilled in the art would also recognize that this would also reduce the amount of power needed to transmit (see Grier at 87).

(OA at 7.)

The Office Action's assertion that a POSITA would have been motivated to modify Agee and McFarland by using data compression and decompression per Ton to reduce the amount of bandwidth and power needed for transmitting does not account for the references other teachings that would discourage a POSITA from pursuing the proposed combination. (Psounis Dec. ¶ 74.)

As Ton discloses:

Implementation of a data compression scheme, however, uses extensive processing resources. If the data compression does not work, then resources are essentially being wasted. For example, when the bit error rate in a wireless telecommunication network increases, it is likely that transmitted data will not be decompressed correctly on the receiving end of the air interface. In such a situation, the decompressor typically detects that the received packets cannot be properly decompressed and requests that the data be resent. In addition, the decompressor begins discarding received packets until the decompressor is able to resynchronize with the compression scheme. In the meantime, however, the compressor makes inefficient use of processing resources and bandwidth by trying to compress the data packets and send them over the air interface link, even though the data packets are simply being discarded by the decompressor.

(Ex. 1010 at 2:38-53.) To address these concerns, and in doing so validating their legitimacy, Ton discloses that the compressor is disabled for a certain amount of time whenever the link quality falls below a certain threshold. (Ex. 1010 at 2:54-64.) (Psounis Dec. ¶ 75.) However, Agee includes repeated statements regarding the desire to minimize complexity and power consumption and reduce overhead and costs associated with its network system, and to conserve

power. (*E.g.*, Ex. 1008, ¶¶15, 20, 48, 69, 96, 99, 249-252, 257, 264, 523.) Agee also discloses concerns about costs associated with additional hardware requirements for example, as illustrated in paragraph 237:

The approaches currently described in the field, . . . require additional hardware at each node comprising one end of a channel per diversity path to exploit that diversity path. This creates a geometric growth in the hardware complexity for each particular node, and a linear growth in cost for each diverse path exploited by a given network, that rapidly renders any network attempting to exploit such diversity uneconomic. Moreover, such an approach 'muddies its own stream' in that it reduces the capacity increase by the power increase needed to power the more complex transceiver. Exploitation of this multipath approach requires both high power (to permit data transport over the relatively weaker additional diversity path) and complex codecs (to permit data transports at high rates on the dominant path by filtering out the diversity path transmissions).

(Ex. 1008, ¶237.) A POSITA would have recognized the same concern with respect to requiring compression and decompression solutions at each node based on the teachings of Ton and Agee as well as McFarland. (Psounis Dec. ¶ 76.)

These concerns are further exacerbated by the fact that Ton's compression and decompression solution does not function below a certain threshold link quality, (Ex. 1010 at 2:54-64), and thus may not function in a host of network environments contemplated by Agee, or with the a variety of simple node types contemplated by McFarland in comparison to the "new wireless data communication systems" contemplated in Ton, (Ex. 1010 at 2:34-36). (Psounis Dec. ¶ 77.) Ton also readily acknowledges that "In the wireless context, however, the use of compression introduces a number of problems. First, *compression schemes require high processing power*, while it is typically desirable to reduce the amount of resources used in a wireless telecommunications system. For example, mobile stations generally have a limited power supply, and it is therefore beneficial to reduce the amount of power used by the processor in the mobile

station.” (Ex. 1010, 1:22-30.) This is directly contrary to the Office Action’s assertion that modifying Agee with Ton’s teachings regarding compression and decompression would have resulted in power savings. (OA at 7.) (Psounis Dec. ¶ 78.) Ton also discloses:

Wireless networks, on the other hand, often have a higher and much more variable hit error rate caused by the combination of mobile station mobility and the use of an air interface as a transmission medium. As a result, when the wireless quality deteriorates (i.e., a high bit error rate exists), some data packets may be lost, thereby causing decompression on the receiving end to fail to regenerate the 40 packet data. Such a situation causes an *inefficient use of processing power* because data packets are being compressed on the transmitting end, even though the data packets cannot be regenerated.

(Ex. 1010 at 1:33-43.) In view of these disclosures, and that the proposed modification to Agee is directed to feedback signals rather than data, a POSITA would not have had a motivation to combine the references as proposed by Requester or the Examiner, nor would they have had a reasonable expectation of success either. (Psounis Dec. ¶ 79.)

[53.5] receiving a compressed second feedback from a third node that characterizes receipt of a second signal sent from the first node to the third node;

Claim element [53.5] additionally requires the step of receiving a compressed second feedback from a third node that characterizes receipt of a second signal sent from the first node to the third node.

For at least the reasons identified for element [53.4] above, Requester and Mr. Geier fail to provide sufficient evidence that the proposed Agee-Ton combination¹¹ teaches this element or would have rendered it obvious. Likewise, the Office Action is incorrect in asserting that this claim element would have been obvious in the context of claim 53 for at least the same reasons. (Psounis Dec. ¶ 80.)

¹¹ Mr. Geier does not rely on McFarland for this element.

[53.6] decompressing the compressed first feedback resulting in a decompressed first feedback

Claim element [53.6] requires the step of decompressing the compressed first feedback resulting in a decompressed first feedback. (Psounis Dec. ¶ 81.)

For the reasons set forth for element [53.4] above, Requester and Mr. Geier fail to provide sufficient evidence that the proposed Agee-Ton combination¹² teaches this element or would have rendered it obvious in the context of claim 53 because at a minimum they fail to show that the combination teaches a “compressed first feedback.” (Psounis Dec. ¶ 82.)

Specifically, Mr. Geier merely cites generalized teachings of “feedback” in Agee and a “decompressor” in Ton as meeting this element. (*See* Ex. AA at 18-20, citing Ex. 1008 at ¶¶ 214, 163, 172, 249-50, 244, 193; Ex. 1010 at 3:56-59, 3:65-4:3.) However, Mr. Geier does not offer any evidence of decompressing any control information that characterizes receipt of a first signal, as elements [53.6] and [53.4] require. Nor does Mr. Geier offer any evidence that any such “decompressed first feedback” in his proposed combination is the basis for the transmit power for subsequent transmission to the second node, as element [53.8] requires. Therefore, Requester and Mr. Geier have failed to make a prima facie case of obviousness as to element [53.6]. (Psounis Dec. ¶ 82.)

Additionally, for all the same reasons noted above, the Office Action is incorrect.

[53.7] decompressing the compressed second feedback resulting in a decompressed second feedback

Claim element [53.7] requires that the first node decompress the compressed second feedback resulting in a decompressed second feedback. (Psounis Dec. ¶ 83.)

¹² Mr. Geier does not rely on McFarland for this element.

For at least the reasons identified for elements [53.5] and [53.6] above, Requester and Mr. Geier fail to provide sufficient evidence that the proposed Agee-Ton combination¹³ teaches this element or would have rendered it obvious in the context of claim 53. Specifically, Mr. Geier does not offer any evidence of decompressing any control information that characterizes receipt of a second signal, as elements [53.7] and [53.5] require. Nor does Mr. Geier offer any evidence that any such “decompressed second feedback” in his proposed combination is used to determine transmit power for subsequent transmissions to the third node, as element [53.9] requires. Moreover, Mr. Geier specifically offers no evidence in his combination of a *second* signal or a *second* feedback that are different from the first signal and first feedback, respectively, and transmitted from a different (“*third*”) node. (Psounis Dec. ¶ 84.)

Therefore, Requester and Mr. Geier have failed to make a prima facie case of obviousness as to element [53.7].

For the same reasons noted above, the Office Action is incorrect and has not established a prima facie case of obviousness with respect to claim 53 and this claim element.

[53.8] wherein the filtered transmission signal is a filtered first transmission signal that is transmitted to the second node using an 802.11-based orthogonal frequency-division multiplexing (OFDM) protocol via at least one antenna of a plurality of antennas, using a first power that is based on the decompressed first feedback; and further comprising

Claim element [53.8] requires that the filtered transmission signal to the second node (recited in element [53.2] above) is a filtered first transmission signal transmitted using an 802.11-based OFDM protocol via at least one antenna of a plurality of antennas, using a first power that is based on the decompressed first feedback. (Psounis Dec. ¶ 85.)

¹³ Mr. Geier does not rely on McFarland for this element. (See Ex. AA at 20-23.)

For the reasons set forth for elements [53.1]-[53.4] and [53.6] above, Requester and Mr. Geier fail to provide sufficient evidence that the combination of Agee, McFarland and Ton alone or in combination teach this claim element in the context of claim 53 or would have rendered it obvious. (Psounis Dec. ¶ 86.) At a minimum, they fail to show that the combination teaches a “decompressed first feedback.” Moreover, for at least the additional reasons below, Mr. Geier does not provide sufficient evidence that the proposed Agee-McFarland-Ton combination teaches or suggests this element.

First, Mr. Geier wrongly opines that the teaching of Locally-Enabled Network Optimization (LEGO) in Agee meets this element. (Ex. 1003, ¶96; Ex. AA at 25, citing Ex. 1008 at ¶ 499.) LEGO requires a very specific condition called channel reciprocity: the designer must calibrate the hardware at each node such that the channel from node 1 to 2 equals that from node 2 to 1. While the medium itself (such as the air) is the same in either direction, channel reciprocity within the hardware (such as the transmit and receive circuitry at each node) requires special calibration. Such calibration to achieve channel reciprocity is technically difficult and rarely used in practice in WiFi, due to the low cost of hardware components. However, the description of LEGO in Agee assumes that channel reciprocity is satisfied. (Ex. 1008 at ¶¶ 187-89.) Mr. Geier does not offer any evidence of channel reciprocity in his proposed Agee-McFarland-Ton combination. (Psounis Dec. ¶ 87.)

Moreover, Agee teaches a very specific method to compute transmit power using “receive and transmit weights employed by all nodes in the network during uplink and downlink operations”:

LEGO is enabled by exploiting substantive reciprocity of the internode channel responses, together with appropriate normalization of transmit power measures, to design uplink and downlink network quality metrics $D_{21}(W_2, G_1)$ and $D_{12}(W_1, G_2)$ that satisfy network reciprocity property:

$$D_{12}(W, G) = D_{21}(G^*, W^*) \quad (\text{EQ. 2})$$

where (W_2, G_1) and (W_1, G_2) represent the receive and transmit weights employed by all nodes in the network during uplink and downlink operations, respectively. If equation 1 holds, then equal network quality can be achieved in each link direction by setting $G_1 = W_1^*$ and $G_2 = W_2^*$, such that each node use the receive combiner weights as transmit distribution weights during subsequent transmission operations, i.e., the network is preferentially designed and constrained such that each link is substantially reciprocal, such that the ad hoc network capacity measure can be made equal in both link directions by setting at both ends of the link.

(Ex. 1008 at ¶ 188-89.) (Psounis Dec. ¶ 88.)

Mr. Geier does not provide any evidence that this method of computing transmit power using “weights” meet the claim requirement of using a “decompressed first feedback” to determine the transmit power for the transmission of the filtered transmission to the second node. (Psounis Dec. ¶ 89.)

Agee teaches implicit beamforming, where the base station relies on channel reciprocity rather than feedback from a receiving node to estimate the channel. The method of channel reciprocity described in Agee relies on channel calibration, not feedback. Therefore, the “weights” that Agee uses for adjusting transmit power are internally computed and not based on feedback received from a second node. (Psounis Dec. ¶ 89.)

As Mr. Geier recognizes, Agee explains that its nodes are capable of “*independently* adjust[ing] transmit power, for example, to optimize capacity achievable at that node given the total power [available] to it, or to minimize power emitted into the network by that node given an aggregate power requirement.” (Ex. 1008 ¶ 478; see Ex. AA at 26.) Indeed, “most of the quantities required for the optimization only require local information.” (Ex. 1008 ¶ 515.) Mr. Geier does not attempt to reconcile any of these teachings with the claim requirement that the transmit power is based on the decompressed first feedback, or otherwise explain how Agee teaches

computing transmit power based on feedback. Rather, Agee suggests that the transmit power is determined by the “aggregate power requirement,” not any specific type of feedback. (Ex. 1008 ¶ 478; see also ¶ 192 (“minimize the total transmit power in the entire network subject to a network quality constraint”).) Mr. Geier does not attempt to tie such “aggregate” or “total” power requirements to any feedback received by a node. (Psounis Dec. ¶ 89.)

Mr. Geier’s reliance on McFarland is similarly misplaced. (Psounis Dec. ¶ 90.) Mr. Geier cites the same portions of McFarland he previously cites for elements [53.2] and [53.3]. (*Compare* Ex. AA at 8 and 10 with 27.) Those paragraphs, reproduced below in full, explain that a base station autonomously instructs each node as to how much power to use:

In a third operational consideration in the invention, ***all signals transmitted from nodes 100-300 preferably arrive at the base station 400 with similar power levels.*** This is because a signal that is much too strong would swamp the ADCs in the base station 400, while a signal transmitted from one of nodes 100-300 that is much too weak would be lost in the noise from the other channels and not reliably received by the base station 400.

Similar to the above closed-loop control techniques, ***the system may use the base station 400 to send signals to nodes 100-300 which indicate whether each node 100-300 should transmit with more or less power.*** The system may alternatively implement open-loop control by having each node 100-300 ***adjust its power based on the power level it is receiving from the base station 400.***

It should be noted that the above difficulties do not typically occur when a single base station transmits to all other nodes simultaneously. Because all signals are emanating from the same source, it is easy to insure that frequency sub-channels do not overlap, that all signals have their symbol transitions at the same time, and that the power level of all sub-channels is the same as transmitted and therefore as received. However, ***it is possible for the base station to vary its allocation of transmit power amongst the various nodes to enhance efficiency.***

(Ex. 1009 at 8:8-32; Ex. AA at 27-28.)

To the extent Mr. Geier contends that the same portions of McFarland teach an “instruction” used to determine specific frequencies for subsequent transmissions as well as feedback used to determine the power of the transmitted signal, his theories fail because he does not separately identify an “instruction” and a “compressed feedback.” As set forth above, McFarland does not teach the “instruction” as claimed in element [53.1] and utilized in element [53.2]. (Psounis Dec. ¶¶ 90-91.)

Moreover, Mr. Geier previously fails to cite anything in McFarland as teaching the compressed or decompressed feedback of elements [53.4]-[53.7] and therefore cannot rely on McFarland for element [53.8]. But even if a POSITA would have considered McFarland in the overall combination, the portions that Mr. Geier cites are inapposite. Specifically, as shown above, McFarland teaches that ***the base station instructs nodes*** as to the optimal transmit power, ***not*** that the first node (here, the base station) determines its transmit power based on feedback received from a second node (here, “nodes 100-300”), as element [53.8] requires. In teaching only one-way instructions and feedback (i.e., from the base station to nodes 100-300), McFarland teaches away from element [53.8] altogether, because a POSITA would be steered away from arriving at the inventions claimed in the ’720 patent. (Psounis Dec. ¶ 92.)

This one-way feedback mechanism of McFarland is further exemplified by the following disclosures cited by Mr. Geier:

According to a fourth aspect of the invention, the sub-channels are shared between low data rate nodes and high data rate nodes as described above, and means are provided to ensure that signals from the various nodes arrive at the base station with similar power levels. This may be done by implementing ***a closed-loop power control scheme in which the strength of each signal is adjusted at the node according to feedback signals sent to it by the base station***, or by implementing an open-loop power control scheme in which the strength of each signal is adjusted at the node according to the power level of the base station signal it receives.

(Ex. 1009 at 3:28-38; Ex. AA at 28.) (Psounis Dec. ¶ 92.)

Therefore, all of the portions of Agee and McFarland that Mr. Geier relies on teach that nodes either adjust their transmit “independently” of any received feedback (as in Agee, see Ex. 1008 ¶ 478) or are instructed by the base station to adjust their transmit power via open or closed-loop feedback from the base station (as in McFarland, see Ex. 1009 at 8:8-32, 3:28-38). Mr. Geier does not identify any disclosures in the asserted references where the first node (such as an access point or base station) transmits to a second node using a transmit power based on feedback received from the second node. (Psounis Dec. ¶ 93.)

Therefore, Requester and Mr. Geier have failed to make a prima facie case of obviousness as to element [53.8].

For the same reasons noted above for this claim element and the other related claim elements of claim 53, the Office Action also fails to establish a prima facie case of obviousness.

[53.9] transmitting, using the 802.11-based OFDM protocol, a filtered second transmission signal, simultaneously with the filtered first transmission signal, to the third node using a second power that is based on the decompressed second feedback.

Claim element [53.9] requires transmitting, simultaneously with the filtered first transmission signal to the second node, a filtered second transmission signal to the third node using a second power that is based on the decompressed second feedback. (Psounis Dec. ¶ 94.)

For the reasons set forth for element [53.8] above, Requester and Mr. Geier fail to provide sufficient evidence that the combination of Agee, McFarland, and Ton teaches this element or would have rendered it obvious in the context of claim 53. At a minimum, they fail to show that the combination teaches transmitting a filtered transmission signal using a power that is based on a decompressed feedback. Specifically, for the reasons set forth in the preceding claim elements

of claim 53, Mr. Geier does not provide sufficient evidence that the proposed combination teaches this limitation in the context of claim 53. (Psounis Dec. ¶ 95.)

For this element, Mr. Geier relies on additional disclosures from Agee as purportedly teaching simultaneous MIMO transmissions. (*See* Ex. 1003, ¶98; Ex. AA at 28-29.) However, these disclosures do not remedy the deficiencies identified above. (Psounis Dec. ¶ 96.) For example, Agee teaches that “a subset of its nodes are MIMO-capable nodes, and that each such node can simultaneously communicate with up to as many nodes in its field of view as it has antennae.” (Ex. 1008 ¶ 177.) But the mere ability of the first node to simultaneously communicate with multiple nodes says nothing about whether the first node transmits to each such node *using a power that is based on a decompressed feedback from each respective node*. Mr. Geier does not provide any evidence of this aspect of element [53.9] in Agee or his proposed combination. (Psounis Dec. ¶ 96.)

Rather, Mr. Geier’s reliance on “Locally-Enabled Network Optimization (LEGO) to manage the transmit power for each node (BS and SU) operating, dynamically,” (Ex. AA at 30, citing Ex. 1008 ¶ 499), undermines his obviousness theory. As described above in connection with element [53.8], Mr. Geier does not provide any evidence that Agee’s method of computing transmit power for LEGO using “weights” meets the claim requirement of transmitting a filtered second transmission signal simultaneously with the transmission of the filtered first transmission signal using a second power that is based on the “decompressed second feedback.”. Indeed, as Mr. Geier again recognizes, Agee explains that its nodes are capable of “*independently* adjust[ing] transmit power, for example, to optimize capacity achievable at that node given the total power [available] to it, or to minimize power emitted into the network by that node given an aggregate power requirement.” (Ex. 1008 ¶ 478; *see* Ex. AA at 31.) (Psounis Dec. ¶ 97.)

Mr. Geier does not rely on any additional portions of McFarland for this element beyond what he previously relies on for element [53.8]. As set forth there, McFarland does not teach or suggest this element alone or in combination with Agee and/or Ton.

Therefore, Requester and Mr. Geier have failed to make a prima facie case of obviousness as to element [53.9].

For the same reasons noted above for this claim element and the other related claim elements of claim 53, the Office Action also fails to establish a prima facie case of obviousness.

Claims 54-56, 64-66, 70, 76, 81-84 and 87-94

Claims 54-56, 64-66, 70, 76, 81-84 and 87-94 all depend on claim 53 and thus are patentable over the proposed combination for the same reasons discussed above with respect to claim 53. (Psounis Dec. ¶ 98.)

No Motivation to Combine

As discussed above, the proposed combination of Agee, McFarland and Ton fails to disclose or render obvious the method claimed in claim 53. In addition, the proposed combination is based on improper hindsight and is legally and factually erroneous.

A. Mr. Geier's Purported Rationale for Combining the References Is Insufficient as a Matter of Law

Requester's and its expert, Mr. Geier's, arguments concerning the purported motivations to combine the asserted references fail as a matter of law. For starters, they argue numerous times that based on Agee, a POSITA "*could have*" looked to other references such as McFarland and Ton for additional teachings. But the Federal Circuit has expressly rejected that rationale and held that a motivation to combine requires more than the mere fact that a POSITA "could have" combined references, stating "obviousness concerns whether a skilled artisan *not only could have made but would have been motivated* to make the combinations or modifications of prior art to

arrive at the claimed invention.” *Belden Inc. v. Berk-Tek LLC*, 805 F.3d 1064, 1073 (Fed. Cir. 2015) (emphasis added). This fatal flaw affects the entire request for reexamination, as evidenced by the numerous, repeated arguments made by requester, which are reproduced below in relevant part:

“A POSITA would have been motivated to make such a combination because the disclosure of restricting the channels or frequencies of transmissions in Agee could have caused them to look to McFarland for how to better operate a system that utilizes feedback across nodes in a network to instruct the adjustment of channels or frequencies of transmissions accordingly.” (Request at 13 (citing Ex. 1003, ¶50) (emphasis added)).

“A POSITA would have been motivated to make such a combination because the disclosure of restricting the channels or frequencies of transmissions in Agee could have caused them to look to McFarland for how to implement filtering of the signals to remove power from the frequencies to be avoided.” (Request at 14 (citing Ex. 1003, ¶ 56) (emphasis added)).

“A POSITA would have been motivated to make such a combination because the disclosure of using a band pass filter to filter transmission signals in Agee could have caused them to look to McFarland for how to better operate a system that utilizes feedback across nodes in a network to instruct the band pass filtering in Agee accordingly.” (Request at 14-15 (citing Ex. 1003, ¶57)(emphasis added)).

“A POSITA would have been motivated to make such a combination because the disclosure of the desire to minimize capacity and power of the network-so to minimize interference-in Agee could have caused them to look to Ton for how to implement compression and decompression of signals.” (Request at 16 (citing Ex. 1003, ¶62) (emphasis added)).

“A POSITA would have been motivated to make such a combination because the disclosure of reducing strain and increasing efficiency in the network through control and feedback mechanisms in Agee could have caused them to look to Ton for how to more efficiently operate a wireless communication network.” (Request at 16 (citing Ex. 1003, ¶ 63) (emphasis added)).

“POSITA would have been motivated to make such a combination because the disclosure of OFDM in Agee could have caused them to look to McFarland for a standard, well-known protocol (i.e., IEEE 802.11).” (Request at 17 (citing Ex. 1003, ¶68) (emphasis added)).

“A POSITA would have been motivated to make such a combination because the disclosure of using OFDM in Agee could have caused them to look to McFarland

for a well-known standard for OFDM in wireless communication networks (i.e., IEEE 802.11).” (Request at 17 (citing Ex. 1003, ¶69) (emphasis added)).

Requester’s expert, Mr. Geier, also relies on the same legally deficient rationale as demonstrated by the statements reproduced below:

“In my opinion, a POSITA would have been motivated to make such a combination because the disclosure of restricting the channels or frequencies of transmissions in Agee could have caused them to look to McFarland for how to better operate a system that utilizes feedback across nodes in a network to instruct the adjustment of channels or frequencies of transmissions accordingly.” (Ex. 1003 at ¶51) (emphasis added).

“In my opinion a POSITA would have been motivated to make such a combination because the disclosure of restricting the channels or frequencies of transmissions in Agee could have caused them to look to McFarland for how to implement filtering of the signals to remove power from the frequencies to be avoided.” (Ex. 1003, ¶56)(emphasis added)).

“It is my opinion that a POSITA would have been motivated to make such a combination because the disclosure of using a band pass filter to filter transmission signals in Agee could have caused them to look to McFarland for how to better operate a system that utilizes feedback across nodes in a network to instruct the band pass filtering in Agee accordingly.” (Ex. 1003, ¶57) (emphasis added)).

“In my opinion, a POSITA would have been motivated to make such a combination because the disclosure of the desire to minimize capacity and power of the network—so to minimize interference—in Agee could have caused them to look to Ton for how to implement compression and decompression of signals.” (Ex. 1003, ¶62 (emphasis added)).

“It is my opinion that a POSITA would have been motivated to make such a combination because the disclosure of reducing strain and increasing efficiency in the network through control and feedback mechanisms in Agee could have caused them to look to Ton for how to more efficiently operate a wireless communication network.” (Ex. 1003, ¶63 (emphasis added)).

“In my opinion, a POSITA would have been motivated to make such a combination because the disclosure of OFDM in Agee could have caused them to look to McFarland for a standard, well-known protocol (i.e., IEEE 802.11).” (Ex. 1003, ¶68 (emphasis added)).

“It is my opinion that a POSITA would have been motivated to make such a combination because the disclosure of using OFDM in Agee could have caused them to look to McFarland for a well-known standard for OFDM in wireless communication networks (i.e., IEEE 802.11).” (Ex. 1003, ¶69 (emphasis added)).

This is precisely the type of rationale that the Federal Circuit has repeatedly rejected. In *PersonalWeb*, the Federal Circuit held:

The Board's reasoning is also deficient in its finding that a relevant skilled artisan would have had a motivation to combine Woodhill and Stefik in the way claimed in the '310 patent claims at issue and would have had a reasonable expectation of success in doing so. The Board's most substantial discussion of this issue merely agrees with Apple's contention that "a person of ordinary skill in the art reading Woodhill and Stefik would have understood that the combination of Woodhill and Stefik would have allowed for the selective access features of Stefik to be used with Woodhill's content-dependent identifiers feature." ***But that reasoning seems to say no more than that a skilled artisan, once presented with the two references, would have understood that they could be combined. And that is not enough: it does not imply a motivation to pick out those two references and combine them to arrive at the claimed invention.***

PersonalWeb Techs., LLC v. Apple, Inc., 848 F.3d 987, 993-94 (Fed. Cir. 2017) (emphasis added).

Likewise, in *NPF Ltd. v. Smart Parts, Inc.*, the Federal Circuit rejected precisely this type of expert testimony, finding it "irrelevant to the motivation to combine analysis":

NPF provides several arguments as to why Smart Parts did not prove a motivation to combine. First, NPF argues that Smart Parts' expert did not provide any [*979] evidence on this issue. Smart Parts' expert stated: "It's my opinion that by the end of 1997 certainly microcontrollers could have been designed into paintball guns or were described in paintball gun prior art references. Also microprocessors that could have been designed into paintball guns could be reprogrammed either remotely or externally to update their program instructions." (J.A. 541.) ***We agree with NPF that such testimony is irrelevant to the motivation to combine analysis. What "could have been" merely employs hindsight to determine whether the claimed invention was technically feasible at the time of the invention. Such testimony does not address the central question in the motivation to combine inquiry—"whether a person of ordinary skill in the art . . . would have been led to make the combination recited in the claims."*** Merely knowing, years later, that someone could have successfully made the combination does not aid in determining whether at the time of the invention, one of skill in the art would have been motivated to do so. NPF is therefore correct that Smart Parts' expert did not provide the requisite evidence of motivation to combine.

NPF Ltd. v. Smart Parts, Inc., 187 F. App'x 973, 978-79 (Fed. Cir. 2006) (quoting *Kahn*, 441 F.3d at 988) (emphasis added).

The Federal Circuit also rejected Requestor's rationale in a recent opinion in *Virtek Vision*, where it held:

We conclude that the Board erred as a matter of law with regard to the motivation to combine. It does not suffice to meet the motivation to combine requirement to recognize that two alternative arrangements such as an angular direction system using a single camera and a 3D coordinate system using two cameras were both known in the art. Briggs discloses a laser projector system with different embodiments of laser tracker systems—one that uses two cameras to determine the 3D coordinates of a target, and another that uses one camera to determine angular measurements of a target, Briggs discloses these two measurement options "may be applied to any computer controlled aiming system." These disclosures, however, do not provide any reason why a skilled artisan would use 3D coordinates instead of angular directions in a system. *See Belden Inc. v. Berk-Tek LLC*, 805 F.3d 1064, 1073 (Fed. Cir. 2015) ("[O]bviousness concerns whether a skilled artisan not only could have made but would have been motivated to make the combinations or modifications of prior art to arrive at the claimed invention.").

The mere fact that these possible arrangements existed in the prior art does not provide a reason that a skilled artisan would have substituted the one-camera angular direction system in Keitler and Bridges with the two-camera 3D coordinate system disclosed in Briggs. There was no argument in the petition regarding why a skilled artisan would make this substitution—other than that the two different coordinate systems were "known to be used." The petition does not argue Briggs articulates any reason to substitute one for another or any advantages that would flow from doing so. Nor does Dr. Mohazzab, Aligned Vision's expert, articulate any reason why a skilled artisan would combine these references. In his declaration, he testified "it would have been obvious" to use the 3D coordinates instead of angular measurements because "both such measurement systems were known."

Virtek Vision Int'l ULC v. Assembly Guidance Sys., Inc., 97 F.4th 882, 886-87 (Fed. Cir. 2024) (internal citations omitted) (emphasis added).

Indeed, the Federal Circuit has consistently held that arguments such as those made by Requester and Mr. Geier, and adopted by the Office Action, are insufficient to establish the requisite motivation to combine necessary for a finding of obviousness. *See, e.g., InTouch Techs., Inc. v. VGo Communs., Inc.*, 751 F.3d 1327, 1352 (Fed. Cir. 2014) ("Go's expert also succumbed to hindsight bias in her obviousness analysis. Dr. Yanco's testimony primarily consisted of

conclusory references to her belief that one of ordinary skill in the art *could* combine these references, not that they *would* have been motivated to do so.”); *ActiveVideo Networks, Inc. v. Verizon Commc'ns, Inc.*, 694 F.3d 1312, 1327 (Fed. Cir. 2012) (“[T]he expert's testimony on obviousness was essentially a conclusory statement that a person of ordinary skill in the art would have known, based on the 'modular' nature of the claimed components, how to combine any of a number of references to achieve the claimed inventions. This is not sufficient and is fraught with hindsight bias.”); *TQ Delta, LLC v. Cisco Sys.*, 942 F.3d 1352, 1362 (Fed. Cir. 2019) (“This passage of Stopler provides no express discussion of, nor any connection to, the PAR of a multicarrier transmitter. Instead, Stopler explains that the phase scrambling sequence is applied in order to randomize the overhead channel symbols, and is only applied to the other symbols in order to simplify implementation. Dr. Tellado fails to identify any other evidence that provides this necessary link. Dr. Tellado instead offers only unsupported and conclusory statements asserting that an ordinarily skilled artisan at the time of the invention would have been motivated to apply the randomization disclosed in Stopler as a means to reduce PAR in Shively . . . Dr. Tellado's *ipse dixit* declaration fails to provide any meaningful explanation for why one of ordinary skill in the art would be motivated to combine these references ***at the time of this invention***. It also fails to explain why a person of ordinary skill in the art would have combined elements from specific references ***in the way the claimed invention does***.”)(internal quotations and citations omitted)(emphasis in original).

The Patent Office has rejected the same arguments as well, including in two informative opinions. First, in *Johns Manville v. Knauf*, the Board held that “[o]bviousness, however, requires ‘a reason that would have prompted a person of ordinary skill in the relevant field to combine the elements in the way the claimed new invention does.’” IPR2018-00827, Paper 10 at 13 (PTAB

Oct. 16, 2018) (informative) (quoting *KSR Int'l Co. v. Teleflex Inc.*, 550 U.S. 398, 418 (2007)). The Board emphasized that “[d]emonstrating that a reference is analogous art or relevant to the field of endeavor of the challenged patent is not sufficient to establish that one of ordinary skill would have had reason to combine its teachings with other prior art in the manner set forth in the claim” “and “[m]ere compatibility of the references is likewise not sufficient.” *Id.* at 10, 17. Likewise, in *Hulu LLC v. Sound View Innovations, LLC*, the Board again rejected a similar argument concerning a purported motivation to combine, stating “[w]e are also mindful that ‘obviousness concerns whether a skilled artisan not only ***could have made*** but ***would have been motivated to make*** the combinations or modifications of prior art to arrive at the claimed invention.’” IPR2018-00582, Paper 34 at 21 (PTAB Aug. 5, 2019) (quoting *Belden*, 805 F.3d at 1073)(informative); *see also id.* at 22 (“Just as in *Belden*, the fact that the combination might have been successful does not mean that an ordinarily skilled artisan would have been motivated to make the combination.”). Moreover, in rejecting the petitioner’s motivation to combine rationale, the Board found the lack of any purported benefit in the proposed combination to be a significant, if not dispositive, factor, stating “***it is unclear why an ordinarily skilled artisan would have taken that path when there is no perceptible benefit*** from using main memory in the first place, as discussed above.” *Id.* at 21(emphasis added).

The Board’s holding in *Hulu* is directly applicable in this proceeding, where Requester and its expert ***admit*** that proposed combinations “***would not have affected how the method of Agee would have operated.***” (Request at 15 (citing Ex. 1003, ¶58) (emphasis added); *id.* at 16 (citing Ex. 1003, ¶64), 17 (citing Ex. 1003, ¶70); *see also* Ex. 1003, ¶¶52, 58, 64, 70)). Their admission that the combinations do not affect Agee’s method of operation demonstrates that their purported rationales for combining the asserted references is based on pure hindsight.

B. The Office Action Has Not Articulated a Sufficient Motivation to Combine

With respect to claim 53, the Office Action has not articulated a sufficient motivation to combine as it relies on Mr. Geier's flawed declaration. In addition, the Office Action's purported motivations to combine are insufficient for additional reasons. For example, regarding claim limitation 53[1], the Office Action states:

McFarland discloses an analogous wireless adaptive communication system (see Abstract) in which a node may adjust the frequency used by that node (see column 7, lines 37-40 and column 3, lines 7-14) based upon feedback from a base station (see column 4, lines 34-50), which leads to the node sending requests to the base station for channel reallocation, see column 5, lines 40-57). *One skilled in the art would recognize that this implementation because this would allow for more efficiency by allowing nodes to manage frequencies by simply sending instructions (see James T. Grier Declaration at 50).*

(OA at 5-6 (emphasis added).) Respectfully, it is not clear what rationale is being relied on as the purported motivation to combine the disclosures of McFarland and Agee, nor what the Office Action is relying on as the claimed instruction (e.g., is it McFarland's reference to "allowing the base station 400 to feed back information to the node", "requests to the base station 400 to change or reallocate channels," the "appropriate command," or something else?).

Additionally, as noted above, a POSITA would not have been motivated to combine the teachings of Agee and McFarland. (Psounis Dec., ¶62.) Agee and McFarland are directed to different problems and Agee already addresses the issue of interference such that a POSITA would not have looked to McFarland for any improvement as suggested in the Office Action and by Mr. Geier. (Psounis Dec., ¶62.) Indeed, Agee discloses that the issue of interference is already addressed via the diversity channels which gain the benefits of orthogonality. (*Id.*) In contrast, McFarland discloses a number of methods to have low rate nodes pick certain sub channels to transmit while higher rate nodes use the rest of the sub channels simultaneously, and ensures no interference by having sub channels which do not overlap. In other words, not only the two patents

solve different problems, but also the problem of no interference between simultaneous transmissions is already addressed by Agee with the “orthogonality” of the spatially separated diversity based channels. (Psounis Dec., ¶62; Ex. 1008 ¶ 176.)

Similarly, the Office Action’s assertion that a POSITA would have been motivated to modify Agee and McFarland by using data compression and decompression per Ton to reduce the amount of bandwidth and power needed for transmitting does not account for the references other teachings that would discourage a POSITA from pursuing the proposed combination. (Psounis Dec., ¶¶74-79) As Ton discloses:

Implementation of a data compression scheme, however, uses extensive processing resources. If the data compression does not work, then resources are essentially being wasted. For example, when the bit error rate in a wireless telecommunication network increases, it is likely that transmitted data will not be decompressed correctly on the receiving end of the air interface. In such a situation, the decompressor typically detects that the received packets cannot be properly decompressed and requests that the data be resent. In addition, the decompressor begins discarding received packets until the decompressor is able to resynchronize with the compression scheme. In the meantime, however, the compressor makes inefficient use of processing resources and bandwidth by trying to compress the data packets and send them over the air interface link, even though the data packets are simply being discarded by the decompressor.

(Ex. 1010 at 2:38-53.) To address these concerns, and in doing so validating their legitimacy, Ton discloses that the compressor is disabled for a certain amount of time whenever the link quality falls below a certain threshold. (Ex. 1010 at 2:54-64; Psounis Dec., ¶¶74-79.) However, Agee includes repeated statements regarding the desire to minimize complexity and power consumption and reduce overhead and costs associated with its network system, and to conserve power. (E.g., Ex. 1008, ¶¶15, 20, 48, 69, 96, 99, 249-252, 257, 264, 523.) Agee also discloses concerns about costs associated with additional hardware requirements for example, as illustrated in paragraph 237:

The approaches currently described in the field, . . . require additional hardware at each node comprising one end of a channel per diversity path to exploit that diversity path. This creates a geometric growth in the hardware complexity for each particular node, and a linear growth in cost for each diverse path exploited by a given network, that rapidly renders any network attempting to exploit such diversity uneconomic. Moreover, such an approach 'muddies its own stream' in that it reduces the capacity increase by the power increase needed to power the more complex transceiver. Exploitation of this multipath approach requires both high power (to permit data transport over the relatively weaker additional diversity path) and complex codecs (to permit data transports at high rates on the dominant path by filtering out the diversity path transmissions).

(Ex. 1008, ¶237.) A POSITA would have recognized the same concern with respect to requiring compression and decompression solutions at each node based on the teachings of Ton and Agee as well as McFarland. (Psounis Dec., ¶¶74-79.)

These concerns are further exacerbated by the fact that Ton's compression and decompression solution does not function below a certain threshold link quality, (Ex. 1010 at 2:54-64), and thus may not function in a host of network environments contemplated by Agee, or with the a variety of simple node types contemplated by McFarland in comparison to the "new wireless data communication systems" contemplated in Ton, (Ex. 1010 at 2:34-36.) (Psounis Dec. ¶ 77.) Ton also readily acknowledges that "In the wireless context, however, the use of compression introduces a number of problems. First, *compression schemes require high processing power*, while it is typically desirable to reduce the amount of resources used in a wireless telecommunications system. For example, mobile stations generally have a limited power supply, and it is therefore beneficial to reduce the amount of power used by the processor in the mobile station." (Ex. 1010, 1:22-30.) This is directly contrary to the Office Action's assertion that modifying Agee with Ton's teachings regarding compression and decompression would have resulted in power savings. Ton also discloses:

Wireless networks, on the other hand, often have a higher and much more variable bit error rate caused by the combination of mobile station mobility and the use of an air interface as a transmission medium. As a result, when the wireless quality deteriorates (i.e., a high bit error rate exists), some data packets may be lost, thereby causing decompression on the receiving end to fail to regenerate the 40 packet data. Such a situation causes an *inefficient use of processing power* because data packets are being compressed on the transmitting end, even though the data packets cannot be regenerated.

(Ex. 1010 at 1:33-43.) In view of these disclosures, and that the proposed modification to Agee is directed to feedback signals rather than data, a POSITA would not have had a motivation to combine the references as proposed by Requester or the Examiner, nor would they have had a reasonable expectation of success either. (Psounis Dec., ¶¶74-79.)

Conclusion

Pursuant to 37 C.F.R. 1.550(f), the attached Certificate of Service indicates that copies of this Response to Office Action have been served in their entirety on the third party requester by first class mail at the address of record for the third party requester, in accordance with 37 C.F.R. 1.248.

The Commissioner is hereby authorized to charge any deficiency of fees submitted herewith, or credit any overpayment, to Deposit Account No. 601918. If the Examiner believes that a phone interview would be helpful, the Examiner is kindly requested to contact Patent Owner's undersigned attorney.

Date: June 2, 2025

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LISTING OF CLAIMS

This listing of claims will replace all prior versions and listings of claims:

1. A method for managing interference in a radio communications network, comprising the steps of:
 - receiving an aggregated radio signal at a first node in the radio communications network on a plurality of frequencies;
 - determining a power level for the aggregated radio signal for each frequency in the plurality frequencies;
 - subtracting the power level for each the frequency from a power limit to produce a power differential for the each frequency; and
 - instructing a second node in the radio communications network to avoid using a transmission frequency corresponding to a non-positive power differential in the plurality of power differentials to transmit to the first node.
2. The method of claim 1, further comprising the steps of: receiving a transmission from the second node in the radio communications network; and discarding any portion of the transmission carried on the transmission frequency.
3. The method of claim 2, wherein the discarding step comprises applying a filter to the transmission.
4. The method of claim 1, wherein the step of determining a power level is carried out by:
 - acquiring a plurality of instantaneous power level measurements for each the frequency;
 - and
 - calculating an average power level based on the plurality of instantaneous power level measurements.
5. The method of claim 1, wherein the step of determining a power level is carried out by:

acquiring a plurality of instantaneous power level measurements for the each frequency;
and

calculating a median power level based on the plurality of instantaneous power level measurements.

6. The method of claim 1, further comprising the step of: sending to the second node a request to adjust a transmission power level on a frequency corresponding to a positive power differential in the plurality of power differentials.

7. The method of claim 1, further comprising the step of: instructing a plurality of other nodes in the radio communications network to avoid using the transmission frequency to transmit information to the first node.

8. The method of claim 7, further comprising the steps of:
receiving a transmission from one of the plurality of other nodes; and
discarding any portion of the second transmission carried on a frequency corresponding to a non-positive power differential in the plurality of power differentials.

9. The method of claim 8, further comprising the step of: sending to the one of the plurality of other nodes a request to adjust a transmit power level on a frequency corresponding to a positive power differential in the plurality of power differentials.

10. The method of claim 1, further comprising the steps of:
determining an updated power level for the aggregated radio signal for each frequency in the plurality frequencies;
subtracting the updated power level for each the frequency from the power limit to produce a plurality of updated power differentials; and
instructing the second node to avoid transmitting to the first node on a frequency corresponding to a non-positive updated power differential in the plurality of updated power differentials.

11. The method of claim 1, further comprising the steps of:

generating an optimal waveform profile based on the plurality of power differentials; and reporting the optimal waveform profile to the second node.

12. The method of claim 11, wherein the reporting step is carried out using a common network configuration channel.

13. The method of claim 11, further comprising the step of compressing the optimal waveform profile prior to performing the reporting step.

14. The method of claim 11, wherein the optimal waveform profile specifies a waveform pattern.

15. The method of claim 14, wherein the waveform pattern defines a transmission signal having a power spectral density that varies over time.

16. The method of claim 14, further comprising the steps of:
generating a second optimal waveform profile based on the plurality of power differentials; and
reporting the second optimal waveform profile to a third node in the radio communications network; wherein the second optimal waveform profile specifies a second waveform pattern that is orthogonal to the waveform pattern.

17. The method of claim 1, wherein the plurality of frequencies comprises all of the frequencies in a radio frequency band.

18. The method of claim 1, further comprising the steps of: associating a unique pattern with the second node; and determining whether the transmission contains the unique pattern.

19. A method for managing interference in a radio communications network, comprising the steps of:

receiving at a first node in the radio communications network an instruction transmitted from a second node in the radio communications network to avoid using a plurality of frequencies to transmit to the second node;

filtering a transmission signal to remove power from the transmission signal at each frequency in the plurality of frequencies to be avoided;

transmitting the filtered transmission signal to the second node;

separately from the receipt of the instruction, receiving a compressed first feedback from the second node that is based on a received power and one or more frequencies of a first signal transmitted from the first node to the second node;

separately from the receipt of the instruction, receiving a compressed second feedback from a third node that is based on a received power and one or more frequencies of a second signal transmitted from the first node to the third node;

decompressing the compressed first feedback resulting in a decompressed first feedback;

decompressing the compressed second feedback resulting in a decompressed second feedback;

generating one or more data structures based on the decompressed first feedback and the decompressed second feedback;

wherein the filtered transmission signal is a filtered first transmission signal that is transmitted using a first frequency and an 802.11-based orthogonal frequency-division multiplexing (OFDM) protocol via at least one antenna of a plurality of antennas, using a first power that is based on at least one of the one or more data structures; and further comprising:

transmitting, using a second frequency and the 802.11-based OFDM protocol, a filtered second transmission signal, simultaneously with the filtered first transmission signal, to the third node, using a second power that is based on at least one of the one or more data structures.

20. A method for managing interference in a radio communications network, comprising the steps of:

receiving at a first node in the radio communications network an instruction transmitted from a second node in the radio communications network to avoid using a plurality of frequencies to transmit to the second node;

filtering a transmission signal to remove power from the transmission signal at each frequency in the plurality of frequencies to be avoided;

transmitting the filtered transmission signal to the second node;

receiving an optimal waveform profile from the second node, the optimal waveform profile being based on a plurality of power measurements for the plurality of frequencies and a power limit; and

conforming the transmission signal to the optimal waveform profile prior to performing the transmitting step.

21. The method of claim 20, further comprising the step of decompressing the optimal waveform profile prior to performing the conforming step.

22. The method of claim 19, wherein the instruction includes a first instruction, and further comprising:

receiving at the first node in the radio communications network a second instruction transmitted from the third node to avoid using a different plurality of frequencies to transmit to the third node; and

filtering a second transmission signal to remove power from the second transmission signal at each frequency in the different plurality of frequencies to be avoided, resulting in the filtered second transmission signal.

23. The method of claim 19, wherein the first power and the second power are the same.

24. The method of claim 19, wherein the first power and the second power are different.

25. The method of claim 19, wherein an update of the compressed first feedback is repeatedly received at time periods of less than one second, and the first power is repeatedly updated based on an updated decompressed first feedback at time periods of less than one second; and an update of the compressed second feedback is repeatedly received at time periods of less than one second, and the second power is repeatedly updated based on an updated decompressed second feedback at time periods of less than one second.

26. The method of claim 19, wherein the filtered first transmission signal and the filtered second transmission signal are transmitted via the same transceiver.
27. The method of claim 19, wherein the filtered first transmission signal and the filtered second transmission signal are transmitted via different transceivers.
28. The method of claim 19, wherein the instruction is received utilizing a dedicated channel.
29. The method of claim 19, wherein the instruction is received via an antenna configured for omnidirectional communication.
30. The method of claim 19, wherein the compressed first feedback and the compressed second feedback are received utilizing a dedicated channel.
31. The method of claim 19, wherein the compressed first feedback and the compressed second feedback are received via an antenna configured for omnidirectional communication.
32. The method of claim 19, wherein the decompressed first feedback and the decompressed second feedback are used to increase spatial separation among transmissions.
33. The method of claim 19, wherein the decompressed first feedback and the decompressed second feedback are used to increase spatial separation among transmissions at the same frequency.
34. The method of claim 19, and further comprising:
receiving a compressed third feedback from a fourth node that characterizes receipt of a third signal sent from the first node to the fourth node, the fourth node being a legacy node;
decompressing the compressed third feedback resulting in a decompressed third feedback;
transmitting, using a third frequency and another 802.11-based OFDM protocol, the third transmission signal to the fourth node using a transceiver separate from one or more other

transceivers used to transmit the filtered first transmission signal and the filtered second transmission signal, and further using a third power that is based on the decompressed third feedback.

35. The method of claim 34, wherein the third transmission signal is transmitted simultaneously with the filtered first transmission signal and the filtered second transmission signal via at least one different antenna of the plurality of antennas.

36. The method of claim 19, wherein the compressed first feedback is based on a received power at a plurality of frequencies via which the first signal is received.

37. The method of claim 19, wherein the instruction is received prior to the receipt of the compressed first feedback.

38. The method of claim 19, wherein the filtered second transmission signal is transmitted simultaneously with the filtered first transmission signal via the same plurality of antennas.

39. The method of claim 19, wherein the first frequency is selected as a function of the compressed first feedback, and the second frequency is selected as a function of the compressed second feedback.

40. The method of claim 19, wherein the instruction includes a 802.11 clear to send (CTS) instruction.

41. The method of claim 19, wherein the instruction includes a 802.11 request to send (RTS) instruction.

42. The method of claim 19, wherein the filtered second transmission signal is transmitted simultaneously with the filtered first transmission signal via at least one different antenna of the plurality of antennas.

43. The method of claim 19, wherein the filtered second transmission signal is transmitted simultaneously with the filtered first transmission signal using the at least one antenna of the plurality of antennas.
44. The method of claim 19, wherein at least one of:
- the first signal includes a data signal; the first signal includes an aggregate signal;
 - the compressed first feedback is configured to ensure that transmissions from all neighbors of the first node are received at a same power level;
 - the compressed first feedback is configured to at least one of: minimize a transmit power on reliable links, maximize an ability to achieve spatial separation among transmissions on a same frequency, minimize network self-interference, improve low probability of intercept (LPI), or lower probability of detection (LPD);
 - the compressed first feedback and the compressed second feedback are received simultaneously;
 - at least one of the compressed first feedback or the compressed second feedback is received separately from the receipt of the instruction, by being received before the instruction is received;
 - at least one of the compressed first feedback or the compressed second feedback is received separately from the receipt of the instruction, by being received after the instruction is received;
 - the one or more frequencies of the first signal includes a frequency band;
 - the one or more frequencies of the second signal includes a frequency band;
 - the one or more frequencies of the first signal includes a first frequency band, and the one or more frequencies of the second signal includes a second frequency band;
 - a single data structure is generated based on the decompressed first feedback and the decompressed second feedback;
 - a first data structure is generated based on the decompressed first feedback, and a second data structure is generated based on the decompressed second feedback;
 - a first data structure is generated based on the decompressed first feedback, where the first power is based on the first data structure, and a second data structure is generated based on

the decompressed second feedback, where the second power is based on the second data structure;

the first power and the second power differ in terms of power level;

the steps are performed in the order listed;

the radio communications network includes an 802.11 network;

the radio communications network includes an 802.11a network; the radio communications network includes an 802.11g network;

the at least one antenna includes multiple antennas;

the at least one antenna includes at least one omnidirectional antenna;

the at least one antenna includes at least one directional antenna;

the first frequency includes a first frequency band;

the second frequency includes a second frequency band;

the first frequency is part of a first frequency band;

the second frequency is part of a second frequency band;

the first frequency includes a first frequency band, and the second frequency includes a second frequency band, where the first frequency band and the second frequency band do not overlap;

interference in the radio communications network is managed;

the first node is a mobile node and the second node is a non-mobile node;

the second node is a mobile node and the first node is a non-mobile node; the instruction sets forth the plurality of frequencies to avoid using;

the instruction specifies the plurality of frequencies to avoid using;

a purpose of the instruction is to avoid using the plurality of frequencies;

a purpose of the instruction is to avoid using the plurality of frequencies, where the purpose is accomplished by specifying the plurality of frequencies to avoid using;

a purpose of the instruction is to avoid using the plurality of frequencies, where the purpose is accomplished by specifying one or more frequencies to use;

a purpose of the instruction is to avoid using the plurality of frequencies, where the purpose is accomplished by specifying one or more frequencies to use, the one or more frequencies not including the plurality of frequencies;

the instruction to avoid the plurality of frequencies sets forth one or more frequencies to use;

the instruction to avoid the plurality of frequencies specifies one or more frequencies to use;

the instruction to avoid the plurality of frequencies assigns one or more frequencies to use;

the instruction to avoid the plurality of frequencies does not specify the plurality of frequencies;

the instruction to avoid the plurality of frequencies sets forth one or more frequencies to use, thereby resulting in the avoidance of using the plurality of frequencies;

a purpose of the filtering is to remove the power from the transmission signal at each frequency in the plurality of frequencies to be avoided, where the purpose is accomplished by specifying one or more frequencies to which the power is to be applied;

a purpose of the filtering is to remove the power from the transmission signal at each frequency in the plurality of frequencies to be avoided, where the purpose is accomplished by specifying the plurality of frequencies to be avoided;

the filtering suppresses or otherwise minimizes waves or oscillations at each frequency in the plurality of frequencies to be avoided;

the filtering suppresses or otherwise minimizes waves or oscillations at each frequency in the plurality of frequencies to be avoided, thereby resulting in the removal of the power from the transmission signal at each frequency in the plurality of frequencies to be avoided;

the filtering removes all power from the transmission signal;

the filtering removes some power from the transmission signal;

the filtering discards one or more portions of the transmission signal at each of the plurality of frequencies;

the filtering utilizes transmit excision;

the filtering utilizes compression;

the filtering identifies certain one or more frequencies in connection with which power is applied, thereby resulting in the removal of the power from the transmission signal at each frequency in the plurality of frequencies to be avoided;

the removal of power from the transmission signal at each frequency in the plurality of frequencies to be avoided is accomplished by an adjustment in relation to power previously used in connection with the transmission signal;

the removal of power from the transmission signal at each frequency in the plurality of frequencies is accomplished by adjusting a processing of the transmission signal so that power that was previously used in connection with the transmission signal at each frequency in the plurality of frequencies to be avoided, is no longer used in connection with the transmission signal at each frequency in the plurality of frequencies to be avoided;

the removal of power from the transmission signal at each frequency in the plurality of frequencies to be avoided is accomplished by setting a waveform profile that results in no power being applied in connection with the transmission signal at each frequency in the plurality of frequencies to be avoided;

the removal of power from the transmission signal at each frequency in the plurality of frequencies to be avoided is accomplished by pre-processing the transmission signal, before any power is applied, so that power, which would otherwise be applied in connection with the transmission signal at each frequency in the plurality of frequencies, is not applied in connection with the transmission signal at each frequency in the plurality of frequencies to be avoided;

the removal of power from the transmission signal at each frequency in the plurality of frequencies to be avoided is accomplished by pre-processing the transmission signal, before any power is applied, so that no power is applied in connection with the transmission signal at each frequency in the plurality of frequencies to be avoided;

the transmission signal is generated so as to not include power at each frequency in the plurality of frequencies to be avoided;

the transmission signal is generated so as to not include power at each frequency in the plurality of frequencies to be avoided, thereby resulting in the removal of the power from the transmission signal at each frequency in the plurality of frequencies to be avoided;

the transmission signal is pre-processed so as to not include power at each frequency in the plurality of frequencies to be avoided, thereby resulting in the removal of the power from the transmission signal at each frequency in the plurality of frequencies to be avoided;

the filtering is performed using an output filter;

the filtering is performed using an optimal matched filter;
the filtering is performed using a band selection filter; the filtering is performed using a median filter; or
the filtering is performed using a nonlinear filter.

45. The method of claim 19, wherein the removal of power from the transmission signal at each frequency in the plurality of frequencies to be avoided is accomplished by adjusting a processing of the transmission signal so that certain power that was previously used in connection with the transmission signal at each frequency in the plurality of frequencies to be avoided before the instruction is received, is no longer used in connection with the transmission signal at each frequency in the plurality of frequencies to be avoided in accordance with the instruction.

46. The method of claim 19, wherein the removal of power from the transmission signal at each frequency in the plurality of frequencies to be avoided is accomplished by adjusting a processing of the transmission signal so that certain power that was previously used in connection with the transmission signal at each frequency in the plurality of frequencies to be avoided before the instruction is received, is no longer used in connection with the transmission signal at each frequency in the plurality of frequencies to be avoided in accordance with the instruction, which specifies at least one frequency to use so as to avoid using the plurality of frequencies to be avoided in order to transmit to the second node.

47. The method of claim 19, wherein network forwarding decisions are guided using instantaneous information from a media access control (MAC) layer.

48. The method of claim 47, wherein the network forwarding decisions are guided to eliminate a dominant end-to-end latency effect of channel access delay at at least one hop.

49. The method of claim 19, wherein frequency channels are reused in order to increase spatial reuse across multiple basic service sets.

50. The method of claim 19, wherein RTS/CTS signaling is extended such that frequency channels are reused in order to increase spatial reuse across multiple basic service sets.

51. The method of claim 19, wherein RTS/CTS signaling is extended such that frequency channels are reused in order to increase spatial reuse across multiple basic service sets, to accommodate legacy access points.

52. A method for managing interference in a radio communications network, comprising the steps of:

- receiving at a first node in the radio communications network an instruction transmitted from a second node in the radio communications network to avoid using a plurality of frequencies to transmit to the second node;

- filtering a transmission signal to remove power from the transmission signal at each frequency in the plurality of frequencies to be avoided;

- transmitting the filtered transmission signal to the second node;

- wherein the instruction includes a first instruction and the filtered transmission signal includes a filtered first transmission signal that is transmitted to the second node using a first power via an 802.11-based orthogonal frequency-division multiplexing (OFDM) protocol, and further comprising:

- receiving at the first node in the radio communications network a second instruction transmitted from a third node in the radio communications network to avoid using a different plurality of frequencies to transmit to the third node;

- filtering a second transmission signal to remove power from the second transmission signal at each frequency in the different plurality of frequencies to be avoided; and

- transmitting, using a second power via the 802.11-based OFDM protocol and simultaneously with the filtered first transmission signal, the filtered second transmission signal to the third node.

53. A method for managing interference in a radio communications network, comprising the steps of:

receiving at a first node in the radio communications network an instruction transmitted from a second node in the radio communications network to avoid using a plurality of frequencies to transmit to the second node;

filtering a transmission signal to remove power from the transmission signal at each frequency in the plurality of frequencies to be avoided;

transmitting the filtered transmission signal to the second node;

receiving a compressed first feedback from the second node that characterizes receipt of a first signal sent from the first node to the second node;

receiving a compressed second feedback from a third node that characterizes receipt of a second signal sent from the first node to the third node;

decompressing the compressed first feedback resulting in a decompressed first feedback;
and

decompressing the compressed second feedback resulting in a decompressed second feedback;

wherein the filtered transmission signal is a filtered first transmission signal that is transmitted to the second node using an 802.11-based orthogonal frequency-division multiplexing (OFDM) protocol via at least one antenna of a plurality of antennas, using a first power that is based on the decompressed first feedback; and further comprising:

transmitting, using the 802.11-based OFDM protocol, a filtered second transmission signal, simultaneously with the filtered first transmission signal, to the third node using a second power that is based on the decompressed second feedback.

54. The method of claim 53, wherein the instruction includes a first instruction, and further comprising:

receiving at the first node in the radio communications network a second instruction transmitted from the third node to avoid using a different plurality of frequencies to transmit to the third node; and

filtering a second transmission signal to remove power from the second transmission signal at each frequency in the different plurality of frequencies to be avoided, resulting in the filtered second transmission signal.

55. The method of claim 53, wherein the first power and the second power are the same.
56. The method of claim 53, wherein the first power and the second power are different.
57. The method of claim 53, and further comprising:
generating a first data structure based on the decompressed first feedback, where the first power is based on the first data structure; and
generating a second data structure based on the decompressed second feedback, where the second power is based on the second data structure.
58. The method of claim 57, wherein the first data structure and the second data structure are different.
59. The method of claim 57, wherein the first data structure and the second data structure are orthogonal.
60. The method of claim 57, wherein the first data structure is unique to the second node, and the second data structure is unique to the third node.
61. The method of claim 57, wherein the first data structure is a first profile, and the second data structure is a second profile.
62. The method of claim 57, wherein the first data structure is a first optimal waveform profile.
63. The method of claim 53, and further comprising:
generating a single data structure based on the decompressed first feedback and the decompressed second feedback, where both the first power and the second power are based on the single data structure.
64. The method of claim 53, wherein the filtered second transmission signal is transmitted

simultaneously with the filtered first transmission signal via the same plurality of antennas.

65. The method of claim 53, wherein the filtered second transmission signal is transmitted simultaneously with the filtered first transmission signal via at least one different antenna of the plurality of antennas.

66. The method of claim 53, wherein the filtered second transmission signal is transmitted simultaneously with the filtered first transmission signal via the at least one antenna of the plurality of antennas.

67. The method of claim 53, wherein an update of the compressed first feedback is repeatedly received, and the first power is repeatedly updated based on an updated decompressed first feedback; and an update of the compressed second feedback is repeatedly received, and the second power is repeatedly updated based on an updated decompressed second feedback.

68. The method of claim 53, wherein an update of the compressed first feedback is repeatedly received in real-time, and the first power is repeatedly updated in real-time based on an updated decompressed first feedback; and an update of the compressed second feedback is repeatedly received in real-time, and the second power is repeatedly updated in real-time based on an updated decompressed second feedback.

69. The method of claim 53, wherein an update of the compressed first feedback is repeatedly received at time periods of less than one second, and the first power is repeatedly updated based on an updated decompressed first feedback at time periods of less than one second; and an update of the compressed second feedback is repeatedly received at time periods of less than one second, and the second power is repeatedly updated based on an updated decompressed second feedback at time periods of less than one second.

70. The method of claim 53, wherein the filtered first transmission signal and the filtered second transmission signal are sent via the same transceiver.

71. The method of claim 53, wherein the filtered first transmission signal and the filtered second transmission signal are sent via different transceivers.
72. The method of claim 53, wherein the compressed first feedback and the compressed second feedback are received utilizing a dedicated channel.
73. The method of claim 53, wherein the compressed first feedback and the compressed second feedback are received via an antenna configured for omnidirectional communication.
74. The method of claim 53, wherein the decompressed first feedback and the decompressed second feedback are used to increase spatial separation among transmissions.
75. The method of claim 53, wherein the decompressed first feedback and the decompressed second feedback are used to increase spatial separation among transmissions at the same frequency.
76. The method of claim 53, and further comprising:
receiving a compressed third feedback from a fourth node that characterizes receipt of a third signal sent from the first node to the fourth node, the fourth node being a legacy node;
decompressing the compressed third feedback resulting in a decompressed third feedback;
transmitting, using a third frequency and another 802.11-based OFDM protocol, the third transmission signal to the fourth node using a third power that is based on the decompressed third feedback.
77. The method of claim 53, wherein the compressed first feedback is based on a received power and one or more frequencies via which the first signal is communicated.
78. The method of claim 53, wherein the compressed first feedback is based on a received power at a plurality of frequencies via which the first signal is communicated.

79. The method of claim 53, wherein the compressed first feedback is based on a series of power values as a function of frequency.
80. The method of claim 53, wherein the compressed first feedback includes a data structure that is based on a series of power values as a function of frequency.
81. The method of claim 53, wherein the instruction is received prior to the receipt of the compressed first feedback.
82. The method of claim 53, wherein the instruction is received separately with respect to the receipt of the compressed first feedback.
83. The method of claim 53, wherein at least three transmission signals are capable of being simultaneously transmitted to at least three different devices, using the same multiple antennas.
84. The method of claim 53, wherein at least three transmission signals are capable of being simultaneously transmitted to at least three different devices, using at least one different antenna.
85. The method of claim 53, wherein the instruction includes a request to send (RTS) instruction.
86. The method of claim 53, wherein the instruction includes a 802.11 clear to send (CTS) instruction.
87. The method of claim 53, wherein the filtered first transmission signal is transmitted using a frequency band that is selected based on the instruction and the filtered second transmission signal is transmitted using the frequency band that is selected based on another instruction received from the third node, where the filtered first transmission signal is transmitted using a first frequency in the frequency band and the filtered second transmission signal is transmitted

using a second frequency in the frequency band.

88. The method of claim 53, wherein the filtered first transmission signal is transmitted using a first frequency and the filtered second transmission signal is transmitted using a second frequency.

89. The method of claim 53, wherein the filtered first transmission signal and the filtered second transmission signal are transmitted using the same one or more frequencies.

90. The method of claim 53, wherein the filtered first transmission signal and the filtered second transmission signal are transmitted using the same frequency band.

91. The method of claim 53, wherein the filtered first transmission signal is transmitted using a first frequency that is based on the instruction and the filtered second transmission signal is transmitted using a second frequency that is based on another instruction received from the third node.

92. The method of claim 53, wherein the filtered first transmission signal is transmitted using a frequency that is based on the instruction and the filtered second transmission signal is transmitted using the frequency that is based on another instruction received from the third node.

93. The method of claim 53, wherein the filtered first transmission signal is transmitted using a frequency band that is selected based on the instruction and the filtered second transmission signal is transmitted using the frequency band that is selected based on another instruction received from the third node.

94. The method of claim 53, wherein at least one of:
the first signal includes a data signal;
the first signal includes an aggregate signal;
the first signal includes a first data signal, and the second signal includes a second data signal;

the first and second signals are reflected in an aggregate signal;
the compressed first feedback is combined with the instruction;
the compressed first feedback is received with the instruction;
the compressed first feedback is configured to ensure that transmissions from all neighbors of the first node are received at a same power level;
the compressed first feedback is configured to at least one of: minimize a transmit power on reliable links, maximize an ability to achieve spatial separation among transmissions on a same frequency, minimize network self-interference, improve low probability of intercept (LPI), or lower probability of detection (LPD);
the compressed first feedback and the compressed second feedback are received simultaneously;
at least one of the compressed first feedback or the compressed second feedback is received before the instruction is received;
at least one of the compressed first feedback or the compressed second feedback is received after the instruction is received;
the steps are performed in the order listed;
the radio communications network includes an 802.11 network;
the radio communications network includes an 802.11a network;
the radio communications network includes an 802.11g network;
the at least one antenna includes multiple antennas; the at least one antenna includes at least one omnidirectional antenna;
the at least one antenna includes at least one directional antenna;
interference in the radio communications network is managed;
the first node is a mobile node and the second node is a non-mobile node;
the second node is a mobile node and the first node is a non-mobile node;
the instruction sets forth the plurality of frequencies to avoid using;
the instruction specifies the plurality of frequencies to avoid using;
a purpose of the instruction is to avoid using the plurality of frequencies;
a purpose of the instruction is to avoid using the plurality of frequencies, where the purpose is accomplished by specifying the plurality of frequencies to avoid using;

a purpose of the instruction is to avoid using the plurality of frequencies, where the purpose is accomplished by specifying one or more frequencies to use;

a purpose of the instruction is to avoid using the plurality of frequencies, where the purpose is accomplished by specifying one or more frequencies to use, the one or more frequencies not including the plurality of frequencies;

the instruction to avoid the plurality of frequencies sets forth one or more frequencies to use;

the instruction to avoid the plurality of frequencies specifies one or more frequencies to use;

the instruction to avoid the plurality of frequencies assigns one or more frequencies to use;

the instruction to avoid the plurality of frequencies does not specify the plurality of frequencies;

the instruction to avoid the plurality of frequencies sets forth one or more frequencies to use, thereby resulting in the avoidance of using the plurality of frequencies;

a purpose of the filtering is to remove the power from the transmission signal at each frequency in the plurality of frequencies to be avoided, where the purpose is accomplished by specifying one or more frequencies to which the power is to be applied;

a purpose of the filtering is to remove the power from the transmission signal at each frequency in the plurality of frequencies to be avoided, where the purpose is accomplished by specifying the plurality of frequencies to be avoided;

the filtering suppresses or otherwise minimizes waves or oscillations at each frequency in the plurality of frequencies to be avoided;

the filtering suppresses or otherwise minimizes waves or oscillations at each frequency in the plurality of frequencies to be avoided, thereby resulting in the removal of the power from the transmission signal at each frequency in the plurality of frequencies to be avoided;

the filtering removes all power from the transmission signal;

the filtering removes some power from the transmission signal;

the filtering discards one or more portions of the transmission signal at each of the plurality of frequencies;

the filtering utilizes transmit excision;

the filtering utilizes compression;

the filtering identifies certain one or more frequencies in connection with which power is applied, thereby resulting in the removal of the power from the transmission signal at each frequency in the plurality of frequencies to be avoided;

the removal of power from the transmission signal at each frequency in the plurality of frequencies to be avoided is accomplished by an adjustment in relation to power previously used in connection with the transmission signal;

the removal of power from the transmission signal at each frequency in the plurality of frequencies is accomplished by adjusting a processing of the transmission signal so that power that was previously used in connection with the transmission signal at each frequency in the plurality of frequencies to be avoided, is no longer used in connection with the transmission signal at each frequency in the plurality of frequencies to be avoided;

the removal of power from the transmission signal at each frequency in the plurality of frequencies to be avoided is accomplished by setting a waveform profile that results in no power being applied in connection with the transmission signal at each frequency in the plurality of frequencies to be avoided;

the removal of power from the transmission signal at each frequency in the plurality of frequencies to be avoided is accomplished by pre-processing the transmission signal, before any power is applied, so that power, which would otherwise be applied in connection with the transmission signal at each frequency in the plurality of frequencies, is not applied in connection with the transmission signal at each frequency in the plurality of frequencies to be avoided;

the removal of power from the transmission signal at each frequency in the plurality of frequencies to be avoided is accomplished by pre-processing the transmission signal, before any power is applied, so that no power is applied in connection with the transmission signal at each frequency in the plurality of frequencies to be avoided;

the transmission signal includes a plurality of packets;

the transmission signal includes a plurality of different transmissions;

the transmission signal includes a plurality of transmissions to the second node;

the transmission signal includes a plurality of differently-timed transmissions to the second node;

the transmission signal includes a plurality of transmission components to the second node, each with different power levels;

the transmission signal includes a plurality of transmission components to the second node, each with different power levels as a result of different instances of the filtering;

the transmission signal is generated so as to not include power at each frequency in the plurality of frequencies to be avoided;

the transmission signal is generated so as to not include power at each frequency in the plurality of frequencies to be avoided, thereby resulting in the removal of the power from the transmission signal at each frequency in the plurality of frequencies to be avoided;

the transmission signal is pre-processed so as to not include power at each frequency in the plurality of frequencies to be avoided, thereby resulting in the removal of the power from the transmission signal at each frequency in the plurality of frequencies to be avoided;

the filtering is performed using an output filter;

the filtering is performed using an optimal matched filter;

the filtering is performed using a band selection filter;

the filtering is performed using a median filter; or

the filtering is performed using a nonlinear filter.

95. A method for managing interference in a radio communications network, comprising the steps of:

receiving at a first node in the radio communications network an instruction transmitted from a second node in the radio communications network to avoid using a plurality of frequencies to transmit to the second node;

filtering a transmission signal to remove power from the transmission signal at each frequency in the plurality of frequencies to be avoided;

transmitting the filtered transmission signal to the second node;

separately from the receipt of the instruction, receiving a particular signal at the first node that is transmitted from the second node;

generating a feedback based on a received power and one or more frequencies via which the particular signal is received;

compressing the feedback; and

transmitting the compressed feedback from the first node to the second node, for use by the second node in determining a transmit power with which the second node transmits to the first node via at least one antenna of a plurality of antennas, while simultaneously transmitting to one or more other nodes;

wherein the filtered transmission signal is transmitted to the second node using an 802.11-based orthogonal frequency-division multiplexing (OFDM) protocol;

wherein an update of the compressed feedback is repeatedly generated, compressed, and transmitted at time periods of less than one second; so that the transmit power is repeatedly updated based thereupon at time periods of less than one second.

96. The method of claim 95, wherein the instruction includes a first instruction and the filtered transmission signal includes a filtered first transmission signal, and further comprising:

receiving at the first node in the radio communications network a second instruction transmitted from a third node in the radio communications network to avoid using a different plurality of frequencies to transmit to the third node;

filtering a second transmission signal to remove power from the second transmission signal at each frequency in the different plurality of frequencies to be avoided; and

transmitting the filtered second transmission signal to the third node.