

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

SAMSUNG ELECTRONICS CO., LTD.,
SAMSUNG ELECTRONICS AMERICA, INC.

Petitioners,

v.

MASSIVELY BROADBAND LLC.

Patent Owner.

Case No. IPR2026-00035

U.S. Patent No. 7,676,194

**DECLARATION OF DR. MAHON IN SUPPORT OF PETITION FOR
INTER PARTES REVIEW OF U.S. PATENT NO. 7,676,194**

TABLE OF CONTENTS

	<u>Page</u>
I. INTRODUCTION	1
II. QUALIFICATIONS	1
III. LEGAL STANDARDS	10
A. Person of Ordinary Skill in the Art	10
B. Claim Construction	11
C. Presumption of Validity	12
D. Obviousness	12
IV. BACKGROUND	15
A. '194 Patent	15
1. Earliest Priority Date.....	15
2. Specification	15
3. Prosecution History.....	18
B. Asserted Prior Art	21
1. Ganz (EX1005)	21
2. Larrick (EX1007).....	22
3. Engels (EX1008).....	25
4. Perlman (EX1011)	25
5. Roese (EX1012).....	26
V. PERSON OF ORDINARY SKILL.....	26
VI. CLAIM CONSTRUCTION.....	26
VII. GROUND 1: GANZ IN COMBINATION WITH LARRICK RENDERS CLAIMS 1-5, 9-16, 18-19, AND 21-25 OBVIOUS.....	27
A. Overview and Motivation to Combine	27
B. Limitation-By-Limitation Analysis	33
1. Claim 1	33
2. Claim 2: The broadband repeater of claim 1 wherein said network information includes one or more IDs for each of the components to be used in said network, and IDs for users permitted to be used in said network.....	49

3.	Claim 3: The broadband repeater of claim 1 wherein said network information includes one or more of a specified coverage area for wireless devices to permit use of said network, and specified applications permitted to be used in said network.	50
4.	Claim 4: The broadband repeater of claim 1 further comprising a buffer memory for storing received or to be transmitted electronic signals for processing by said controller.....	50
5.	Claim 5: The broadband repeater of claim 1 wherein either or both said at least one receiver and said at least one transmitter respectively receives or transmits electronic signals by either or both a wireless or a wired link.	52
6.	Claim 9: The broadband repeater of claim 1 where network provisioning information is passed to or pre-programmed with said controller, for purposes of network traffic provisioning, wherein said controller uses said provisioning information to prioritize either or both reception of data and transmission of data to or from said repeater.	53
7.	Claim 10: The broadband repeater of claim 1 wherein said transmitter and said receiver have reversible input/output directions.....	54
8.	Claim 11: The broadband repeater of claim 1 wherein either pre-programmed or programmable network information supplied to said controller is communicated using either a wireless or wired link.	55
9.	Claim 12.....	56
10.	Claim 13: The broadband repeater of claim 12 wherein said provisioning information prioritizes by one or more of network user, type of data being received by said at least one receiver, type of data being transmitted by said at least one transmitter, and the particular type of application being used by one or more users of the network being transmitted by said at least one transmitter.	57
11.	Claim 14: The broadband repeater of claim 12 further comprising a buffer memory for storing received or to be transmitted electronic signals or data for processing by said controller.....	58
12.	Claim 15: The broadband repeater of claim 12 wherein either or both said at least one receiver and said at least one transmitter respectively receives or transmits electronic signals or data by either or both a wireless or a wired link.....	58
13.	Claim 16: The broadband repeater of claim 12 wherein said at least one receiver and said at least one transmitter and said controller are stationary or mobile/portable and are associated with one or more	

	of an AC outlet, a room fixture, a display terminal, a gaming devices, office or home equipment, a ceiling fixture, a wall fixture, furniture, or a computer.	58
14.	Claim 18: The broadband repeater of claim 12 wherein said provisioning information supplied to said controller is communicated using either a wireless or wired link.....	59
15.	Claim 19: The broadband repeater of claim 18 wherein said provisioning information is further supplied to said controller by one or more of over-the-air ultrawideband signaling, and wired connections from another device.	59
16.	Claim 21: The broadband repeater of claim 12 wherein said transmitter and said receiver have reversible input/output directions.....	60
17.	Claim 22.....	60
18.	Claim 23: The broadband repeater of claim 22 further comprising one or more of a means for exporting traffic information or security information to one or more computer processors or devices, and a means for adjusting one or more operations of said controller based on said traffic information or security information.	61
19.	Claim 24.....	61
20.	Claim 25: The broadband repeater of claim 11 wherein said network information is further supplied to said controller by one or more of over-the-air ultrawideband signaling, and a wired connection from another device.....	63
VIII.	GROUND 2: GANZ AND LARRICK IN COMBINATION WITH ENGELS RENDERS CLAIMS 8, AND 20 OBVIOUS.....	64
A.	Overview and Motivation to Combine	64
B.	Limitation-By-Limitation Analysis	65
1.	Claim 8: The broadband repeater of claim 1 wherein said controller either or both a) uses adaptive or steerable antennas or MIMO technologies to control the direction or coverage zones or capacity or quality of transmissions or reception, and b) directs undesired user or intruder information to be passed to other components of a network from said at least one transmitter using either wireless or wired connectivity.....	65
2.	Claim 20: The broadband repeater of claim 12 wherein said controller either or both a) uses adaptive or steerable antennas or MIMO technologies to control the direction or coverage zones or capacity or quality of transmissions or reception, and b) directs undesired user or intruder information to be passed to other	

	components of a network from said at least one transmitter using either wireless or wired connectivity.	66
IX.	GROUND 3: GANZ AND LARRICK IN COMBINATION WITH PERLMAN RENDERS CLAIM 6 OBVIOUS.....	66
A.	Overview and Motivation to Combine	66
B.	Limitation-By-Limitation Analysis	67
1.	Claim 6: The broadband repeater of claim 1 wherein said at least one receiver and said at least one transmitter and said controller are stationary or mobile/portable and are associated with one or more of an AC outlet, a room fixture, a display terminal, a gaming device, office or home equipment, a ceiling fixture, a wall fixture, furniture, or a computer.	67
X.	GROUND 4: GANZ AND LARRICK IN COMBINATION WITH ROESE RENDERS CLAIM 7 OBVIOUS.....	68
A.	Overview and Motivation to Combine	68
B.	Limitation-By-Limitation Analysis	69
1.	Claim 7: The broadband repeater of claim 1 wherein said controller permits one or more network information to be modified and support of position location capabilities for use by a network.	69
2.	Claim 17: The broadband repeater of claim 12 wherein said controller permits one or more of provisioning information to be modified and support of position location capabilities for use by a network.	70
XI.	CONCLUSION.....	71

EXHIBIT LIST

Exhibit	Description
EX1001	U.S. Patent 7,676,194 (“’194 Patent”)
EX1002	Declaration of Mark Mahon, Ph.D.
EX1003	Certificate of Correction for U.S. Patent 7,676,194
EX1004	File History of U.S. Patent 7,676,194
EX1005	U.S. Patent 6,584,080 (“Ganz”)
EX1006	Intentionally Omitted
EX1007	U.S. Patent 7,209,523 (“Larrick”)
EX1008	Patent Cooperation Treaty Patent Application WO 03/058850 (“Engels”)
EX1009	Intentionally Omitted
EX1010	Intentionally Omitted
EX1011	U.S. Patent Application Pub. No. 2004/0160928 (“Perlman”)
EX1012	U.S. Patent 7,295,556 (“Roese”)
EX1013	Curriculum Vitae of Mark Mahon Ph.D.

LIST OF CHALLENGED CLAIMS

Claim	
1[pre]	A broadband wireless repeater, comprising:
1[a]	at least one receiver for receiving electronic signals at least some of which are sent by one or more ultrawideband wireless devices in a network, and
1[b]	at least one transmitter for transmitting received, modified, or stored electronic signals or data, wherein said at least one receiver and at least one transmitter may be separate components or be combined as a transceiver, and wherein said at least one receiver and at least one transmitter may be dedicated receive only and transmit only or may function alternatively as a receiver and as a transmitter; and
1[c]	a controller, which is either pre-programmed or programmable with network information which at least identifies said one or more ultrawideband wireless devices,
1[d]	which controls the screening of data received by said at least one receiver, and either passes, ignores, rejects, redirects, modifies, or kills received data,
1[e]	said controller providing such data screening in order to differentiate between desired and undesired data for network security, network management, or interference mitigation purposes for said network,
1[f]	said controller controlling reception of electronic signals or data by said at least one receiver from said one or more ultrawideband wireless devices and transmission by said at least one transmitter to said one or more ultrawideband wireless devices,
1[g]	said controller further providing for the collecting, reporting, or storing of network usage, network statistics, or network information for said network.
2	The broadband repeater of claim 1 wherein said network information includes one or more IDs for each of the components to be used in said network, and IDs for users permitted to be used in said network.
3	The broadband repeater of claim 1 wherein said network information includes one or more of a specified coverage area for wireless devices to permit use of said network, and specified applications permitted to be used in said network.
4	The broadband repeater of claim 1 further comprising a buffer memory for storing received or to be transmitted electronic signals for processing by said controller.
5	The broadband repeater of claim 1 wherein either or both said at least one receiver and said at least one transmitter respectively receives or transmits electronic signals by either or both a wireless or a wired link.
6	The broadband repeater of claim 1 wherein said at least one receiver and said at least one transmitter and said controller are stationary or mobile/portable and are associated with one or more of an AC outlet, a room fixture, a display terminal, a gaming device, office or home equipment, a ceiling fixture, a wall fixture, furniture, or a computer.
7	The broadband repeater of claim 1 wherein said controller permits one or more network information to be modified and support of position location capabilities for use by a network.

Claim	
8	The broadband repeater of claim 1 wherein said controller either or both a) uses adaptive or steerable antennas or MIMO technologies to control the direction or coverage zones or capacity or quality of transmissions or reception, and b) directs undesired user or intruder information to be passed to other components of a network from said at least one transmitter using either wireless or wired connectivity.
9	The broadband repeater of claim 1 where network provisioning information is passed to or pre-programmed with said controller, for purposes of network traffic provisioning, wherein said controller uses said provisioning information to prioritize either or both reception of data and transmission of data to or from said repeater.
10	The broadband repeater of claim 1 wherein said transmitter and said receiver have reversible input/output directions.
11	The broadband repeater of claim 1 wherein either pre-programmed or programmable network information supplied to said controller is communicated using either a wireless or wired link.
12[pre]	A broadband wireless repeater, comprising:
12[a]	at least one receiver for receiving electronic signals at least some of which are sent by one or more ultrawideband wireless devices in a network, and
12[b]	at least one transmitter for transmitting received, modified, or stored electronic signals or data, wherein said at least one receiver and at least one transmitter may be separate components or be combined as a transceiver, and wherein said at least one receiver and at least one transmitter may be dedicated receive only and transmit only or may function alternatively as a receiver and as a transmitter; and
12[c]	a controller which is either pre-programmed or programmable with provisioning information which at least identifies said one or more ultrawideband wireless devices for purposes of network traffic provisioning,
12[d]	wherein said controller uses said provisioning information to prioritize either or both reception of data by said at least one receiver and transmission of data by said at least one transmitter to said one or more ultrawideband wireless devices,
12[e]	said controller controlling reception of electronic signals or data by said at least one receiver and transmission of electronic signals or data by said at least one transmitter to said one or more ultrawideband wireless devices.
13	The broadband repeater of claim 12 wherein said provisioning information prioritizes by one or more of network user, type of data being received by said at least one receiver, type of data being transmitted by said at least one transmitter, and the particular type of application being used by one or more users of the network being transmitted by said at least one transmitter.
14	The broadband repeater of claim 12 further comprising a buffer memory for storing received or to be transmitted electronic signals or data for processing by said controller.
15	The broadband repeater of claim 12 wherein either or both said at least one receiver and said at least one transmitter respectively receives or transmits electronic signals or data by either or both a wireless or a wired link.

Claim	
16	The broadband repeater of claim 12 wherein said at least one receiver and said at least one transmitter and said controller are stationary or mobile/portable and are associated with one or more of an AC outlet, a room fixture, a display terminal, a gaming devices, office or home equipment, a ceiling fixture, a wall fixture, furniture, or a computer.
17	The broadband repeater of claim 12 wherein said controller permits one or more of provisioning information to be modified and support of position location capabilities for use by a network.
18	The broadband repeater of claim 12 wherein said provisioning information supplied to said controller is communicated using either a wireless or wired link.
19	The broadband repeater of claim 18 wherein said provisioning information is further supplied to said controller by one or more of over-the-air ultrawideband signaling, and wired connections from another device.
20	The broadband repeater of claim 12 wherein said controller either or both a) uses adaptive or steerable antennas or MIMO technologies to control the direction or coverage zones or capacity or quality of transmissions or reception, and b) directs undesired user or intruder information to be passed to other components of a network from said at least one transmitter using either wireless or wired connectivity.
21	The broadband repeater of claim 12 wherein said transmitter and said receiver have reversible input/output directions.
22[pre]	A broadband wireless repeater, comprising:
22[a]	at least one receiver for receiving electronic signals at least some of which are sent by one or more ultrawideband wireless devices in a network, and
22[b]	at least one transmitter for transmitting received, modified, or stored electronic signals or data, wherein said at least one receiver and at least one transmitter may be separate components or be combined as a transceiver, and wherein said at least one receiver and at least one transmitter may be dedicated receive only and transmit only or may function alternatively as a receiver and as a transmitter; and
22[c]	a controller which is either pre-programmed or programmable to collect traffic information or security information related to received and transmitted data at least some of which is received from or sent to said one or more ultrawideband wireless devices in said network,
22[d]	said controller controlling reception of electronic signals or data by said at least one receiver and transmission by said at least one transmitter.
23	The broadband repeater of claim 22 further comprising one or more of a means for exporting traffic information or security information to one or more computer processors or devices, and a means for adjusting one or more operations of said controller based on said traffic information or security information.
24[pre]	A broadband repeater, comprising:
24[a]	at least one receiver for receiving electronic signals at least some of which are sent by one or more ultrawideband wireless devices and

Claim	
24[b]	at least some of said signals being sent by a wired link, said one or more ultrawideband wireless devices being in a network which includes said wired link, and
24[c]	at least one transmitter for transmitting received, modified, or stored electronic signals or data, wherein said at least one receiver and at least one transmitter may be separate components or be combined as a transceiver, and wherein said at least one receiver and at least one transmitter may be dedicated receive only and transmit only or may function alternatively as a receiver and as a transmitter; and
24[d]	a controller for controlling reception of electronic signals by said at least one receiver from said one or more ultrawideband wireless devices and said wired link and transmission by said at least one transmitter to said one or more ultrawideband wireless devices and said wired link,
24[e]	wherein said controller supports a hub or router function to allow for the commingling of both wireless and wired traffic within said broadband repeater.
25	The broadband repeater of claim 11 wherein said network information is further supplied to said controller by one or more of over-the-air ultrawideband signaling, and a wired connection from another device.

I. INTRODUCTION

I, MARK MAHON, Ph.D. hereby declare as follows:

1. My name is Mark Mahon. I have been retained to testify as an expert in this Inter Partes Petition on behalf of Samsung Electronics Co., Ltd. (“SEC”) and Samsung Electronics America, Inc. (“SEA”) (collectively, “Samsung” or “Petitioner”).

2. I have prepared this declaration in connection with Samsung’s related petition for inter partes review (“IPR”) of U.S. Patent No. 7,676,194 (the “’194 patent,” EX1001), which I am informed is being filed concurrently with this declaration. I have been asked to provide certain opinions relating to the patentability of the ’194 patent. Specifically, I have been asked to provide my opinion regarding whether claims 1-25 of the ’194 patent (“the Challenged Claims”) are invalid as obvious in view of the prior art.

II. QUALIFICATIONS

3. I am over the age of 18 and am competent to write this declaration. I have personal knowledge, or have developed knowledge of these technologies based upon education, training, or experience, of the matters set forth herein.

4. My qualifications are summarized here and explained in more detail in my curriculum vitae, which is attached as Appendix A to this report. Appendix A also includes a list of my publications and the cases in which I have testified at

deposition, hearing, or trial within the past four years.

5. I am a Teaching Professor in the School of Electrical Engineering and Computer Science at Pennsylvania State University, University Park, PA (“Penn State” or “PSU”). I have worked on telecommunications and wireless networks, including Z-Wave, Bluetooth, Zigbee, Wi-Fi, NFC, AMPS, IS-95, CDMA2000, GSM, EDGE, UMTS/WCDMA, LTE, and 5G cellular systems since 1988.

6. I received my B.S. in Electronics Engineering from the University of Scranton in 1987. I received my M.S. in Electrical Engineering and Ph.D. in Acoustics from Penn State in 1991 and 2001, respectively.

7. In 1988, after I received my bachelor’s degree, I joined the Central Intelligence Agency (CIA) while pursuing my M.S. degree at Penn State part-time. My first job at the CIA involved designing and testing systems to automatically capture and characterize telecommunication signals and emissions from various wireless and computer networking devices.

8. I returned to Penn State in early 1990 to pursue graduate research full-time and complete my M.S. degree. My graduate research work focused on wideband beamforming and adaptive signal processing. After completing my M.S. degree in EE in 1991, I accepted a full-time faculty research position at the Applied Research Lab at PSU, primarily working on classified programs, and began working on diverse radio frequency and acoustic sensor systems including wireless

communications and small wireless networks for acoustic tracking, source localization, and feature extraction.

9. I began pursuing my Ph.D. part-time in 1993 while continuing my faculty research position. In 1997, as part of my faculty research position, I began working on classified programs focused on mathematical analytical modeling of cellular communication networks and the development of hardware and software systems to test against cellular networks. My role was to develop the algorithms and write the code running on a specially developed embedded system. For this work, I received a letter of recognition as the “genius behind the VELA software algorithms” from the Director of National Reconnaissance Office (NRO) Systems Engineering and Technology Office. As part of this same work, I was extensively involved in protocol and signaling analysis as well as researching model-specific performance and unique functional characteristics associated with individual mobile devices. The work involved testing dozens of handsets from many manufacturers in controlled and real-world environments against network simulators and live operational networks for each research project.

10. In 2000, my research extended into utilizing non-orthogonal wavelets for improving detection and localization of cellular handsets from high altitude sensor systems. In 2001, I completed my Ph.D. and my research focused on the utilization of advanced communication signals for wideband characterization and

remote sensing of propagation channels.

11. Beginning in 1997, my cellular communications research work focused on CDMA, GSM, EDGE, UMTS, LTE, and 5G cellular systems primarily under grants sponsored principally by the Department of Defense. This classified research work required 3GPP protocol analysis and development of real-time embedded hardware and software systems capable of interacting with cellular networks and cellular handsets. A large portion of my work was directed at architectures, protocols, software, and signaling.

12. I have been working on classified projects since 1988. Before 1998, because the work was not deemed highly classified, I was able to publish eight journal and conference papers prior to 2000. Between 1999 and 2015, however, I was allowed to publish only one article in an unclassified symposium and published and presented about a dozen articles in classified settings. This is because during this period, the vast majority of my research was highly classified. As a result, nearly all of my research results were summarized in classified reports and not available to the general public. Further, because the U.S. government owns any intellectual property resulting from the sponsored research work, I did not pursue or file patent applications.

13. Beginning in 2003, I was co-principal investigator and technical lead on a 3 year multi-million-dollar research effort for developing the Global

Information Grid (GIG). This project was sponsored by the Secretary of Defense's Office with a goal of developing a real-time, multi-intelligence (multi-Int) network for collecting, processing, storing, disseminating, and managing information on demand for decision makers including the warfighter, combatant command centers, policy makers, and support personnel and was the largest network-centric warfare project in development at the time. My research team (Ubiquitous Automated Information Manager) focused on building and deploying a scalable application to perform real-time, multi-int data fusion to support every user in the system. This software application was deployed in Combat Operation Centers, Joint Interagency Task Force locations, and on various platforms (mobile and small computing environments) used by various warfighters. The fused data sources included various content management systems, supply chain logistic reports, GPS-based reports, new feeds, backend databases, sensor system reports, and various other broad data sources.

14. Beginning in 1994, I worked on various projects that involved the implementation and design of user interfaces to support the use of the research, design, analysis tools and signal processing systems for the end user. The user platforms included a broad array of footprints including, small handheld devices with screens or visual displays and those limited to audio-only inputs, medium sized laptops and small desktop systems, and also large, heavy devices, such as servers

and clusters in operational environments (including combat operations centers and 3D immersive environments).

15. Specifically, for the GIG research effort, I led a team of software engineers to deploy our inferencing tool for a disparate range of end users, from dismounted combat soldiers with only a microphone as an interface to soldiers in mules with smart devices (tablets and laptops with multiple visual display interaction capabilities) to field command centers (medium sized clients with significant video displays and processing power with touch and stylus interfaces to the) to combat operation centers with high-powered processing and complex user-interface capabilities/modalities.

16. In 2015, I transferred to the School of Electrical Engineering and Computer Science at Penn State as a teaching faculty member. In that role, I have continued teaching graduate and undergraduate courses, guiding Ph.D. and M.S. students in communication and mobile networking (including LTE and 5G cellular networks), and pursuing research in this and related areas. Since 2015, I have been an author on nine refereed papers as listed in my curriculum vitae (CV).

17. Because of my decades of research and my continuing work at Penn State, I have intimate knowledge of telecommunication networks, including the technology involved in the patents in this case. I have been highly recognized as an expert in such systems within the research community. I was recognized twice by

the National Reconnaissance Office with commendation letters for work dealing with detecting cellular signals in low signal to noise ratio environments. The U.S. government awarded me over \$12M in grants between 2003 and 2015 for projects focused on mobile communication devices and networks, in which I served as a Principal Investigator (PI), Co- PI, and/or technical lead.

18. Additionally, during my research career, I interacted extensively with computer scientists and engineers responsible for the design, development, and testing of telephony and data networking systems and testbeds. As a research faculty member, I oversaw engineers and computer scientists that executed many joint projects with development organizations. These interactions exposed me to a wide range of computer scientists and engineers working on telecommunication network technologies. Since 2011, I have been teaching undergraduate and graduate classes in communication and mobile networking and am familiar with the curricula being taught to electrical engineers and computer scientists. The interactions with a wide range of computer scientists and engineers working on telecommunication network technologies and the familiarity with the classes taught to electrical engineers and computer scientists have allowed me to have a good understanding of the level of skills possessed by a person of ordinary skill in the field of cellular technology.

19. I have extensive experience with mobile networks in general and LTE and 5G specifically. While most of my research efforts between 1998 and 2015 were

highly classified, I can state that they included detailed investigation of network architectures, signaling, and functional behavior. A typical research effort would involve studying 3GPP, 3GPP2, IEEE, and other protocol standards to fully comprehend all aspects of L1, L2, and L3 requirements including timing, bit-level construction of the control and user plane messages, and timing characteristics for a given standard as well as functional behavior of network components and user equipment.

20. From 2006 through 2015, my research focused specifically on LTE. My research continues to this day, although I am no longer operating in a classified environment. During this time, I investigated the performance and functional differences of many varied network and handset devices to see how differing signaling and hardware configurations (including MIMO) and environmental factors influenced the behavior of user equipment in a given network environment. This included how diversity techniques (transmit and receive), synchronization, timing, and signal to interference plus noise ratio (SINR) for a given device would affect specific functional aspects including elements of the receiver structure, decoding and demodulation performance, calculation of parameters used by the device for making decisions and deriving parameters reported to the network.

21. As part of my research work, I built several custom CDMA, GSM, UMTS, and LTE platforms that implemented specific network-side and user

equipment-side functionality including custom signal generation and processing structures, particularly the signal processing chains on both the transmit and receive sides. This equipment was developed using network simulation hardware in a laboratory environment and was later tested with corresponding networks in both controlled and fully operational environments. Implementing the transmit and receive chains for custom built protocol-enabled equipment required me to gain an intimate understanding of the relevant 3GPP protocol specifications and the underlying structures. Since 2015, I have been primarily focused on guiding graduate students pursuing research including using code domain non-orthogonal multiple access (NOMA) combined with MIMO sparse coding multiple access to minimize latency and maximize user density in grant free Internet of Things (IoT) environments. Additionally, I am guiding my graduate students in pursuing research in optimized distributed processing algorithms, implementation of block chain coding techniques to improve handover security, and edge computing resource allocation in 4G (LTE)/5G (NR) networks.

22. Much of the classified research work I performed also led to similar approaches for other wireless protocols including IEEE 802.11 and 802.15 (e.g., Zigbee, Bluetooth, and UWB), HART, and other short-range standards as well as HF radio and Wi-MAX.

23. My curriculum vitae, included as an appendix to this declaration,

includes a list of publications on which I am a named author. It contains further details regarding my experience, education, publications, and other qualifications to render an expert opinion in connection with this proceeding.

24. In writing this Declaration, I have considered the following: my own knowledge and experience, including my work experience in the fields of wireless communication networks, research and development of wireless signaling, protocols, transmission, and detection techniques, design and construction of wireless test equipment, prototypes, engineering models, and related areas; my experience in teaching those subjects; and my experience in working with others involved in those fields, the materials cited and/or referenced throughout this Petition.

III. LEGAL STANDARDS

25. Counsel for Samsung has informed me of the following legal standards. I am not an attorney, and I am relying only on instructions from Samsung's attorneys for these legal standards.

A. Person of Ordinary Skill in the Art

26. I understand that issues of claim construction and invalidity are analyzed from the perspective of a person of ordinary skill in the art ("POSITA").

27. I understand that a POSITA is a hypothetical person who is used to analyzing the prior art without the benefit of hindsight. A POSITA is presumed to

be one who thinks along the lines of conventional wisdom in the art.

28. I understand that the hypothetical POSITA is presumed to have knowledge of all references that are sufficiently related to one another and to the pertinent art, and to have knowledge of all arts reasonably pertinent to the particular problem that the claimed invention addresses.

29. I understand that factors considered in determining the level of ordinary skill in the art at the time of an invention include (1) the type of problems encountered in the art; (2) the prior art solutions to those problems; (3) the educational level of active workers in the field; (4) the rapidity with which innovations are made; and (5) the sophistication of the technology. I further understand that the inventors' specific levels of skill are not relevant to this inquiry.

B. Claim Construction

30. I have been informed by counsel that the Patent Trial and Appeal Board ("PTAB") applies the same claim construction standard used in district courts, where the claims are given their ordinary meaning as understood by one skilled in the art at the time of the invention, informed by the claim language itself, the specification, and the prosecution history. I also understand that "extrinsic evidence"—i.e., evidence other than the patent and prosecution history—can be relevant in determining how a POSITA would understand terms of art used in the claims. I have been informed, however, that extrinsic evidence may not be used to contradict the

meaning of the claims as I described in the intrinsic evidence—i.e., evidence in the claim language itself, the specification, and the prosecution history.

C. Presumption of Validity

31. I understand that a granted patent is presumed to be valid. I understand that the presumption of validity can be overcome if clear and convincing evidence is presented that proves the patent is invalid.

D. Obviousness

32. I understand that even if a patent claim is not anticipated, it is still invalid if the differences between the claimed subject matter and the prior art are such that the subject matter, as a whole, would have been obvious at the time the invention was made to a person of ordinary skill in the pertinent art.

33. I understand that a person of ordinary skill in the art provides a reference point from which the prior art and claimed invention should be viewed. This reference point prevents one from using his or her own insight or hindsight in deciding whether a claim is obvious.

34. I also understand that an obviousness determination includes the consideration of various factors such as (1) the scope and content of the prior art, (2) the differences between the prior art and the asserted claims, (3) the level of ordinary skill in the pertinent art, and (4) the existence of secondary considerations or objective indicia of obviousness or non-obviousness.

35. I understand that an obviousness determination can be based on a single prior art reference or a combination of multiple prior art references or the knowledge of one of ordinary skill in the art. I understand that the prior art itself may provide a suggestion, motivation, or reason to combine or modify the teachings of the prior art, or that such a reason may come from other sources, such as the knowledge of a person having ordinary skill in the art, common sense, and market forces. I understand that the following rationales may support a finding of obviousness:

- combining prior art elements according to known methods to yield predictable results;
- simple substitution of one known element for another to obtain predictable results;
- use of known technique to improve similar devices (methods, or products) in the same way;
- applying a known technique to a known device (method or product) ready for improvement to yield predictable results;
- “obvious to try” - choosing from a finite number of identified, predictable solutions, with a reasonable expectation of success;
- 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;
- 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.

36. I understand that an obviousness determination requires a reasonable expectation of success in achieving the claimed invention.

37. I understand that secondary considerations or objective indicia of obviousness or non-obviousness may include (1) a long felt but unmet need in the prior art that was satisfied by the invention of the patent; (2) commercial success or lack of commercial success of processes covered by the patent; (3) unexpected results achieved by the invention; (4) praise of the invention by others skilled in the art; (5) the taking of licenses under the patent by others; (6) deliberate copying of the invention; (7) teaching away; and (8) the simultaneous invention of the claimed subject matter. I also understand that there must be a relationship between any such secondary considerations and the invention. I further understand that contemporaneous and independent invention by others is a secondary consideration supporting an obviousness determination.

38. I understand that any secondary considerations or objective indicia must bear a nexus to the claimed invention. Where the offered secondary consideration actually results from something other than what is both claimed and novel in the claim, there is no nexus to the merits of the claimed invention. I further understand that the patentee bears the burden of demonstrating that the relevant commercial success is attributable to the claimed invention, as opposed to other economic and commercial factors unrelated to the technical quality of the patented

subject matter.

39. I understand that whether a prior art reference “teaches away” from the claimed invention is a fact to be considered in determining obviousness. I understand that it is improper to combine references where the references teach away from their combination. However, I understand that the nature of the teaching is highly relevant and must be weighed in substance – a known or obvious composition does not become patentable simply because it has been described as somewhat inferior to some other product for the same use. Furthermore, I understand that the prior art’s mere disclosure of more than one alternative does not constitute a teaching away from any of these alternatives because such disclosure does not criticize, discredit, or otherwise discourage the solution claimed.

IV. BACKGROUND

A. ’194 Patent

1. Earliest Priority Date

40. The ’194 patent is a pre-AIA patent whose earliest priority date is August 22, 2003 via U.S. Provisional Application Nos. 60/498,324 and 60/496,913.

2. Specification

41. The ’194 patent relates to an ultrawideband radio transceiver/repeater that merges wired and wireless network devices while providing connection to the plant, flexible repeater capabilities, network security, and traffic flow control for

wired and wireless connectivity of devices or networks. (EX1001, Abstract.)

42. The ultrawideband repeater described in the '194 patent “serves to ‘repeat’ data signals coming from one or many devices so that other devices, located farther away from the ‘source’ will be able to access the internet, Cable TV, Satellite source, phone/DSL line, or other broadband ‘plant’ source via the repeater.” (*Id.*, 6:38-43.)

43. The patent describes that “[u]ltrawideband technologies are about to become mainstream, and are described in” various patent applications and publications. (*Id.*, 2:1-8.) The patent also describes that “[t]he IEEE 802.15.3 standards bodies have been developing Physical (PHY) and MAC layer standards for dynamic channel selection and repeater service for UWB, which falls under the general IEEE 802.15.3 standards body.” (*Id.*, 2:8-12.) The patent contends that “the presently proposed 802.15.3 standard[] is not adequate to provide one or more of sufficient security, proper traffic filtering, bandwidth provisioning, network management features, or flexibility of networks that can be installed or controlled easily by a consumer. That is to say, the current repeater operation contemplated by 802.15.3 and proposed UWB devices is based on the assumption that a single chip can perform necessary repeater functions, but this functionality alone will not be adequate for the rapid emergence of UWB and the onslaught of wireless data that is certain to occur.” (*Id.*, 2:33-44.)

44. In addition, the patent describes that “IEEE 802.15.3a, the Ultrawideband Physical Layer standard committee, is working on creating a standard that may either be Multiband OFDM transmission (MBOA), with 500 MHz channels, or a Direct Sequence Spread Spectrum impulse radio standard that has broader channel bandwidths (UWB Forum).” (*Id.*, 2:44-49.) Moreover, ***the patent describes that UWB chips capable of 100 megabits per second were already commercially available*** (*id.*, 2:64-3:4) and that mesh networking will provide efficient network paths that allow very high data rates across the internet (*id.*, 2:62-67.)

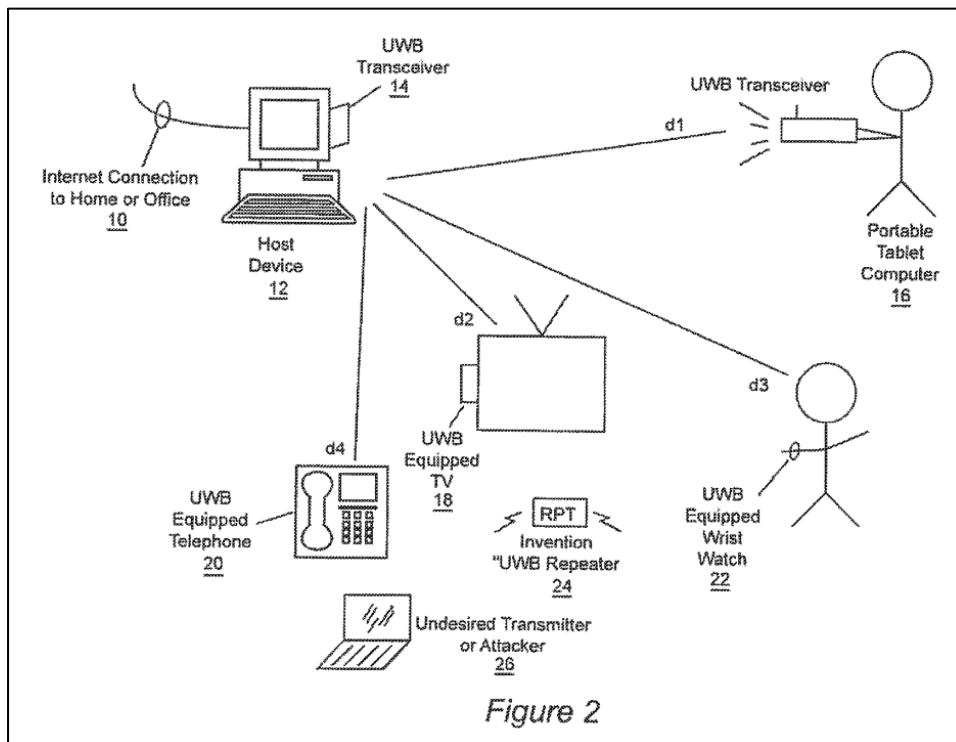
45. Repeaters are “well known in the art, and they have been manufactured for decades in the cellular and PCS industries, and more recently, ... for the IEEE 802.11a/b marketplace [and] for IEEE 802.11g wireless LAN WiFi standard.” (*Id.*, 3:16-22.)

46. Contrary to the FCC defining ultrawideband as larger than 500 MHz,¹ the patent defines “ultrawideband” as “any type of electromagnetic signals that have an instantaneous or overall occupied bandwidth of 100 MHz or more and that are used to communicate or to position-locate between 2 or more devices. Such wide

¹ FCC, First Report and Order 02-48. February 2002. The FCC published this formal definition in April 2002, prior to the earliest priority date of the patents.

bandwidths ... generally implies a proportionally higher noise floor power level, which requires UWB devices generally to be physically closer in distant to each other in order to obtain a sufficiently strong signal to noise ratio (SNR).... Thus, repeaters will become necessary to connect devices over greater distances than the range of a single UWB device.” (*Id.*, 3:57-4:7.)

47. In connection with FIG. 2, the ultrawideband repeater is stated to require careful signal processing that is able to null out noise and interference across the very wide bandwidth used by UWB such as noise from an undesired transmitter or attacker. (*Id.*, 8:65-9:2.)



3. Prosecution History

48. The '194 patent was filed on August 17, 2004 as application

10/919,515, and claims priority to provisional applications 60/498,324 and 60/496,913.

49. On January 30, 2008 an office action issued rejecting pending claims 1, 2, 4, 6, 7, and 11 under 35 U.S.C. 103(a) as being obvious over U.S. Patent Application Publication 2006/0063484 (“Proctor”) in view of U.S. Patent No. 5,634,196 (“Alford”). (EX1004, January 30, 2008 Office Action.)

50. According to the examiner, Proctor teaches a broadband wireless repeater containing the requisite transmitter and receiver, (*id.*) while Alford teaches “a controller, which is either preprogrammed or programmable with network information, which controls the screening of data received by said at least one receiver, and either passes, ignores, rejects, redirects, modifies, or kills received data, said controller providing such data screening in order to differentiate between desired and undesired data for network security, network management, or interference mitigation purposes.” (*Id.*) The Examiner also concluded that Alford’s controller performed the requisite “controlling reception of electronic signals or data” and “providing for the collecting, reporting, or storing of network usage, network statistics, or network information.” (*Id.*)

51. On June 24, 2008, the Applicant filed a request for reconsideration, arguing the failure of the Proctor/Alford combination to disclose the claimed inventions. (EX1004, June 24, 2008 Applicant Remarks.)

52. According to Applicant, Proctor “only does frequency translation” and “does no controlling as contemplated by the present invention,” *i.e.* “screen[ing] data which passes through repeater 200 for purposes of network security, management or interference mitigation.” (*Id.*) Further, Applicant argued that Proctor does not disclose “the ability to allow the controller to be programmable with network information, or pre-programmed, in order to control the screening of data that passes through the repeater,” or the “ability to fuse wireless and wireline data together.” (*Id.*) Applicant argued that Alford does not cure these deficiencies, as “[t]he focus of Alford is on an end-user mobile radio that can store logs of activity. The repeaters in Alford do not themselves have the intelligence or processing capabilities that are required by claim 1 of the present application.” According to Applicant, “unlike in the present application, the repeaters in Alford simply pass data, and do not operate or actively interpret the ‘payload’ sent by other users in the wireless network.” (*Id.*)

53. In response, the Office issued a Final Rejection on February 27, 2009, rejecting claims 1-2,4,6-7,11,38-39, and 42-43 under 35 U.S.C. 103(a) as being obvious over U.S. Patent Application Publication 2006/0063484 (“Proctor”) in view of U.S. Patent No. 6,272,640 (“Sokol”).

54. The Examiner found that while Proctor does not teach the requisite controlling functions, Sokol “teaches a controller...which is...either pre-programmed or programmable with network information...which controls the

screening of data received by said at least one receiver and either passes, ignores, rejects, redirects, modifies, or kills received data, said controller providing such data screening in order to differentiate between desired and undesired data...for network security, network management, or interference mitigation purposes...said controller controlling reception of electronic signals or data by said at least one receiver and transmission by said at least one transmitter...said controller further providing for the collecting, reporting, or storing of network usage, network statistics, or network information.” (EX1004, February 27, 2009 Final Rejection.)

55. As a result, Applicant amended claims 1, 2, 4, 18, 38, and 41 to “highlight the broadband wireless repeater's involvement with ultrawideband (UWB) wireless devices in a network (it being understood that the network can include wired links as well).” (EX1004, June 29, 2009 Applicant Remarks.) Applicant argued that the controller, “being in an ultrawideband repeater and performing specified functions,” distinguishes the invention from the prior art. (*Id.*)

56. The claims were then allowed. (EX1004, October 21, 2009 Notice of Allowance.)

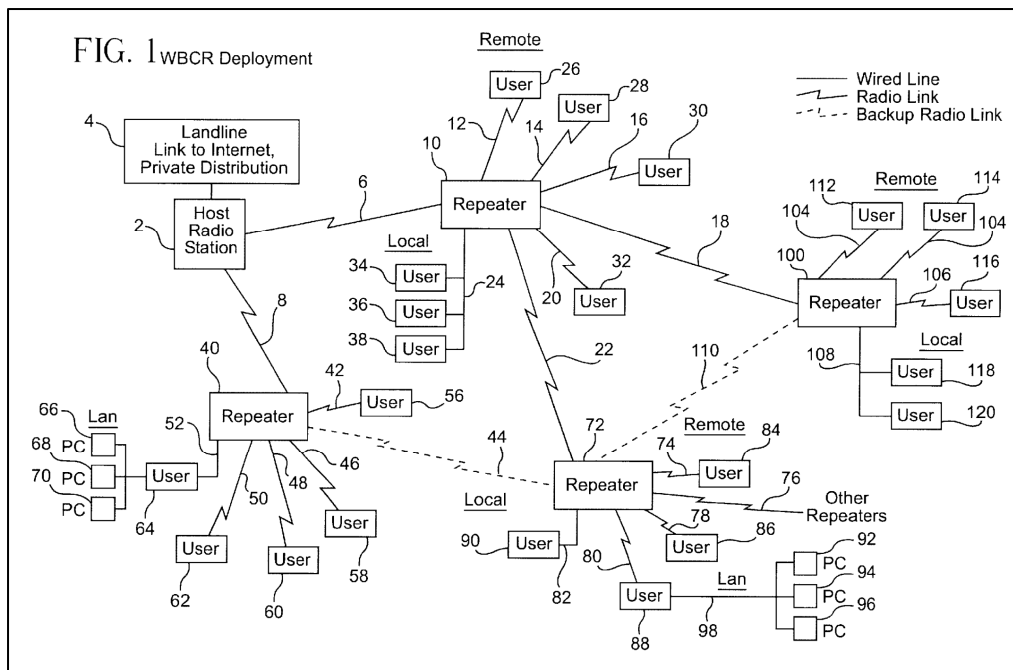
B. Asserted Prior Art

1. Ganz (EX1005)

57. U.S. 6,584,080 (“Ganz”), “*Wireless Burstable Communications Repeater*,” was filed on January 14, 1999, and was published on June 24, 2003. It is

prior art under pre-AIA § 102(a) and § 102(b).

58. Ganz discloses “[a] wireless high speed data communication system having a host radio station connected to a source of data. The host radio station transmits data to a radio repeater that is within a line of sight. The communication system may include numerous repeaters each of which is configured to communicate with each other within a line of sight.” (EX1005, Abstract; emphasis added.)



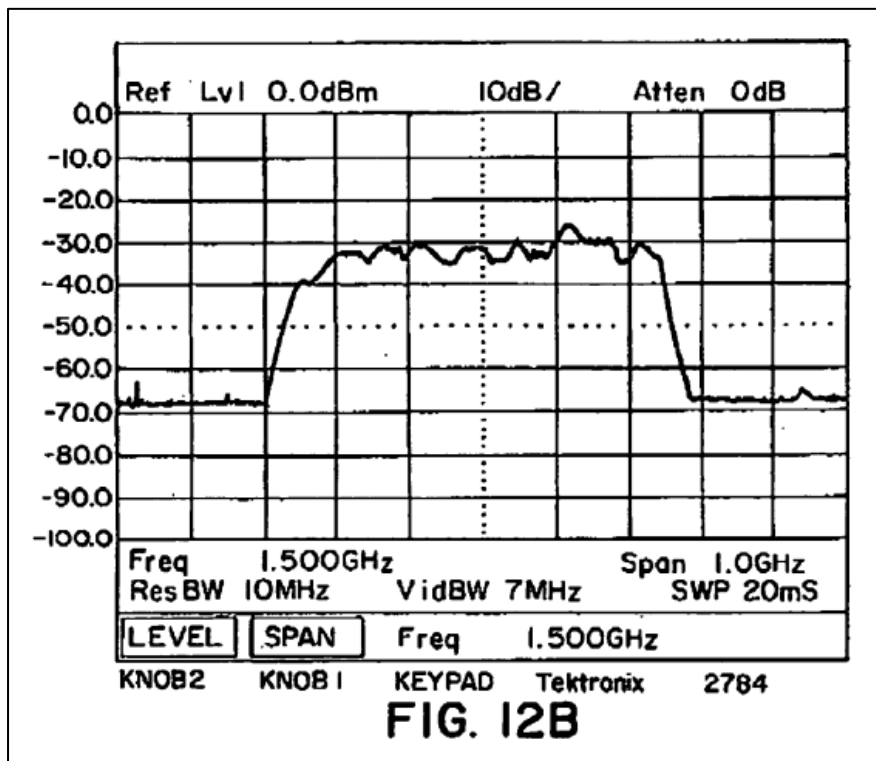
59. Ganz was not before the examiner during prosecution of the '194 patent.

2. Larrick (EX1007)

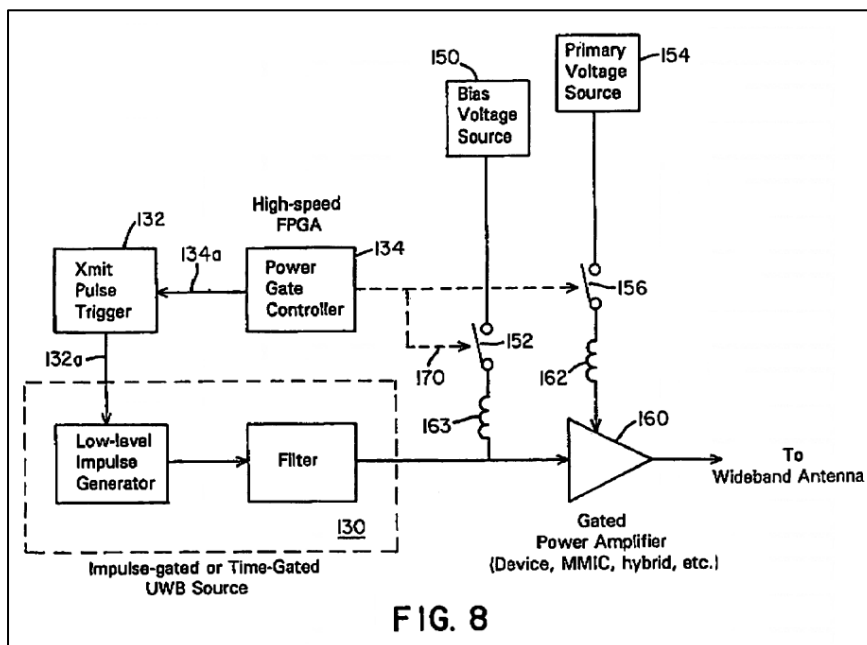
60. U.S. 7,209,523, “*Ultra-wideband Receiver and Transmitter*,” was filed on February 17, 1999, and was published on April 24, 2007. It is prior art under pre-AIA § 102(a).

61. Larrick discloses “[a] waveform-adaptive ultra-wideband (UWB) transmitter and noise-tracking UWB receiver for use in communications, object detection and radar applications.... The UWB transmitter exhibits well defined and controllable spectral characteristics. The UWB transmitter is capable of extremely high pulse repetition frequencies (PRFs) and *data rates in the hundreds of megabits per second* or more, frequency agility on a pulse-to-pulse basis allowing frequency hopping if desired, and extensibility from below HF to millimeter wave frequencies.” (EX1007, Abstract)

62. In one described embodiment and as shown in FIG. 12B, “[a]n UWB transmitter using a low-level impulse generator and microwave bandpass filter was constructed which generated an L-band UWB signal at a center frequency of 1.5 GHz, *with a 3 dB down bandwidth of 400 MHz.*” (EX1007, 10:61-64.)



63. FIG. 8 shows the use of an amplifier 160 that amplifies the output of UWB source 130. (EX1007, 11:36-12:9.)



64. Larrick was not before the examiner during prosecution of the '194 patent.

3. Engels (EX1008)

65. Patent Cooperation Treaty Application WO 03/058850 ("Engels") was filed on January 6, 2003 and published on July 17, 2003. It is prior art under pre-AIA § 102(a).

66. Engels discloses "a wireless radio telecommunications system, an indoor-outdoor coupling device for coupling between a telecommunications network, such as a wireless or cable network and an indoor wireless network, especially a LAN, and a method for providing improved communications between the inside and outside of a building." (EX1008, 1:5-8.)

67. Engels was not before the examiner during prosecution of the '194 patent.

4. Perlman (EX1011)

68. U.S. Patent Application Pub. No. 2004/0160928 ("Perlman") was filed on May 9, 2003. It is prior art under pre-AIA § 102(e).

69. Perlman discloses "[a] network for wireless transmission of data" which "includes a source access point, a destination device and a plurality of wireless repeaters that provide a transmission link between the source access point and the destination device. ." (EX1011, Abstract.) Perlman was not before the examiner

during prosecution of the '194 patent.

5. Roese (EX1012)

70. U.S. Pat. No. 7,295,556 was filed on February 28, 2003. It is prior art under pre-AIA § 102(e). Roese discloses a “method for location discovery in a data network” where a “router” “receiv[es] ... connection information from a neighboring network device and determine[es] a physical location” of that router. (EX1012, Abstract.) Roese was not before the examiner during prosecution of the '194 patent.

V. PERSON OF ORDINARY SKILL

71. A person of ordinary skill in the art as of the asserted priority date (“POSITA”) had at least a Bachelor of Science in electrical engineering or a similar field and at least two years of practical experience in the field of wireless communication applications. More education can supplement for less practical experience, and vice versa.

72. I met this level by the priority date of the '194 patent.

VI. CLAIM CONSTRUCTION

73. I have been informed by counsel that the Patent Trial and Appeal Board (“PTAB”) applies the same claim construction standard used in district courts, where the claims are given their ordinary meaning as understood by one skilled in the art at the time of the invention, informed by the claim language itself, the specification,

and the prosecution history. I also understand that “extrinsic evidence”—i.e., evidence other than the patent and prosecution history—can be relevant in determining how a POSA would understand terms of art used in the claims. I have been informed, however, that extrinsic evidence may not be used to contradict the meaning of the claims as I described in the intrinsic evidence—i.e., evidence in the claim language itself, the specification, and the prosecution history.

74. It is my understanding that no express constructions are required to find the '194 patent claims invalid. As relevant, I give my opinions under the plain meaning of certain terms in the analysis for the presented Grounds. I understand that the challenged claims have not been construed in other proceedings.

VII. GROUND 1: Ganz in Combination with Larrick Renders Claims 1-5, 9-16, 18-19, and 21-25 Obvious²

A. Overview and Motivation to Combine

75. As discussed in more detail below, Ganz teaches a wireless networking device that receives wireless data, processes that wireless data, and transmits wireless data. Ganz uses a wireless burstable communications repeater. (EX1005, Abstract.) Larrick similarly teaches a wireless networking device that contains an

² Unless noted otherwise, all emphases in quotes and annotations to figures from prior art references are added.

ultra-wideband transmitter and receiver, with data rates of at least 100 megabits per second and bandwidth between 100 and 500 MHz.

76. A POSITA would have been motivated to incorporate the teachings of Larrick to improve the Ganz system by allowing it to transmit and receive data using wider frequency bands and at higher data speeds. Ganz teaches a wireless repeater system for wirelessly receiving and transmitting data, and Larrick provides additional detail on how to use ultra-wide band frequency bandwidths and data speeds to wirelessly transfer data. The teachings of Ganz are complementary to Larrick, and a POSITA would have recognized that Larrick's teachings could be easily implemented into Ganz without technical challenge and with a reasonable expectation of success.

77. Ganz addresses wireless burstable communications repeaters for creating network infrastructures while Larrick discloses an ultra-wideband (UWB) transmitter and receiver system with controllable spectral characteristics. Ganz, which discloses efficient spectrum utilization in a shared wireless environment, would benefit from Larrick's waveform-adaptive UWB transmitter which provides "well defined and controllable spectral characteristics." (EX1007, Abstract.) These technologies address different aspects of wireless communication that could naturally work together including Larrick's use of wider frequency bandwidths than those disclosed in Ganz.

78. The “wireless high speed data communication system” of Ganz (EX1005, Abstract), would benefit from Larrick’s UWB technology which enables even faster data speeds such as “extremely high pulse repetition frequencies (PRFs) and data rates in the hundreds of megabits per second” (EX1007, Abstract).

79. Larrick’s UWB technology, which offers waveform adaptation that could improve signal propagation in challenging environments, would be beneficial to Ganz which addresses communication problems where “extended coverage areas are desired and line-of-sight conditions do not exist.” (EX1005, 1:62-63.) Like Ganz, Larrick arises in the field of wireless communication networks and is addressed to increasing transmitting information wirelessly. (EX1007, Abstract.)

80. Enhanced Modulation Techniques

81. The combination would particularly benefit from the complementary modulation approaches described in both patents. Larrick introduces sophisticated UWB signal generation methods that would significantly enhance the Ganz system:

- Larrick’s “waveform-adaptive” approach provides precise control over UWB signal characteristics through an “impulse-gated oscillator” that allows “precise control of radiated frequency” governed by “the choice of oscillator which has a known stable frequency.” (EX1007, 5:62-65.)
- Larrick supports advanced modulation including phase modulation where “oscillator phase may also be controlled to generate an additional phase

modulation.” (EX1007, 5:67-6:1.)

- Larrick enables “frequency agility on a pulse-by-pulse basis allowing frequency hopping if desired” (EX1007, Abstract), which would enhance the frequency hopping capabilities already present in Ganz’ system where “three different hopping sequence sets are established with twenty-six (26) hopping sequences per set.” (EX1005, 7:21-23.)
- Larrick describes a “time-gated oscillator” approach using high-speed switches to create “a sub-nanosecond microwave burst” with controllable bandwidth. (EX1007, 15:1-9.)

82. These advanced modulation capabilities would pair effectively with Ganz’ network protocols, particularly the “burstable packet multi access/collision avoidance (BPMA/CA) protocol” (EX1005, 5:16-17) that Ganz uses to improve network efficiency.

83. Multi-User Capability and Spectral Efficiency

84. Ganz identifies inefficient spectrum utilization in conventional systems due to "polling" which leads to "time slots [going] unused when a polled radio has no data to transfer.” (EX1005, 1:58-60.) Combining this with Larrick’s ability to control “center frequency and bandwidth” (EX1007, 6:14-15) on a “pulse-by-pulse basis” (EX1007, 5:52) would create an advanced multiple access scheme where:

- Different users could be assigned different UWB center frequencies,

enhancing Ganz' ability to support "multiple segments to be installed in a common geographical area without interfering with each other." (EX1005, 8:17-18.)

- The network could dynamically allocate bandwidth based on user requirements, improving on Ganz' goal of providing "high communication speeds" in a "multi-user (access) environment." (EX1005, 2:41-42.)
- Larrick's "well defined and controllable spectral characteristics" (EX1007, Abstract) would enhance Ganz' ability to segment networks where "data bandwidth can be increased beyond 1.5 Mb/s for higher data transfer rate." (EX1005, 8:39-40.)

85. Link Quality Assessment and Power Efficiency

86. Ganz describes sophisticated link testing where "control packets" with "sequence numbers" allow the system to "know whether packets were lost either on the way to the destination, or on the way back to the source node" (EX1005, 12:28-31). This capability would pair effectively with Larrick's adaptable UWB parameters to create a system that could dynamically adjust transmission parameters based on link quality.

87. Additionally, Larrick's "gated power amplifier" with "the unique feature of high power efficiency as the power amplifier is only turned on for approximately the duration of the UWB pulse" (EX1007, 6:42-45) would be

particularly valuable in Ganz' repeater network, especially for remote installations.

88. Data Rate Advancement and Industry Trends

89. At the time of the '194 patent, a significant industry trend was toward higher data rates in wireless communication systems. Ganz' system specifically aims to overcome the "reduction of throughput by a factor of two" that occurs in half-duplex systems (EX1005, 1:19-20) and discusses achieving "information throughput in each segment is preferably at least 1.5 Mb/s, equal to a full dedicated T-1 line rate." (EX1005, 8:24-26.) However, Ganz acknowledges bandwidth limitations within specific frequency bands, noting that "with an 11-bit modulation sequence, a transmission is spread over a 20 MHz bandwidth." (EX1005, 8:26-27.)

90. Larrick directly addresses these limitations by providing technology that enables "data rates in the hundreds of megabits per second or more" (EX1007, Abstract) and explicitly states that prior UWB systems had limitations that prevented higher data rates. (E.g., EX1007, 5:41-44.) Larrick's UWB system operates with bandwidths substantially greater than those mentioned in Ganz, with examples showing bandwidths of "400 MHz" (EX1007, 10:63-64) and "over 2 GHz." (EX1007, 15:41-42.)

91. These significant improvements in data rate capabilities – from Ganz' 1.5 Mb/s to Larrick's "hundreds of megabits per second" – represent precisely the kind of technological advancement that would motivate a POSITA to combine these

references. The substantially increased bandwidth of Larrick's UWB system (400 MHz and greater compared to Ganz' 20 MHz) would directly enable these higher data rates.

92. The combination of Ganz and Larrick would have a reasonable expectation of success. Larrick provides technical details for its ultra-wideband transmitter and receivers, explaining how they can operate at higher bandwidths and data rates. It would have been well-within the skill of an ordinary artisan to implement Larrick's teachings into Ganz' repeater systems.

93. In the analysis below, the combined prior art system will be referred to as Ganz/Larrick.

B. Limitation-By-Limitation Analysis

1. Claim 1

a) 1[pre]: A broadband wireless repeater, comprising:

94. To the extent the preamble is limiting, Ganz discloses this limitation. Ganz's invention "relates generally to a radio communications repeater, and more particularly relates to a radio communications repeater system for high-speed data communication which enables multiple users to access a common geographically distributed radio channel. (EX1005, 1:7-12). Ganz further explains that "[t]he radio/data link element circuits" within its wireless burstable communications repeater (WBCR) "can incorporate an IEEE 802.11 specification, the disclosure of

which is incorporated herein by reference, which calls for two different physical layer implementations: frequency hopping spread spectrum (FHSS) and direct sequence spread spectrum (DSSS).” (EX1005, 7:12-16.)

95. To the extent PO argues that 1[pre] is not disclosed by Ganz, it is likewise expressly disclosed by Larrick, and a POSITA would have been motivated to modify Ganz’s system to include Larrick’s teachings for the reasons discussed in Section VII.A. Larrick discloses “[a] waveform-adaptive ultra-wideband (UWB) transmitter and noise-tracking UWB receiver for use in communications, object detection and radar applications.” Larrick also claims “[a] communication system utilizing an ultra-wideband (UWB) transmitter” (EX1007, 24:52-53) and “[a] method of communicating data by transmitting and detecting an ultra wideband UWB pulse.” (*id.*, 27:17-18).

96. Thus, as further discussed in the below limitations, Ganz/Larrick discloses a broadband wireless repeater or relay.

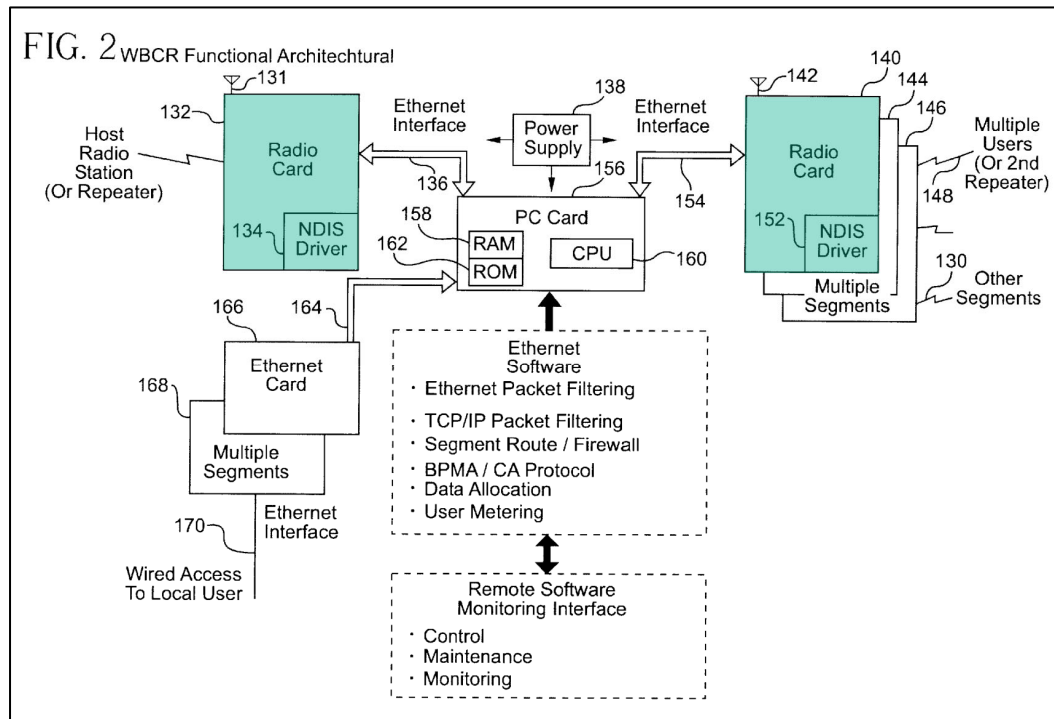
b) 1[a]: at least one receiver for receiving electronic signals at least some of which are sent by one or more ultrawideband wireless devices in a network, and

97. Ganz/Larrick discloses this limitation.

98. “at least one receiver for receiving electronic signals”

99. Ganz discloses a wireless burstable communications repeater (WBCR) that includes a first transceiver circuit 132 and a second transceiver circuit 140.

(EX1005, 3:64-4:21.) A block diagram of a WBCR functional architecture is illustrated in FIG. 2 including the first and second transceiver circuits. (EX1005, 3:64-4:21.)



100. Ganz describes that “[t]he WBCR functions, such that the data packets coming from the user side, are **received** by the second radio transceiver circuit 140.” (EX1005, 4:22-24.) Further, the second radio transceiver circuit 140 “provides multiple radio frequency access to remotely distributed users and/or other WBCRs.” (EX1005, 4:9:12.)

101. Additionally, Ganz explains that the first radio transceiver circuit 132 “provides the radio frequency link to a host radio station and, optionally, to one or more repeaters.” (EX1005, 4:8-12.) During a full data stream transfer, data packets

can be “*receiv[ed]*...from the host radio station” by the first radio transceiver circuit 132 before being “transmitted to the user” via the second radio transceiver circuit 140. (EX1005, 4:30-35.)

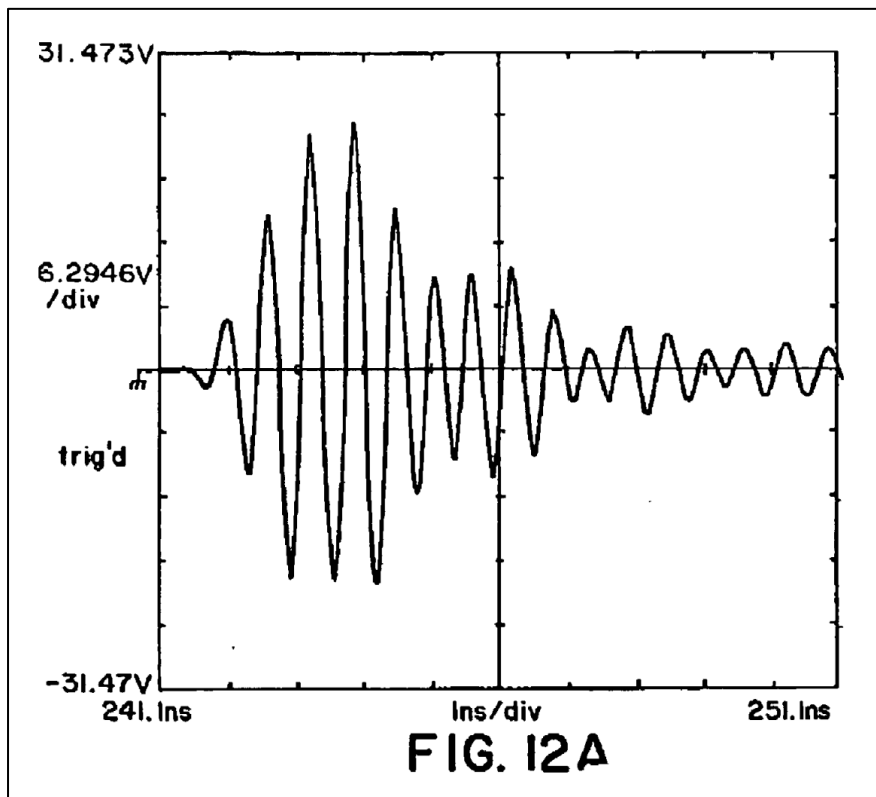
102. Thus, Ganz discloses at least one transceiver for receiving electronic signals.

103. “at least some of which are sent by one or more ultrawideband wireless devices in a network”

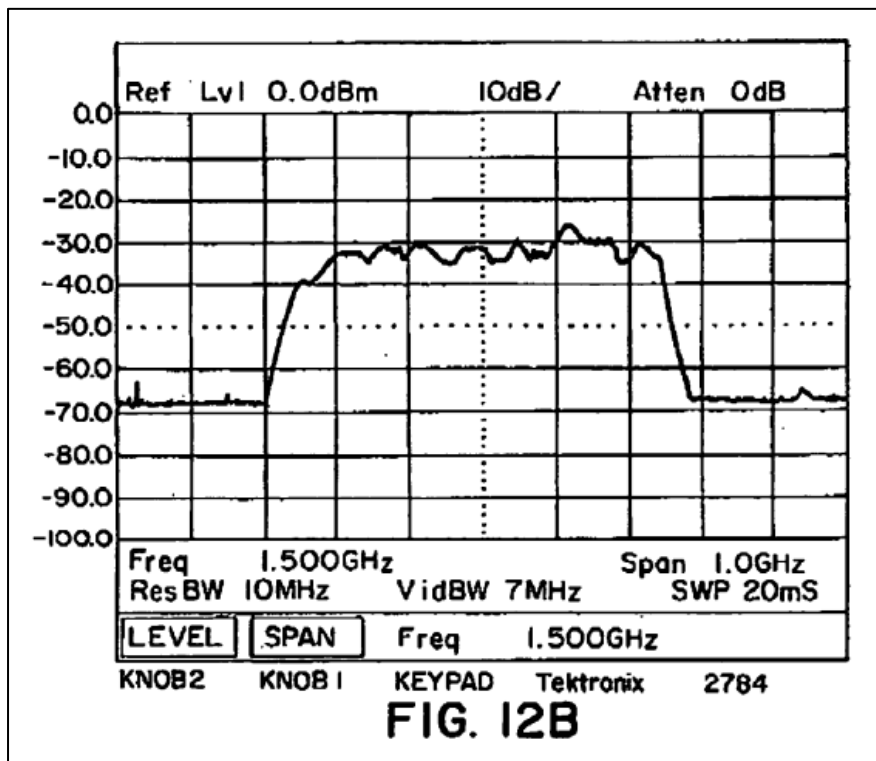
104. While Ganz does not expressly disclose that its transceivers receive signals from ultrawideband wireless devices, Larrick discloses communication with ultrawideband wireless devices, and a POSITA would have been motivated to modify Ganz’s system to include Larrick’s teachings for the reasons discussed in Section VII.A. According to the ’194 patent specification, “ultrawideband” is defined specifically as “any type of electromagnetic signal that have an instantaneous or overall occupied bandwidth of 100 MHz or more and that are used to communicate or to position-locate between two or more devices.” (EX1001; 3:57-60.) Thus, a POSITA would have understood this claim limitation to require a receiver to receive signals that “have an instantaneous or overall occupied bandwidth of 100 MHz or more.” Larrick discloses a transmitter and receiver using this bandwidth and as discussed above, a POSITA would have been motivated to combine Ganz and Larrick.

105. Larrick “relates to the field of *ultra-wideband communication systems*. More particularly, [Larrick] relates to the controlled transmission and reception of ultra-wideband electromagnetic pulses.” (Ex. 1007, 1:21-24) Larrick discloses “UWB transmitters which generate UWB signals having controllable spectral characteristics.” (*Id.*, 9:21-23) “[U]nlike direct high-power impulse excitation of an antenna as in conventional UWB transmitters, low-level impulse excitation of bandpass filter 102 provides complete control over all aspects of the spectral emissions of the UWB transmitter. This is because the spectral emissions are determined exactly by the characteristics of bandpass filter 102, for instance by the center frequency, bandwidth, out of band rejection and skirt responses.” (*Id.*, 11:26-35.)

106. In one described embodiment and as shown in FIG. 12A, “[a]n UWB transmitter using a low-level impulse generator and microwave bandpass filter was constructed which generated an L-band UWB signal at a center frequency of 1.5 GHz, *with a 3 dB bandwidth of 400 MHz.*” (EX1007, 10:61-64.)

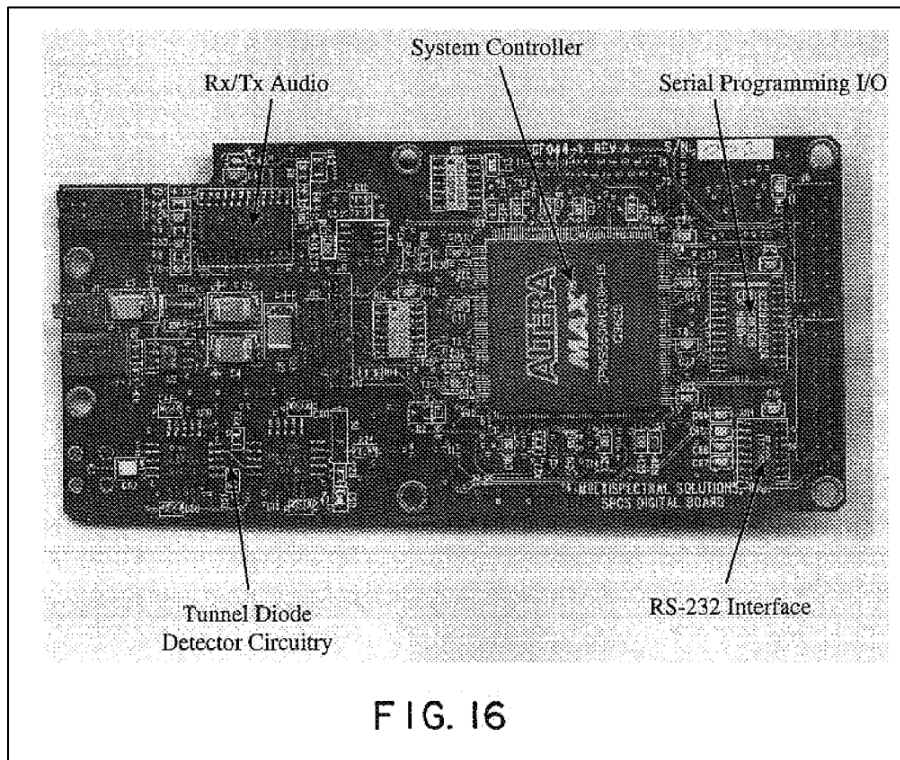


107. FIG. 12B shows the frequency spectrum of the UWB signal shown in FIG. 12A. “The particular filters used were L-band bandpass filters, with a center frequency of 1.5 GHz, *a 1 dB bandwidth of 400 MHz, a 3 dB bandwidth of 500 MHz*, rejection at 1 GHz of greater than 30 dB down.” (*Id.*, 10:65-11:4.)



108. Furthermore, Larrick teaches that a UWB receiver and/or transceiver operates at the same bandwidth and data rate. Larrick is directed to “waveform-adaptive ultra-wideband (UWB) transmitter and noise-tracking UWB receiver for use in communications.” (*Id.*, Abstract.) Thus, a POSITA would understand that Larrick’s disclosure of a UWB receiver receives any signal generated by the low-level impulse generator UWB transmitter discussed above. FIG. 16, “a photograph of a circuit board of a transceiver utilizing the present invention” (*id.*; 9:7-8) “shows the UWB receiver imbedded in a full duplex, voice/data ultra wideband transceiver. The RF section of this particular unit (lower left hand side) is wideband from a few MHz to beyond 4 GHz. Tunnel diodes with adequate response characteristics to 26

GHz and beyond are currently available, and thus the ***UWB receiver*** can readily accommodate a wide variety of center frequencies between a few MHz upwards toward 26 GHz.” (*Id.*; 21:54-61)



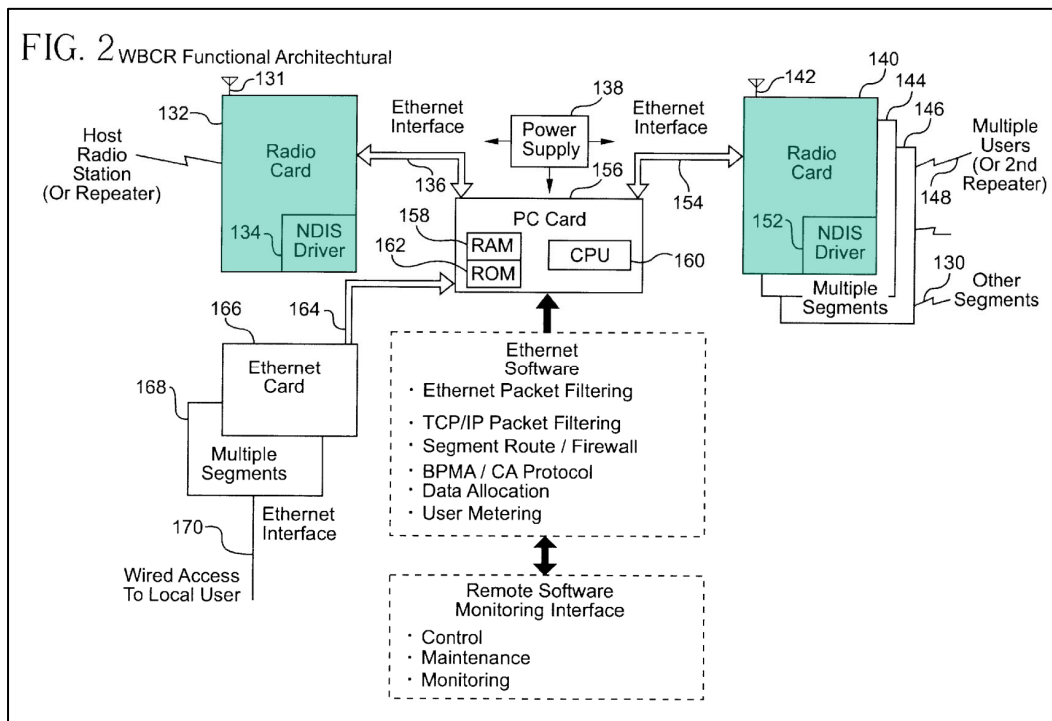
109. A POSITA would have understood that the ultra-wideband transmitter on the same circuit board as the ultra-wideband receiver would be designed or calibrated to transmit transmissions to the ultra-wideband receiver of the transceiver. Larrick describes and shows the calibration of the receiver. (EX1007, FIG. 15 and 19:35-21:12.) In the object detection applications described in Larrick, it would be advantageous if not required that the transmitter have the same frequency bandwidth as the receiver. Larrick discloses a transceiver with the claimed data rates and as

discussed above, a POSITA would have been motivated to combine Ganz and Larrick. In particular, Larrick discloses that its ultra-wideband transceiver is capable of “data rates in the *hundreds of megabits per second* or more, frequency agility on a pulse-to-pulse basis allowing frequency hopping if desired, and extensibility from below HF to millimeter wave frequencies.” (EX1007, Abstract.)

- c) **1[b]: at least one transmitter for transmitting received, modified, or stored electronic signals or data, wherein said at least one receiver and at least one transmitter may be separate components or be combined as a transceiver, and wherein said at least one receiver and at least one transmitter may be dedicated receive only and transmit only or may function alternatively as a receiver and as a transmitter; and**

110. Ganz/Larrick discloses this limitation.

111. As described above, Ganz discloses a wireless burstable communications repeater (WBCR) containing at least two transceivers shown in FIG. 2. (EX1005, 3:64-4:21.)



112. Ganz explains that the first radio transceiver circuit 132 “provides the radio frequency link to a host radio station and, optionally, to one or more repeaters.” (EX1005, 4:8-12.) During a full data stream transfer, data packets can be “receiv[ed]...from the host radio station” by the first radio transceiver circuit 132 before being “*transmitted* to the user” via the second radio transceiver circuit 140. (EX1005, 4:30-35.)

113. Additionally, Ganz describes that “[t]he WBCR functions, such that the data packets coming from the user side, are received by the second radio transceiver circuit 140... before being *retransmitted* by the radio transceiver circuit” to the host radio station. (EX1005, 4:22-26.) Further, the second radio transceiver circuit 140 “provides multiple radio frequency access to remotely distributed users and/or other

WBCRs.” (EX1005, 4:9:12.) Further, as discussed above, both the first and second transceiver circuit in Ganz are capable of both transmitting and receiving. Thus, Ganz discloses multiple transceivers that may function alternatively as a receiver and a transmitter.

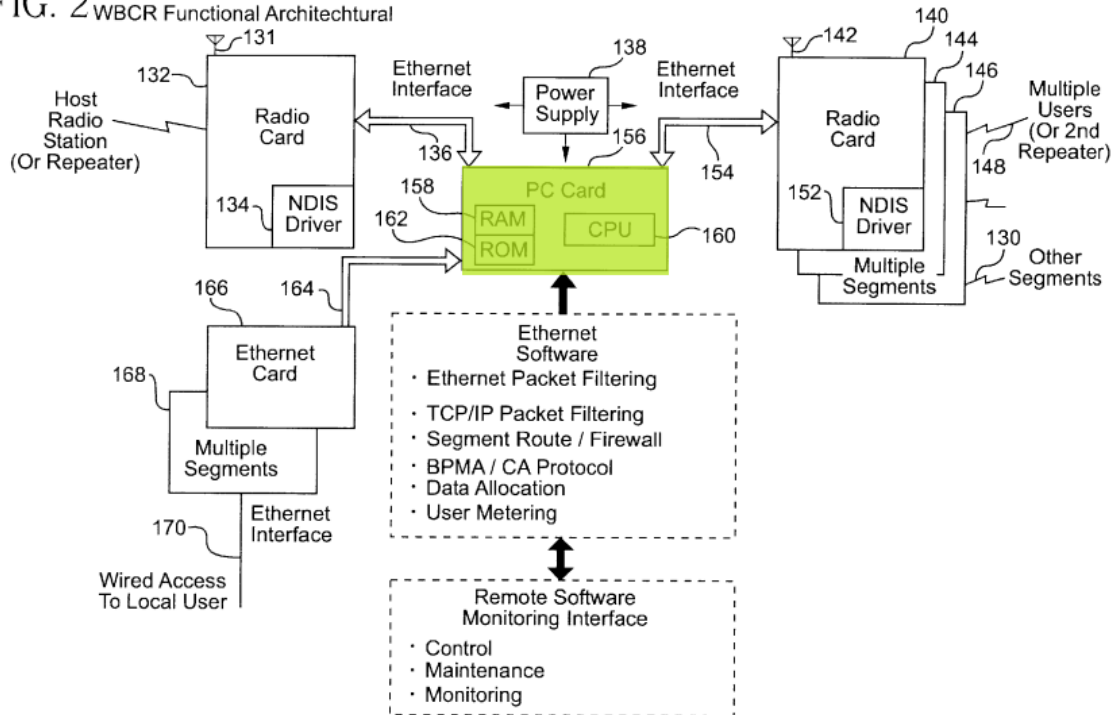
114. To the extent Patent Owner argues that this limitation requires non-simultaneous transmission and reception, Ganz describes that “the present invention [] provide[s] a radio communications repeater which is capable of full data rate transfers in *half-duplex systems*.” (EX1005, 2:17-19.) A POSITA would understand that half-duplex refers to data transmission in one direction at a time, where reception and transmission do not occur simultaneously.

d) 1[c]: a controller, which is either pre-programmed or programmable with network information which at least identifies said one or more ultrawideband wireless devices,

115. Ganz/Larrick discloses this limitation.

116. Ganz discloses that its WBCR contains a “computer circuit 156” that “*performs the controlling functions* within the WBCR and includes the processor **160** (e.g., 486 CPU or equivalent), the RAM circuit **158** and the ROM circuit **162**.” (EX1005, 4:15-21.)

FIG. 2 WBCR Functional Architectural



117. Ganz describes, as part of its capacity management processes, that “[t]he WBCR may also be segregated into multiple tiers or layers when a segment on a user end approaches capacity.” (EX1005, 5:33-46.) This is accomplished with the use of “additional radio transceiver circuits on the user side of the WBCR, *each with its own unique IP address, Ethernet and radio ID code.*” *Id.* Ganz further describes that basic maintenance functions for ensuring efficient network utilization can be performed remotely, such as “adding new users and *user ID's*, and updating user priority codes.” (EX1005, 5:58-60.)

118. Thus, Ganz describes that its WBCR is pre-programmed or programmable with network information which identifies user devices.

- e) **1[d]: which controls the screening of data received by said at least one receiver, and either passes, ignores, rejects, redirects, modifies, or kills received data,**

119. Ganz discloses that its WBCR includes a “firewall circuit 222,” which can “read IP addresses and protect the gates and authorize access by users,” and also “be programmed to pass through what ever services are required by the user without interference.” (EX1005, 10:33-42.) As was known with firewalls, they “can also block traffic from the Internet to the internal network, but permit internal users to communicate with the Internet.” (*Id.*; *see also* 13:2-4 (“The firewall 268, drops packets that don’t meet its rules for valid traffic.”)) A POSITA would have understood that, in other words, a firewall processes received data packets by inspecting their origin (*e.g.* Internet vs. internal) or the targeted service and blocking or allowing the data packet.

120. Ganz also discloses that the WBCR performs “IP filtering,” which “allows for certain data packets to be blocked, *processed* according to QoS policies and used to assess and sort according to traffic load on each WBCR radio segment.” (*Id.*, 11:45-48.) IP filtering also “automatically drops (destroys) incorrectly formed packets or those which the system has been programmed to reject.” (*Id.*, 12:70-13:2.)

121. Thus, a POSITA would understand that the controller in Ganz’s WBCR “controls the screening of data received by said at least one receiver, and either

passes, ignores, rejects, redirects, modifies, or kills received data.”

- f) **1[e]: said controller providing such data screening in order to differentiate between desired and undesired data for network security, network management, or interference mitigation purposes for said network,**

122. Ganz/Larrick discloses this limitation.

123. Ganz describes software controlled radio/data communications that perform “[m]onitoring and control of the WBCR.” (EX1005, 5:47-48.) These monitoring and control functions are valuable because “[t]hroughput speeds and data packet drop rates can be measured periodically and corrective steps taken to adjust the radio parameters remotely.” (EX1005, 5:51-54.) Further, “[t]he controlling functions implemented as part of the BPMA/CA protocol provide for remote dynamic load balancing among the users, and individually enhancing or reducing the allowable user packet size requests, thereby ensuring *efficient network utilization* for all users.” (EX1005, 5:54-58.) Additionally, “[b]asic maintenance functions are performed remotely as well, such as adding new users and user ID's, and updating user priority codes.” (EX1005, 5:58-61).

124. Ganz further discloses that “[t]he radio/data link element circuit 190 preferably employs spread spectrum transmission, either using frequency hopping or direct sequence coding schemes,” in order to “decrease[] the chances of radio frequency *jamming/interference*, detection and interception of radio frequencies”

as well as “provide[] for the capability of *encryption*.” (EX1005, 7:6-12.)

125. Thus, Ganz discloses that its controller provides data screening for network security, network management, and interference mitigation purposes for said network.

g) 1[f]: said controller controlling reception of electronic signals or data by said at least one receiver from said one or more ultrawideband wireless devices and transmission by said at least one transmitter to said one or more ultrawideband wireless devices,

126. A POSITA would understand that under the plain meaning of “controller” and “controlling,” this limitation only requires that the controller control the functions of the receiver and transmitter. (EX1002, ¶126; *see* EX1001, 13:4-10 (“The controller has connection with the other components of the transceiver architecture, and facilitates instructions that may be read or written between each of the components over a bus (for example, I2C bus or new higher speed busses).”) Ganz describes such a controller, as discussed in limitation 1[c]. (EX1005, 4:15-21 (“The computer circuit 156, performs the controlling functions within the WBCR”), 4:36-44 (“The WBCR ‘reads’ each data packet in transit and directs it to the appropriate segment (i.e., out to the user radio link side, or to a use rlocal to the repeater side via the Ethernet card).”). To the extent Patent Owner argues “controlling” further requires a filtering function, as discussed in limitation 1[d],

Ganz discloses selectively screening received data and selectively transmitting data.

- h) **1[g]: said controller further providing for the collecting, reporting, or storing of network usage, network statistics, or network information for said network.**

127. Ganz/Larrick discloses this limitation. Ganz describes software-controlled radio/data communications that perform “*[m]onitoring and control of the WBCR.*” (EX1005, 5:47-48.) As such, “[t]hroughput speeds and data packet drop rates can be measured periodically and corrective steps taken to adjust the radio parameters remotely.” (EX1005, 5:51-54.) “The controlling functions implemented as part of the BPMA/CA protocol provide for remote dynamic load balancing among the users, and individually enhancing or reducing the allowable user packet size requests, thereby ensuring efficient network utilization for all users.” (EX1005, 5:54-58.) Additionally, “[b]asic maintenance functions are performed remotely as well, such as adding new users and user ID's, and updating user priority codes.” (EX1005, 5:58-61).

128. Ganz further describes an embodiment of its WBCR containing a network control module (NCM) including “the processor 204, the DRAM circuit 208, and the flash memory circuit 206,” which “perform per-packet processing, examination of data packets and *maintain WBCR statistics.*” (EX1005, 6:43-48.) The flash memory 206 “stores firmware, *configuration data and statistics.*”

(EX1005, 9:11-12.) The processor 204 also “*collects and maintains WBCR statistics.*” Thus, the NCM is able to handle “diagnostics and error handling, WBCR configuration, implementing the Spanning Tree Protocol, in-band and out-of-band management, statistics reporting, and data prioritization protocols.” EX1005, 9:32-36.)

129. Additionally, Ganz discloses a simple network management protocol (SNMP) circuit 214 that “uses agent software embedded within each network device to collect *network traffic information and device statistics.*” (EX1005, 9:63-65.)

130. Ganz thereby discloses that its controller provides for the collecting, reporting, or storing of network usage, network statistics, or network information.

2. Claim 2: The broadband repeater of claim 1 wherein said network information includes one or more IDs for each of the components to be used in said network, and IDs for users permitted to be used in said network.

131. Ganz/Larrick discloses this limitation. Ganz describes, as part of its capacity management processes, that “[t]he WBCR may also be segregated into multiple tiers or layers when a segment on a user end approaches capacity.” (EX1005, 5:33-46.) This is accomplished with the use of “additional radio transceiver circuits on the user side of the WBCR, *each with its own unique IP address, Ethernet and radio ID code.*” *Id.* Ganz further describes that basic maintenance functions for ensuring efficient network utilization can be performed

remotely, such as “adding new users and *user ID's*, and updating user priority codes.” (EX1005, 5:58-60.) Thus, Ganz describes that its WBCR collects network information including IDs for each of the components to be used in said network and IDs for users permitted to be used in said network.

3. Claim 3: The broadband repeater of claim 1 wherein said network information includes one or more of a specified coverage area for wireless devices to permit use of said network, and specified applications permitted to be used in said network.

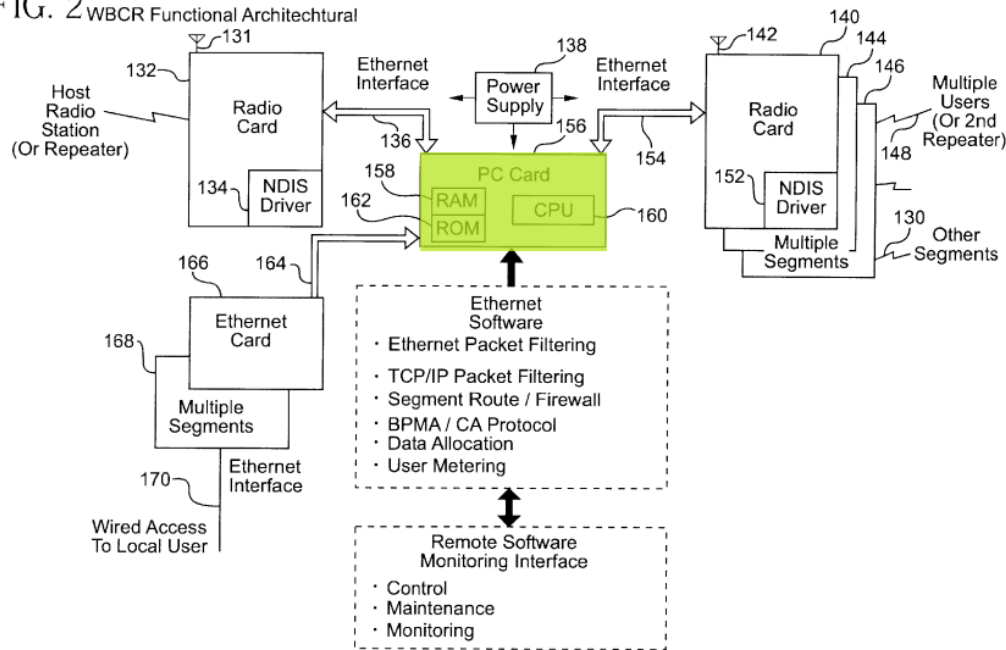
132. Ganz/Larrick discloses this limitation. Ganz discloses a firewall circuit 222, which can “read IP addresses and protect the gates and authorize access by users,” but also can be “programmed to pass through what ever services are required by the user without interference.” (EX1005, 10:32-37.) Thus, Ganz discloses that its WBCR collects information about specified applications permitted to be used in said network, i.e. any of the “services required by the user” that should be passed through without interference.

4. Claim 4: The broadband repeater of claim 1 further comprising a buffer memory for storing received or to be transmitted electronic signals for processing by said controller.

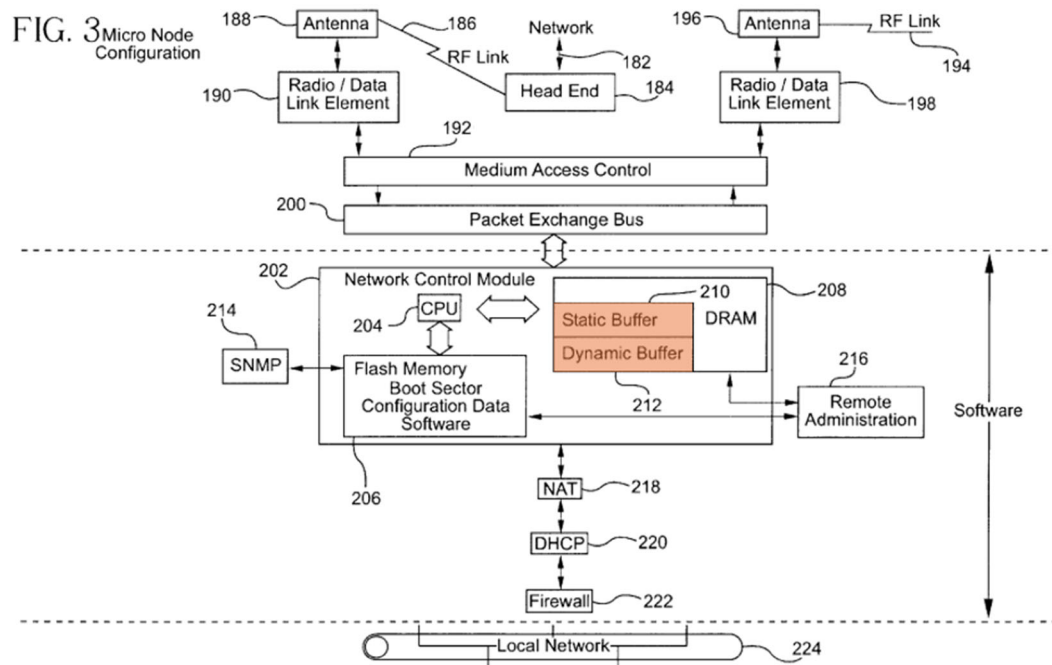
133. Ganz/Larrick discloses this limitation. Ganz discloses a “computer circuit 156” that contains the “processor 160,” the “RAM circuit 158,” and the “ROM circuit 162.” When information is received by the WBCR, “the data packets

coming from the user side, are received by the second radio transceiver circuit 140 and then *temporarily buffered in the RAM circuit 158* before being retransmitted by the radio transceiver circuit 4 to the host radio station.” (EX1005, 4:22-26.)

FIG. 2 WBCR Functional Architectural



134. In another embodiment shown in FIG. 3, Ganz discloses a WBCR containing “a static buffer circuit 210” and “a dynamic buffer circuit 212.” (EX1005, 6:14-16.) By including both the static and dynamic buffer circuit, “buffers for each port or segment can be divided as needed when congested points come and go in the WBCR.” (EX1005, 9:49-52.) This buffering scheme “provides high levels of reliability during periods of peak data packet demand.” (EX1005, 9:52-53.)

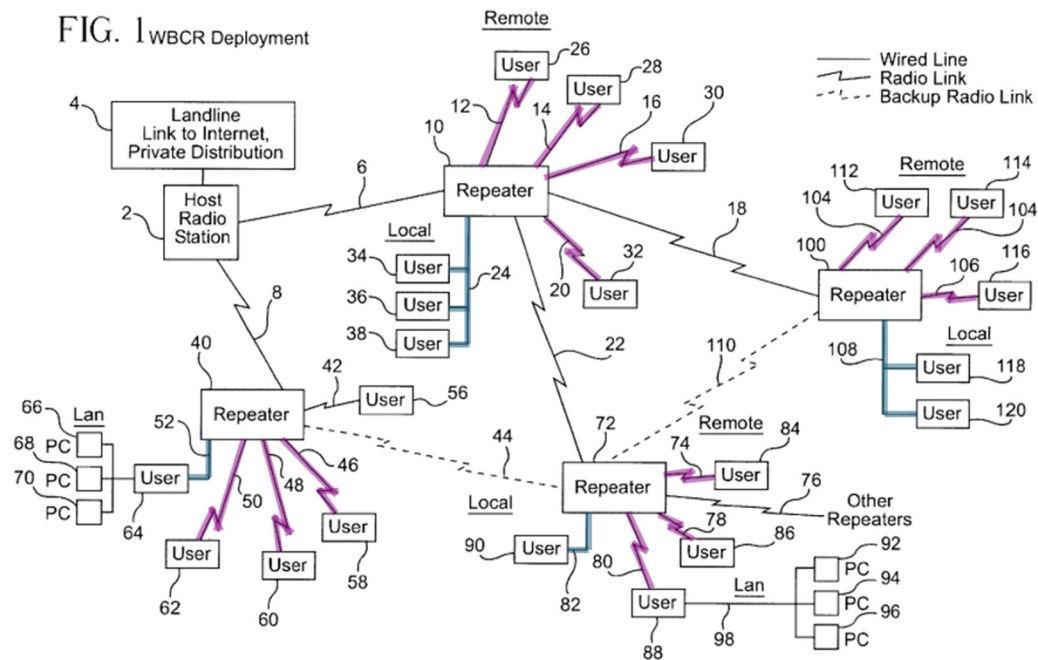


5. **Claim 5: The broadband repeater of claim 1 wherein either or both said at least one receiver and said at least one transmitter respectively receives or transmits electronic signals by either or both a wireless or a wired link.**

135. Ganz/Larrick discloses this limitation. For example, Ganz is directed to a “wireless high speed data communication system,” in which a host radio station transmits data to a wireless communication repeater, which communicates with at least one end user. “The host radio station transmits and receives data to and from at least one wireless communication repeater within line of sight of the host radio station,” thus communicating wirelessly, and “[t]he repeater is configured to communicate with at least one end user by *either a direct electrical connection or a wireless connection.*” (EX1005, 2:46-50.) Ganz further explains that its WBCR

includes “ethernet circuits 166, 168...to *provide wired access* to users locally coupled to the WBCR.” (EX1005, 4:19-21.)

136. Further, in FIG. 1, Ganz depicts user devices being connected to the WBCR via either wired (blue) or wireless (pink) links.



137. Thus, Ganz discloses that its WBCR receives or transmits signals by both a wireless or a wired link.

6. **Claim 9: The broadband repeater of claim 1 where network provisioning information is passed to or pre-programmed with said controller, for purposes of network traffic provisioning, wherein said controller uses said provisioning information to prioritize either or both reception of data and transmission of data to or from said repeater.**

138. Ganz/Larrick discloses this limitation. Ganz discloses that it uses its provisioning information to prioritize both reception and transmission of data to and

from its repeater. For example, Ganz's "quality of service (QoS) 244, includes bandwidth management functions that provide *traffic control of the WBCR*, allowing improved network performance while enforcing traffic flows and other network policies." (EX1005, 10:52-55.) These bandwidth management functions "provide for *control of broadcast traffic*, efficient bandwidth allocation, security within the WBCR environment, and preservation of existing open system interconnection (OSI) layer 3 structures." (EX1005, 10:55-58.) Further, Ganz describes an additional function of the QoS 244, "*dynamic bandwidth throttling technology*," which allows the WBCR to "maximize available bandwidth on backbone connections by throttling open network connections down to the minimum guaranteed bandwidth." (EX1005, 10:58-63.) In doing so, the QoS performs "*prioritization* of data" that gives the WBCR the flexibility to "distinguish between time-sensitive traffic and non-time-sensitive traffic and to give the former higher priority." (EX1005, 11:4-7.)

7. Claim 10: The broadband repeater of claim 1 wherein said transmitter and said receiver have reversible input/output directions.

139. Ganz/Larrick discloses this limitation. Ganz describes that "the present invention [] provide[s] a radio communications repeater which is capable of full data rate transfers in *half-duplex systems*." (EX1005, 2:17-19.) A POSITA would understand that half-duplex communications protocols may implement transceivers

with reversible input/output directions.

140. To the extent PO argues that claim 10 is not disclosed by Ganz, it is likewise expressly disclosed by Larrick, and a POSITA would have been motivated to modify Ganz's system to include Larrick's teachings for the reasons discussed in Section VII.A. Larrick discloses that its UWB transceiver has "high speed operation [that] enables full duplex or two-way transmission and reception of stereo quality voice, video imagery and other data rate critical applications." (EX1007, 17:2-5.) A POSITA would understand that Larrick is describing that its UWB transceivers can operate in either full duplex or half-duplex, as "two-way transmission and reception" is contrasted with "full duplex" and therefore indicates the transmission/reception is not performed simultaneously (*i.e.* half-duplex). A POSITA would have understood that these two-way transmission/reception communications protocols may implement transceivers with reversible input/output directions.

8. Claim 11: The broadband repeater of claim 1 wherein either pre-programmed or programmable network information supplied to said controller is communicated using either a wireless or wired link.

141. Ganz/Larrick discloses this limitation. As discussed above, Ganz's WBCR communicates with a host station via wireless link. *See* claim 5. Further, "[m]onitoring and control of the WBCR is achieved by software controlled radio/data communications, *between a host radio station and the WBCR.*"

(EX1005, 5:47-49.) Thus, pre-programmed or programmable network information supplied to the WBCR is communicated using a wireless link to the host radio station.

9. Claim 12

a) 12[pre]: A broadband wireless repeater, comprising:

142. *See* claim limitation 1[pre].

b) 12[a]: at least one receiver for receiving electronic signals at least some of which are sent by one or more ultrawideband wireless devices in a network, and

143. *See* claim limitation 1[a].

c) 12[b]: at least one transmitter for transmitting received, modified, or stored electronic signals or data, wherein said at least one receiver and at least one transmitter may be separate components or be combined as a transceiver, and wherein said at least one receiver and at least one transmitter may be dedicated receive only and transmit only or may function alternatively as a receiver and as a transmitter; and

144. *See* claim limitation 1[b].

d) 12[c]: a controller which is either pre-programmed or programmable with provisioning information which at least identifies said one or more ultrawideband wireless devices for purposes of network traffic provisioning,

145. *See* claim limitation 1[c] and claim 9.

e) 12[d]: wherein said controller uses said provisioning information to prioritize either or both reception of

data by said at least one receiver and transmission of data by said at least one transmitter to said one or more ultrawideband wireless devices,

146. See claim 9.

- f) 12[e]: said controller controlling reception of electronic signals or data by said at least one receiver and transmission of electronic signals or data by said at least one transmitter to said one or more ultrawideband wireless devices.**

147. See claim limitation 1[f].

- 10. Claim 13: The broadband repeater of claim 12 wherein said provisioning information prioritizes by one or more of network user, type of data being received by said at least one receiver, type of data being transmitted by said at least one transmitter, and the particular type of application being used by one or more users of the network being transmitted by said at least one transmitter.**

148. Ganz/Larrick discloses this limitation. For example, Ganz's "quality of service (QoS) 244, includes bandwidth management functions that provide *traffic control of the WBCR*, allowing improved network performance while enforcing traffic flows and other network policies." (EX1005, 10:52-55.) These bandwidth management functions "provide for *control of broadcast traffic*, efficient bandwidth allocation, security within the WBCR environment, and preservation of existing open system interconnection (OSI) layer 3 structures." (EX1005, 10:55-58.) Further, Ganz describes an additional function of the QoS 244, "*dynamic bandwidth throttling technology*," which allows the WBCR to "maximize available bandwidth

on backbone connections by throttling open network connections down to the minimum guaranteed bandwidth.” (EX1005, 10:58-63.) In doing so, the QoS performs “**prioritization** of data” that gives the WBCR the flexibility to “distinguish between time-sensitive traffic and non-time-sensitive traffic and to give the former higher priority.” (EX1005, 11:4-7.) A POSITA would thereby understand that the QoS is using network provisioning information to prioritize by network user, type of data being received by said at least one receiver, type of data being transmitted by said at least one transmitter, and the particular type of application being used by one or more users of the network being transmitted by said at least one transmitter.

- 11. Claim 14: The broadband repeater of claim 12 further comprising a buffer memory for storing received or to be transmitted electronic signals or data for processing by said controller.**

149. *See* claim 4.

- 12. Claim 15: The broadband repeater of claim 12 wherein either or both said at least one receiver and said at least one transmitter respectively receives or transmits electronic signals or data by either or both a wireless or a wired link.**

150. *See* claim 5.

- 13. Claim 16: The broadband repeater of claim 12 wherein said at least one receiver and said at least one transmitter and said controller are stationary or mobile/portable and are associated with one or more of an AC outlet, a room fixture, a display terminal, a gaming devices, office or home**

equipment, a ceiling fixture, a wall fixture, furniture, or a computer.

151. *See* claim 6.

14. Claim 18: The broadband repeater of claim 12 wherein said provisioning information supplied to said controller is communicated using either a wireless or wired link.

152. *See* claim 11.

15. Claim 19: The broadband repeater of claim 18 wherein said provisioning information is further supplied to said controller by one or more of over-the-air ultrawideband signaling, and wired connections from another device.

153. Ganz/Larrick discloses this limitation. Ganz describes that “[c]ontrol of packet scheduling is performed at the Ethernet level, after the radio encoding has been removed. This enables a repeater controller to select users for a transmission and allocate data packet sizes and numbers for transfer to the users.” (EX1005, 5:11-14.) Thus, information such as user IDs and data packet sizes and numbers are supplied to the controller via a wired (Ethernet) connection to the user device.

154. Ganz further explains, in another embodiment, that “[i]nterface to the network control module (NCM) circuit 202 is achieved by using a network address translation (NAT) circuit 218 at a user end.” (EX1005, 10:5-7.) “The NAT circuit 218 is a feature of many firewalls and routers that allow one IP address to be used for many user machines.” (EX1005, 10:9-12.) In so doing, “[t]he NAT circuit 218, keeps track of MAC addresses associated with translated addresses, re-stamps all

outgoing packets with its own real IP address and an alternate port. Incoming data packets with NAT addresses are translated back into the translated addresses and sent over the network to the user.” (EX1005, 10:14-19.) Thus, the NAT circuit provides network provisioning information to the NCM circuit through a wired connection from the user device.

16. Claim 21: The broadband repeater of claim 12 wherein said transmitter and said receiver have reversible input/output directions.

155. *See* claim 10.

17. Claim 22

a) 22[pre]: A broadband wireless repeater, comprising:

156. *See* claim limitation 1[pre].

b) 22[a]: at least one receiver for receiving electronic signals at least some of which are sent by one or more ultrawideband wireless devices in a network, and

157. *See* claim limitation 1[a].

c) 22[b]: at least one transmitter for transmitting received, modified, or stored electronic signals or data, wherein said at least one receiver and at least one transmitter may be separate components or be combined as a transceiver, and wherein said at least one receiver and at least one transmitter may be dedicated receive only and transmit only or may function alternatively as a receiver and as a transmitter; and

158. *See* claim limitation 1[b].

- d) **22[c]: a controller which is either pre-programmed or programmable to collect traffic information or security information related to received and transmitted data at least some of which is received from or sent to said one or more ultrawideband wireless devices in said network,**

159. *See* claim limitations 1[c] and 1[g].

- e) **22[d]: said controller controlling reception of electronic signals or data by said at least one receiver and transmission by said at least one transmitter.**

160. *See* claim limitation 1[f].

- 18. **Claim 23: The broadband repeater of claim 22 further comprising one or more of a means for exporting traffic information or security information to one or more computer processors or devices, and a means for adjusting one or more operations of said controller based on said traffic information or security information.**

161. *See* claims 9 and 13.

19. Claim 24

- a) **24[pre]: A broadband repeater, comprising:**

162. *See* claim limitation 1[pre].

- b) **24[a]: at least one receiver for receiving electronic signals at least some of which are sent by one or more ultrawideband wireless devices and**

163. *See* claim limitation 1[a].

- c) **24[b]: at least some of said signals being sent by a wired link, said one or more ultrawideband wireless devices being in a network which includes said wired link, and**

164. See claim 5.

- d) **24[c]: at least one transmitter for transmitting received, modified, or stored electronic signals or data, wherein said at least one receiver and at least one transmitter may be separate components or be combined as a transceiver, and wherein said at least one receiver and at least one transmitter may be dedicated receive only and transmit only or may function alternatively as a receiver and as a transmitter; and**

165. See claim limitation 1[b].

- e) **24[d]: a controller for controlling reception of electronic signals by said at least one receiver from said one or more ultrawideband wireless devices and said wired link and transmission by said at least one transmitter to said one or more ultrawideband wireless devices and said wired link,**

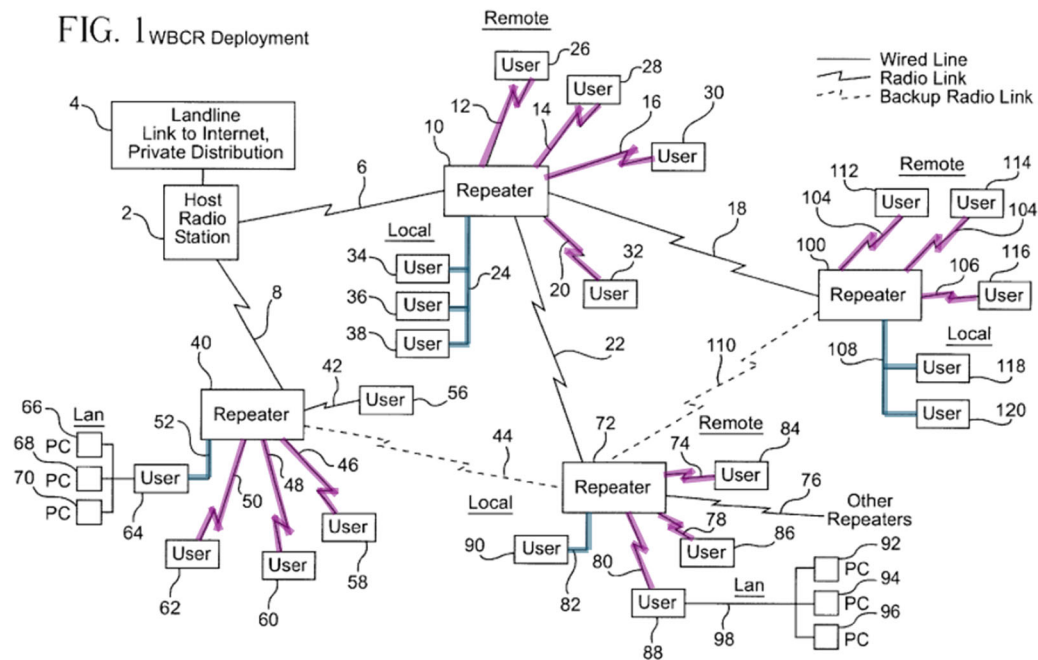
166. See claim limitation 1[f].

- f) **24[e]: wherein said controller supports a hub or router function to allow for the commingling of both wireless and wired traffic within said broadband repeater.**

167. Ganz/Larrick discloses this limitation. Ganz explains that its system “includes basic security measures to ensure that information transmitted over the network can be accessed only by the intended end user.” (EX1005, 5:62-64.) Specifically, “by access to the IP (Internet protocol) addressing within the packets, *the repeater effectively acts as a router*, allowing a firewall to be enacted for a user segment as an additional security measure, in addition to the spread spectrum coding

or other noise-like coding built into the radios at the radio data link level.” (EX1005, 5:64-6:3.)

168. Further, FIG. 1 of Ganz demonstrates that user devices may be connected to the WBCR via wired (blue) or wireless (pink) link:



169. Thus, such repeaters handling both wired and wireless links must allow for the commingling of both wireless and wired traffic.

20. Claim 25: The broadband repeater of claim 11 wherein said network information is further supplied to said controller by one or more of over-the-air ultrawideband signaling, and a wired connection from another device.

170. See claim 19.

**VIII. Ground 2: Ganz and Larrick in Combination with Engels Renders
Claims 8, and 20 Obvious**

A. Overview and Motivation to Combine

171. Engels teaches various conventional antenna technologies that were well-known, including MIMO, beamforming, adaptable, and directional antennas.

172. A POSITA would have been motivated to incorporate the teachings of Engels to improve the Ganz system (along with its combination with Larrick) because of the utility of MIMO, beamforming, adaptable, and directional antennas. Such technologies were conventional and well-known by the time of the '194 patent, and a POSITA would have known and been motivated by their utility. It was known that MIMO could minimize errors, optimize data speed, and improve bandwidth and capacity by allowing data to travel over multiple signals at the same time. In particular, MIMO would transmit multiple signals along multiple paths, allowing better SNR performance in challenging conditions.

173. Beamforming is a signal processing technique used in wireless communications (Wi-Fi, 5G, radar, sonar, etc.) that focuses a signal in a specific direction instead of broadcasting it equally in all directions. Beamforming uses adaptable and steerable antennas. A POSITA would have been motivated to use beamforming as it allows for improved signal strength by directing energy to an intended receiver. This increases range and reduces dead zones, as well as allowing

for higher data rates and reduction in interference. Moreover, beamforming allows multiple users to share the same frequency band simultaneously by steering beams in different directions (multi-user MIMO in 5G and Wi-Fi 6/7). Beamforming also increases energy efficiency by concentrating power where it's needed reduces overall wasted transmission energy.

174. A POSITA would have had a reasonable expectation of success combining Ganz-Larrick with Engels. MIMO and beamforming were well-known and conventional technologies. A POSITA would have been well aware of such methods and the conventional ways of implementing such standard technologies. Implementation would have been well-within the skill of an ordinary artisan.

B. Limitation-By-Limitation Analysis

- 1. Claim 8: The broadband repeater of claim 1 wherein said controller either or both a) uses adaptive or steerable antennas or MIMO technologies to control the direction or coverage zones or capacity or quality of transmissions or reception, and b) directs undesired user or intruder information to be passed to other components of a network from said at least one transmitter using either wireless or wired connectivity.**

175. Engels teaches that “the usage of *multiple antenna techniques* with antenna means (10) may result in a communication with antenna's at multiple outdoor nodes located at different locations.” (EX1008, 13:11-13.) These techniques, which are “particularly useful for providing redundancy in the outdoor

connection,” include “beamforming, spatial division multiple access (SDMA), *multiple input multiple output (MIMO) systems.*” (EX1008, 13:13-15.) Engels therefore discloses that its network device could be configured for using MIMO antenna technology.

2. **Claim 20: The broadband repeater of claim 12 wherein said controller either or both a) uses adaptive or steerable antennas or MIMO technologies to control the direction or coverage zones or capacity or quality of transmissions or reception, and b) directs undesired user or intruder information to be passed to other components of a network from said at least one transmitter using either wireless or wired connectivity.**

176. See claim 8.

IX. Ground 3: Ganz and Larrick in Combination with Perlman Renders Claim 6 Obvious

A. Overview and Motivation to Combine

177. Perlman teaches various conventional repeater techniques that were well-known, including connecting a repeater to an AC outlet.

178. A POSITA would have been motivated to incorporate the teachings of Perlman to improve the Ganz system (along with its combination with Larrick). Both Ganz and Perlman address repeater systems that aimed to address known limitations and problems of wireless technologies at the time. A POSITA would have sought to further improve Ganz by applying the teachings of Perlman because of the utility of connecting a repeater to an AC outlet. Such technologies were conventional and

well-known by the time of the '194 patent, and a POSITA would have known and been motivated by their utility.

179. A POSITA would have had a reasonable expectation of success combining Ganz-Larrick with Perlman. Perlman utilizes a combination of known techniques to improve the performance of known repeater technologies. A POSITA would have been well aware of such methods and the conventional ways of implementing such standard technologies. Implementation would have been well-within the skill of an ordinary artisan.

B. Limitation-By-Limitation Analysis

- 1. Claim 6: The broadband repeater of claim 1 wherein said at least one receiver and said at least one transmitter and said controller are stationary or mobile/portable and are associated with one or more of an AC outlet, a room fixture, a display terminal, a gaming device, office or home equipment, a ceiling fixture, a wall fixture, furniture, or a computer.**

180. Perlman discloses this claim. According to Perlman, “[a]fter the exchange of encryption information has completed, the Firewire cable between the two devices may be disconnected. The repeater unit with the newly activated encryption key may then be plugged into *an electrical outlet* in any location of the home or building where the user wants the network to extend.” A POSITA would understand that such an electrical outlet would be an AC outlet.

X. Ground 4: Ganz and Larrick in Combination with Roesse Renders Claim 7 Obvious

A. Overview and Motivation to Combine

181. Roesse teaches various methods for locating the position of a wireless repeater using network information and using the location information within a network, such as to determine the location of user devices connected to the repeater.

182. A POSITA would have been motivated to incorporate the teachings of Roesse to improve the Ganz system (along with its combination with Larrick) because of the utility of location information. As Roesse itself teaches, location information “may be used in any of a variety of ways to improve configuration accuracy, control, and security,” as well as “control or secure a device itself.” (EX1012, 2:23-28.) Roesse also teaches that “the device location can be used in any number of ways to enhance the operation of, and services provided by, the system,” for example, “anywhere user credentials are required, the location of a device can be required.” (*Id.*, 2:54-61.) Location information was also useful for network administrators to optimize coverage of wireless access points as well as perform location-aware handovers. For example, by knowing the location of itself and its neighbors as well as a user device, a wireless repeater/router could more optimally hand off the user device to a neighboring wireless access point. In addition, users of user devices would have found location information to be beneficial, such as when using mapping

or emergency services. The techniques of Roesse would have been particularly useful at the time of the '194 patent when user devices were unlikely to have GPS.

183. A POSITA would have reasonably expected the combination to succeed. The methods described in Roesse used conventional wireless network technologies and Roesse provides significant detail on its implementation which was within the skill of an ordinary artisan.

B. Limitation-By-Limitation Analysis

1. Claim 7: The broadband repeater of claim 1 wherein said controller permits one or more network information to be modified and support of position location capabilities for use by a network.

184. Ganz teaches that its controller permits network information to be modified. For example, Ganz explains that “[m]onitoring and control of the WBCR is achieved by software controlled radio/data communications, between a host radio station and the WBCR... Throughput speeds and data packet drop rates can be measured periodically and *corrective steps taken to adjust the radio parameters remotely.*” (EX1005, 5:47-61.) Further, “[t]he controlling functions implemented as part of the BPMA/CA protocol provide for *remote dynamic load balancing among the users*, and individually enhancing or reducing the allowable user packet size requests, thereby ensuring efficient network utilization for all users. Basic maintenance functions are performed remotely as well, such as *adding new users*

and user ID's, and updating user priority codes.” (EX1005, 5:47-61.)

185. Roesse discloses a “network entry device,” such as a wireless repeater, using network information in support of position location capabilities. (EX1012, 31:36-42 (“Network entry devices 114 can include, for example, switches, routers, hubs, bridges, repeaters, wireless access points”).) Specifically, Roesse describes that a network entry device can “determine its physical location” by “receiv[ing] location information from each of its neighboring devices.” (EX1012, 36:62-64; *see also id.*, 8:33-40 (“System 100 can employ a first System 100 can employ a first group of mechanisms/techniques for identifying the location of a device (e.g., 104, 114) that communicates via radio frequencies. For example, system 100 triangulates the location of a device using one or more wireless access points, such as 120a-b, associated with network entry devices 114, such as 114a and 114b, respectively, as shown in FIG. 1.”).) Such location information can then be *used by a network*, such as to determine the position location of a user device. (EX1012, 9:47-50 (“System 100 also can use signal amplitude differential from the network entry devices 114a and 114b to determine relative location of user device 104b with respect to an antenna on network device 114a or 114b.”); EX1002, ¶185.)

2. Claim 17: The broadband repeater of claim 12 wherein said controller permits one or more of provisioning information

**to be modified and support of position location capabilities
for use by a network.**

186. *See* claim 7.

XI. CONCLUSION

187. In signing this declaration, I recognize that the declaration will be filed as evidence in a contested case before the Patent Trial and Appeal Board of the United States Patent and Trademark Office. I also recognize that I may be subject to cross-examination in the case and that cross-examination will take place within the United States. If cross-examination is required of me, I will appear for cross-examination within the United States during the time allotted for cross-examination.

* * *

I hereby declare that all statements made herein of my own knowledge are true and that all statements made on the information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code.

Date: October 9, 2025

/s/ Mark Mahon

Dr. Mark Mahon