

Apple, Inc. (“Apple”), Atheros Communications, Inc. (“Atheros”), Belkin International, Inc. (“Belkin”), Broadcom Corporation (“Broadcom”), D-Link Corporation and D-Link Systems, Inc. (“D-Link”), Dell, Inc. (“Dell”), Gateway, Inc. (“Gateway”), Hewlett-Packard Company (“Hewlett-Packard”), Intel Corporation (“Intel”), Lenovo Group Ltd. and Lenovo (United States) Inc. (“Lenovo”), LG Electronics Mobilecomm U.S.A., Inc. and LG Electronics, Inc. (“LG”), Marvell Semiconductor, Inc. (“Marvell”), Motorola, Inc. (“Motorola”), Personal Communications Devices, LLC (“Personal Communications Devices”), Sony Corporation, Sony Corporation of America, Sony Electronics, Inc., and Sony Computer Entertainment America, Inc. (“Sony”), Texas Instruments, Incorporated (“Texas Instruments”), Toshiba America, Inc., Toshiba America Information Systems, Inc., and Toshiba Corporation (“Toshiba”), and UTStarcom, Inc. (“UTStarcom”) for infringement of U.S. Patent No. 5,515,369 (the “369 Patent” or the “Patent-in-Suit”) pursuant to 35 U.S.C. § 271. A copy of the Patent-in-Suit is attached as Exhibit A.

PARTIES

1. Plaintiff Wi-LAN Inc. is a corporation existing under the laws of Canada with its principal place of business at 11 Holland Ave., Suite 608, Ottawa, Ontario, Canada.

2. Upon information and belief, Defendant Acer, Inc., is a Taiwanese Corporation with its principal place of business at 8F, 88, Sec. 1, Hsin Tai Wu Rd., Hsichih 221, Taiwan. Upon information and belief, Defendant Acer America Corporation is a California Corporation with its principal place of business at 333 W. San Carlos Street, Suite 1500, San Jose, California 95110. Acer manufactures for sale and/or sells personal computers and/or other products with wireless capability compliant with

the Bluetooth standards in the United States and, more particularly, in the Eastern District of Texas. Upon information and belief, Defendants Acer, Inc. and Acer America Corporation are commonly owned by the same corporate entity and are alter egos and/or agents of one another. Acer may be served with process by serving its registered agent, CT Corporation System at 350 N. St. Paul Street, Dallas, Texas 75201.

3. Upon information and belief, Defendant Apple is a California Corporation with its principal place of business at 1 Infinite Loop, Cupertino, California 95014. Apple manufactures for sale and/or sells personal computers and/or other products with wireless capability compliant with the Bluetooth standards in the United States and, more particularly, in the Eastern District of Texas. Apple may be served with process by serving its registered agent, CT Corporation System at 350 N. St. Paul Street, Dallas, Texas 75201.

4. Upon information and belief, Defendant Atheros is a Delaware Corporation with its principal place of business at 5480 Great America Pkwy., Santa Clara, California 95054. Atheros manufactures for sale and/or sells integrated circuits and/or circuit boards used and/or designed for use in personal computers and/or other products with wireless capability compliant with the Bluetooth standards in the United States and, more particularly, in the Eastern District of Texas. Atheros may be served with process by serving its registered agent, LexisNexis Document Solutions, Inc. at 211 E. 7th Street, Suite 620, Austin, Texas 78701-3218.

5. Upon information and belief, Defendant Belkin (formerly Belkin Corporation) is a Delaware Corporation with its principal place of business at 12045 E. Waterfront Drive, Playa Vista, California 90094. Belkin manufactures for sale and/or

sells wireless products compliant with the Bluetooth standards in the United States and, more particularly, in the Eastern District of Texas. Belkin may be served with process by serving its registered agent, National Registered Agents, Inc. at 2875 Michelle Drive, Suite 100, Irvine, California 92606.

6. Upon information and belief, Defendant Broadcom is a California Corporation with its principal place of business at 5300 California Ave., Irvine, California 92617. Broadcom manufactures for sale and/or sells integrated circuits and/or circuit boards used and/or designed for use in personal computers and/or other products with wireless capability compliant with the Bluetooth standards in the United States and, more particularly, in the Eastern District of Texas. Broadcom may be served with process by serving its registered agent, National Registered Agents, Inc. at 2875 Michelle Drive, Suite 100, Irvine, California 92606.

7. Upon information and belief, Defendant D-Link Systems, Inc. is a California Corporation with its principal place of business at 17595 Mt. Hermann St., Fountain Valley, California 92708. Upon information and belief, Defendant D-Link Corporation is a Taiwanese Corporation with its principal place of business at 4F, No. 289, Sinhu 3rd Rd., Neihu District, Taipei City, Taiwan. D-Link manufactures for sale and/or sells wireless products compliant with the Bluetooth standards in the United States and, more particularly, in the Eastern District of Texas. Upon information and belief, Defendants D-Link Systems, Inc. and D-Link Corporation are commonly owned by the same corporate entity and are alter egos and/or agents of one another. D-Link may be served with process by serving its registered agent, Nancy Lemm at 17595 Mt. Hermann Street, Fountain Valley, California 92708.

8. Upon information and belief, Defendant Dell is a Delaware Corporation with its principal place of business at 1 Dell Way, Round Rock, Texas 78682-2222. Dell manufactures for sale and/or sells personal computers and/or other products with wireless capability compliant with the Bluetooth standards in the United States and, more particularly, in the Eastern District of Texas. Dell may be served with process by serving its registered agent, Corporation Service Company at 211 E. 7th Street, Suite 620, Austin, Texas 78701-3218.

9. Upon information and belief, Defendant Gateway is a Delaware Corporation with its principal place of business at 7565 Irvine Center Dr., Irvine, California 92618. Gateway manufactures for sale and/or sells personal computers and/or other products with wireless capability compliant with the Bluetooth standards in the United States and, more particularly, in the Eastern District of Texas. Gateway may be served with process by serving its registered agent, CT Corporation System at 818 West Seventh Street, Los Angeles, California 90017.

10. Upon information and belief, Defendant Hewlett-Packard is a Delaware Corporation with its principal place of business at 3000 Hanover St., Palo Alto, California 94304. Hewlett-Packard manufactures for sale and/or sells personal computers and/or other products with wireless capability compliant with the Bluetooth standards in the United States and, more particularly, in the Eastern District of Texas. Hewlett-Packard may be served with process by serving its registered agent, CT Corporation System at 350 N. St. Paul Street, Dallas, Texas 75201.

11. Upon information and belief, Defendant Intel is a Delaware Corporation with its principal place of business at 2200 Mission College Blvd., Santa Clara,

California 95054-1549. Intel manufactures for sale and/or sells integrated circuits and/or circuit boards used and/or designed for use in personal computers and/or other products with wireless capability compliant with the Bluetooth standards in the United States and, more particularly, in the Eastern District of Texas. Intel may be served with process by serving its registered agent, CT Corporation System at 350 N. St. Paul Street, Dallas, Texas 75201.

12. Upon information and belief, Defendant Lenovo Group Ltd. is a Hong Kong Corporation with its principal place of business at 23/F Lincoln House, Taikoo Place, 979 King's Road, Quarry Bay, Hong Kong. Upon information and belief, Defendant Lenovo (United States) Inc. is a Delaware Corporation with its principal place of business at 1009 Think Place, Bldg. 500, Box 29, Morrisville, North Carolina 27560. Lenovo manufactures for sale and/or sells personal computers and/or other products with wireless capability compliant with the Bluetooth standards in the United States and, more particularly, in the Eastern District of Texas. Upon information and belief, Defendants Lenovo Group Ltd. and Lenovo (United States) Inc. of North America are commonly owned by the same corporate entity and are alter egos and/or agents of one another. Lenovo may be served with process by serving its registered agent, CT Corporation System at 350 N. St. Paul Street, Dallas, Texas 75201.

13. Upon information and belief, Defendant LG Electronics Mobilecomm U.S.A., Inc. is a California Corporation with its principal place of business at 10101 Old Grove Road, San Diego, California 92131. Upon information and belief, Defendant LG Electronics, Inc. is a corporation organized and existing under the laws of the country of Korea with its principal place of business at LG Twin Towers 20 Yeouido-dong,

Yeongdeungpo-gu, Seoul, Korea 150-721. LG manufactures for sale and/or sells mobile handsets and/or other wireless products compliant with the Bluetooth standards. Upon information and belief, Defendants LG Electronics Mobilecomm U.S.A., Inc. and LG Electronics, Inc. are commonly owned by the same corporate entity and are alter egos and/or agents of one another. LG may be served with process by serving its registered agent, National Registered Agents, Inc., 16055 Space Center Blvd., Suite 235, Houston, Texas 77062.

14. Upon information and belief, Defendant Marvell Semiconductor, Inc. is a California Corporation with its principal place of business at 5488 Marvell Ln., Santa Clara, California 95054-3606. Marvell manufactures for sale and/or sells integrated circuits and/or circuit boards used and/or designed for use in personal computers and/or other products with wireless capability compliant with the Bluetooth standards in the United States and, more particularly, in the Eastern District of Texas. Marvell may be served with process by serving its registered agent, CT Corporation System, at 350 N. St. Paul Street, Dallas, Texas 75201.

15. Upon information and belief, Defendant Motorola is a Delaware Corporation with its principal place of business at 1303 E. Algonquin Rd., Schaumburg, Illinois 60196. Motorola manufactures for sale and/or sells mobile handsets and/or other wireless products compliant with the Bluetooth standards in the United States and, more particularly, in the Eastern District of Texas. Motorola may be served with process by serving its registered agent, CT Corporation System, 350 N. St. Paul Street, Dallas, Texas 75201.

16. Upon information and belief, Defendant Personal Communications Devices is a Delaware Limited Liability Company with its principal place of business at 555 Wireless Blvd., Hauppauge, New York 11788. Personal Communications Devices manufactures for sale and/or sells mobile handsets and/or other wireless products compliant with the Bluetooth standards in the United States and, more particularly, in the Eastern District of Texas. Personal Communications Devices may be served with process by serving its registered agent, Corporation Service Co., 80 State Street, Albany, New York 12207.

17. Upon information and belief, Defendant Sony Corporation is a Japanese Corporation with its principal place of business at 7-1, Konan, 1-chome Minato-ku, Tokyo 108-0075, Japan. Upon information and belief, Defendant Sony Corporation of America is a New York Corporation with its principal place of business at 555 Madison Ave. 8th Floor, New York, New York 10022. Upon information and belief, Defendant Sony Electronics, Inc. is a Delaware Corporation with its principal place of business at 555 Madison Ave. 8th Floor, New York, New York 10022. Upon information and belief, Defendant Sony Computer Entertainment America, Inc. is a Delaware Corporation with its principal place of business at 919 E Hillsdale Blvd., Foster City, California 94404. Sony manufactures for sale and/or sells personal computers and/or other products with wireless capability compliant with the Bluetooth standards in the United States and, more particularly, in the Eastern District of Texas. Upon information and belief, Defendants Sony Corporation, Sony Corporation of America, Sony Electronics, Inc., and Sony Computer Entertainment America, Inc. are commonly owned by the same corporate entity and are alter egos and/or agents of one another. Sony may be served with process

by serving its registered agent, Corporation Service Company at 211 E. 7th Street, Suite 620, Austin, Texas 78701-3218.

18. Upon information and belief, Defendant Texas Instruments is a Delaware Corporation with its principal place of business at 12500 TI Blvd., Dallas, Texas 75243. Texas Instruments manufactures for sale and/or sells integrated circuits and/or circuit boards used and/or designed for use in mobile handsets and/or other products with wireless capability compliant with the Bluetooth standards in the United States and, more particularly, in the Eastern District of Texas. Texas Instruments may be served with process by serving its registered agent, Joseph F. Huback at 7839 Churchill Way, MS3999, Dallas, Texas 75251.

19. Upon information and belief, Defendant Toshiba Corporation is a Japanese Corporation with its principal place of business at 1-1, Shibaura 1-chome, Minato-ku, Tokyo 105-8001, Japan. Upon information and belief, Defendant Toshiba America, Inc. is a Delaware Corporation with its principal place of business at 1251 Avenue of the Americas Suite 4110, New York, New York 10020. Upon information and belief, Defendant Toshiba America Information Systems, Inc. is a California Corporation with its principal place of business at 9740 Irvine Blvd., Irvine, California 92618. Toshiba manufactures for sale and/or sells personal computers and/or other products with wireless capability compliant with the Bluetooth standards in the United States and, more particularly, in the Eastern District of Texas. Upon information and belief, Defendants Toshiba Corporation, Toshiba America, Inc. and Toshiba America Information Systems, Inc. are commonly owned by the same corporate entity and are alter egos and/or agents of one another. Toshiba may be served with process by serving

its registered agent, CT Corporation System at 350 N. St. Paul Street, Dallas, Texas 75201.

20. Upon information and belief, Defendant UTStarcom, Inc. is a Delaware Corporation with its principal place of business at 1275 Harbor Bay Parkway, Alameda, California 94502. UTStarcom manufactures for sale and/or sells mobile handsets and/or other wireless products compliant with the Bluetooth standards in the United States and, more particularly, in the Eastern District of Texas. UTStarcom may be served with process by serving its registered agent, CT Corporation System, 350 North St. Paul St., Dallas, Texas 75201.

JURISDICTION AND VENUE

21. This is an action for patent infringement under the Patent Laws of the United States, 35 U.S.C. § 271.

22. This Court has subject matter jurisdiction pursuant to 28 U.S.C. §§ 1331 and 1338(a).

23. This Court has personal jurisdiction over each Defendant. Each Defendant has conducted and does conduct business within the State of Texas. Each Defendant, directly or through intermediaries (including distributors, retailers, and others), imports, ships, distributes, offers for sale, sells, and advertises (including the provision of an interactive web page) its products in the United States, the State of Texas, and the Eastern District of Texas. Each Defendant has purposefully and voluntarily placed one or more of its infringing products, as described below, into the stream of commerce with the expectation that they will be purchased by consumers in the Eastern

District of Texas. These infringing products have been and continue to be purchased by consumers in the Eastern District of Texas. Each Defendant has committed the tort of patent infringement within the State of Texas, and particularly, within the Eastern District of Texas.

24. Venue is proper in this Court pursuant to 28 U.S.C. §§ 1391 and 1400(b).

COUNT I: PATENT INFRINGEMENT

25. On May 7, 1996, the United States Patent and Trademark Office (“USPTO”) duly and legally issued the ’369 Patent, entitled “Method for Frequency Sharing and Frequency Punchout in Frequency Hopping Communications Network” after a full and fair examination. Wi-LAN is the assignee of all rights, title, and interest in and to the ’369 Patent and possesses all rights of recovery under the ’369 Patent, including the right to recover damages for past infringement.

26. The Patent-in-Suit is valid and enforceable.

27. Upon information and belief, Acer has been and is now infringing, directly and indirectly by way of inducement and/or contributory infringement, literally and/or under the doctrine of equivalents, the Patent-in-Suit in this District and elsewhere by making, using, offering for sale, importing, and/or selling personal computers and/or other products with wireless capability compliant with the Bluetooth standards that fall within the scope of at least one claim of the Patent-in-Suit.

28. Upon information and belief, Apple has been and is now infringing, directly and indirectly by way of inducement and/or contributory infringement, literally and/or under the doctrine of equivalents, the Patent-in-Suit in this District and elsewhere

by making, using, offering for sale, importing, and/or selling personal computers and/or other products with wireless capability compliant with the Bluetooth standards that fall within the scope of at least one claim of the Patent-in-Suit.

29. Upon information and belief, Atheros has been and is now infringing, directly and indirectly by way of inducement and/or contributory infringement, literally and/or under the doctrine of equivalents, the Patent-in-Suit in this District and elsewhere by making, using, offering for sale, importing, and/or selling integrated circuits and/or circuit boards used and/or designed for use in personal computers and/or other products with wireless capability compliant with the Bluetooth standards that fall within the scope of at least one claim of the Patent-in-Suit.

30. Upon information and belief, Belkin has been and is now infringing, directly and indirectly by way of inducement and/or contributory infringement, literally and/or under the doctrine of equivalents, the Patent-in-Suit in this District and elsewhere by making, using, offering for sale, importing, and/or selling products with wireless capability compliant with the Bluetooth standards that fall within the scope of at least one claim of the Patent-in-Suit.

31. Upon information and belief, Broadcom has been and is now infringing, directly and indirectly by way of inducement and/or contributory infringement, literally and/or under the doctrine of equivalents, the Patent-in-Suit in this District and elsewhere by making, using, offering for sale, importing, and/or selling integrated circuits and/or circuit boards used and/or designed for use in personal computers and/or other products with wireless capability compliant with the Bluetooth standards that fall within the scope of at least one claim of the Patent-in-Suit.

32. Upon information and belief, D-Link has been and is now infringing, directly and indirectly by way of inducement and/or contributory infringement, literally and/or under the doctrine of equivalents, the Patent-in-Suit in this District and elsewhere by making, using, offering for sale, importing, and/or selling products with wireless capability compliant with the Bluetooth standards that fall within the scope of at least one claim of the Patent-in-Suit.

33. Upon information and belief, Dell has been and is now infringing, directly and indirectly by way of inducement and/or contributory infringement, literally and/or under the doctrine of equivalents, the Patent-in-Suit in this District and elsewhere by making, using, offering for sale, importing, and/or selling personal computers and/or other products with wireless capability compliant with the Bluetooth standards that fall within the scope of at least one claim of the Patent-in-Suit.

34. Upon information and belief, Gateway has been and is now infringing, directly and indirectly by way of inducement and/or contributory infringement, literally and/or under the doctrine of equivalents, the Patent-in-Suit in this District and elsewhere by making, using, offering for sale, importing, and/or selling personal computers and/or other products with wireless capability compliant with the Bluetooth standards that fall within the scope of at least one claim of the Patent-in-Suit.

35. Upon information and belief, Hewlett-Packard has been and is now infringing, directly and indirectly by way of inducement and/or contributory infringement, literally and/or under the doctrine of equivalents, the Patent-in-Suit in this District and elsewhere by making, using, offering for sale, importing, and/or selling

personal computers and/or other products with wireless capability compliant with the Bluetooth standards that fall within the scope of at least one claim of the Patent-in-Suit.

36. Upon information and belief, Intel has been and is now infringing, directly and indirectly by way of inducement and/or contributory infringement, literally and/or under the doctrine of equivalents, the Patent-in-Suit in this District and elsewhere by making, using, offering for sale, importing, and/or selling integrated circuits and/or circuit boards used and/or designed for use in personal computers and/or other products with wireless capability compliant with the Bluetooth standards that fall within the scope of at least one claim of the Patent-in-Suit.

37. Upon information and belief, Lenovo has been and is now infringing, directly and indirectly by way of inducement and/or contributory infringement, literally and/or under the doctrine of equivalents, the Patent-in-Suit in this District and elsewhere by making, using, offering for sale, importing, and/or selling personal computers and/or other products with wireless capability compliant with the Bluetooth standards that fall within the scope of at least one claim of the Patent-in-Suit.

38. Upon information and belief, LG has been and is now infringing, directly and indirectly by way of inducement and/or contributory infringement, literally and/or under the doctrine of equivalents, the Patent-in-Suit in this District and elsewhere by making, using, offering for sale, importing, and/or selling products with wireless capability compliant with the Bluetooth standards that fall within the scope of at least one claim of the Patent-in-Suit.

39. Upon information and belief, Marvell has been and is now infringing, directly and indirectly by way of inducement and/or contributory infringement, literally

and/or under the doctrine of equivalents, the Patent-in-Suit in this District and elsewhere by making, using, offering for sale, importing, and/or selling integrated circuits and/or circuit boards used and/or designed for use in personal computers and/or other products with wireless capability compliant with the Bluetooth standards that fall within the scope of at least one claim of the Patent-in-Suit.

40. Upon information and belief, Motorola has been and is now infringing, directly and indirectly by way of inducement and/or contributory infringement, literally and/or under the doctrine of equivalents, the Patent-in-Suit in this District and elsewhere by making, using, offering for sale, importing, and/or selling products with wireless capability compliant with the Bluetooth standards that fall within the scope of at least one claim of the Patent-in-Suit.

41. Upon information and belief, Personal Communications Devices has been and is now infringing, directly and indirectly by way of inducement and/or contributory infringement, literally and/or under the doctrine of equivalents, the Patent-in-Suit in this District and elsewhere by making, using, offering for sale, importing, and/or selling products with wireless capability compliant with the Bluetooth standards that fall within the scope of at least one claim of the Patent-in-Suit.

42. Upon information and belief, Sony has been and is now infringing, directly and indirectly by way of inducement and/or contributory infringement, literally and/or under the doctrine of equivalents, the Patent-in-Suit in this District and elsewhere by making, using, offering for sale, importing, and/or selling personal computers and/or other products with wireless capability compliant with the Bluetooth standards that fall within the scope of at least one claim of the Patent-in-Suit.

43. Upon information and belief, Texas Instruments has been and is now infringing, directly and indirectly by way of inducement and/or contributory infringement, literally and/or under the doctrine of equivalents, the Patent-in-Suit in this District and elsewhere by making, using, offering for sale, importing, and/or selling integrated circuits and/or circuit boards used and/or designed for use in mobile handsets and/or other products with wireless capability compliant with the Bluetooth standards that fall within the scope of at least one claim of the Patent-in-Suit.

44. Upon information and belief, Toshiba has been and is now infringing, directly and indirectly by way of inducement and/or contributory infringement, literally and/or under the doctrine of equivalents, the Patent-in-Suit in this District and elsewhere by making, using, offering for sale, importing, and/or selling personal computers and/or other products with wireless capability compliant with the Bluetooth standards that fall within the scope of at least one claim of the Patent-in-Suit.

45. Upon information and belief, UTStarcom has been and is now infringing, directly and indirectly by way of inducement and/or contributory infringement, literally and/or under the doctrine of equivalents, the Patent-in-Suit in this District and elsewhere by making, using, offering for sale, importing, and/or selling products with wireless capability compliant with the Bluetooth standards that fall within the scope of at least one claim of the Patent-in-Suit.

46. Wi-LAN has no adequate remedy at law against Defendants' acts of infringement and, unless Defendants are enjoined from their infringement of the Patent-in-Suit, Wi-LAN will suffer irreparable harm.

47. Many of the Defendants have had knowledge of the Patent-in-Suit and have not ceased their infringing activities. These Defendants' infringement of the Patent-in-Suit has been and continues to be willful and deliberate. All the Defendants have knowledge of the Patent-in-Suit by way of this complaint and to the extent they do not cease their infringing activities their infringement is and continues to be willful and deliberate.

48. Wi-LAN is in compliance with the requirements of 35 U.S.C. § 287.

49. Defendants, by way of their infringing activities, have caused and continue to cause Wi-LAN to suffer damages in an amount to be determined at trial.

PRAYER FOR RELIEF

WHEREFORE, Wi-LAN prays for the following relief:

A. A judgment in favor of Wi-LAN that Defendants have infringed, directly and indirectly by way of inducement and/or contributory infringement, literally and/or under the doctrine of equivalents, the Patent-in-Suit;

B. A permanent injunction, enjoining Defendants and their officers, directors, agents, servants, employees, affiliates, divisions, branches, subsidiaries, parents and all others acting in concert or privity with any of them from infringing, inducing the infringement of, or contributing to the infringement of the Patent-in-Suit;

C. Award to Wi-LAN the damages to which it is entitled under 35 U.S.C. § 284 for Defendants' past infringement and any continuing or future infringement up until the date Defendants are finally and permanently enjoined from further infringement, including both compensatory damages and treble damages for willful infringement;

E. A judgment and order requiring Defendants to pay the costs of this action (including all disbursements), as well as attorneys' fees as provided by 35 U.S.C. § 285;

F. Award to Wi-LAN pre-judgment and post-judgment interest on its damages; and

G. Such other and further relief in law or in equity to which Wi-LAN may be justly entitled.

DEMAND FOR JURY TRIAL

Wi-LAN demands a trial by jury of any and all issues triable of right before a jury.

DATED: April 7, 2010.

Respectfully submitted,

McKool Smith, P.C.

/s/ Sam Baxter

Sam Baxter

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**ATTORNEYS FOR WI-LAN
INC.**

EXHIBIT A



US005515369A

United States Patent [19]

[11] **Patent Number:** **5,515,369**

Flammer, III et al.

[45] **Date of Patent:** **May 7, 1996**

[54] **METHOD FOR FREQUENCY SHARING AND FREQUENCY PUNCHOUT IN FREQUENCY HOPPING COMMUNICATIONS NETWORK**

5,079,768 1/1992 Flammer .
 5,115,433 5/1992 Baran et al. .
 5,361,401 1/1994 Pirillo 455/62

[75] Inventors: **George H. Flammer, III**, Cupertino;
Brett D. Galloway, Campbell; **David L. Paulsen**, Mountain View, all of Calif.

Primary Examiner—Melvin Marcelo
Assistant Examiner—Huy D. Vu
Attorney, Agent, or Firm—Townsend and Townsend and Crew; Kenneth R. Allen; Stephen J. LeBlanc

[73] Assignee: **Metricom, Inc.**, Los Gatos, Calif.

[57] **ABSTRACT**

[21] Appl. No.: **265,096**

[22] Filed: **Jun. 24, 1994**

[51] **Int. Cl.**⁶ **H04J 1/14**

[52] **U.S. Cl.** **370/69.1; 370/76; 375/285**

[58] **Field of Search** 370/95.1, 95.2, 370/95.3, 69.1, 76, 70, 50, 94.1, 77, 18; 375/202, 200, 203, 208, 285; 455/61, 62, 63, 69, 70, 71, 138, 166.1

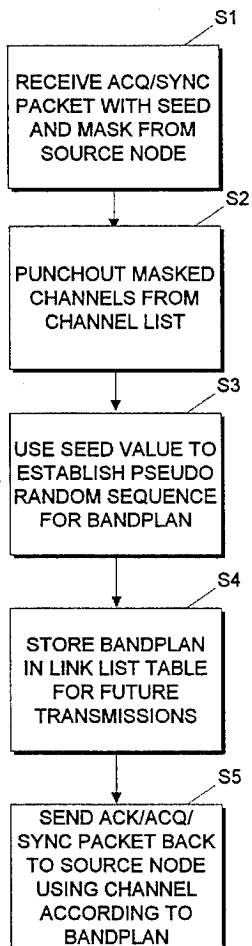
In a wireless packet communication system having a plurality of nodes, each having a transmitter and a receiver, the receiver at each node is assigned a seed value and is provided with a channel punchout mask. A node uses its seed value and punchout mask to generate a specific randomly ordered channel hopping band plan on which to receive signals. A node transmits its seed value and punchout mask to target nodes with which it wants to establish communication links, and those target nodes each use the seed value and punchout mask to generate the randomly ordered channel hopping band plan for that node. Subsequently, when one of the target nodes wish to transmit to the node, the target node changes frequency to the frequency of the node according to that node's band plan.

[56] **References Cited**

U.S. PATENT DOCUMENTS

4,554,668 11/1985 Deman et al. 375/202
 5,007,052 4/1991 Flammer .

10 Claims, 2 Drawing Sheets



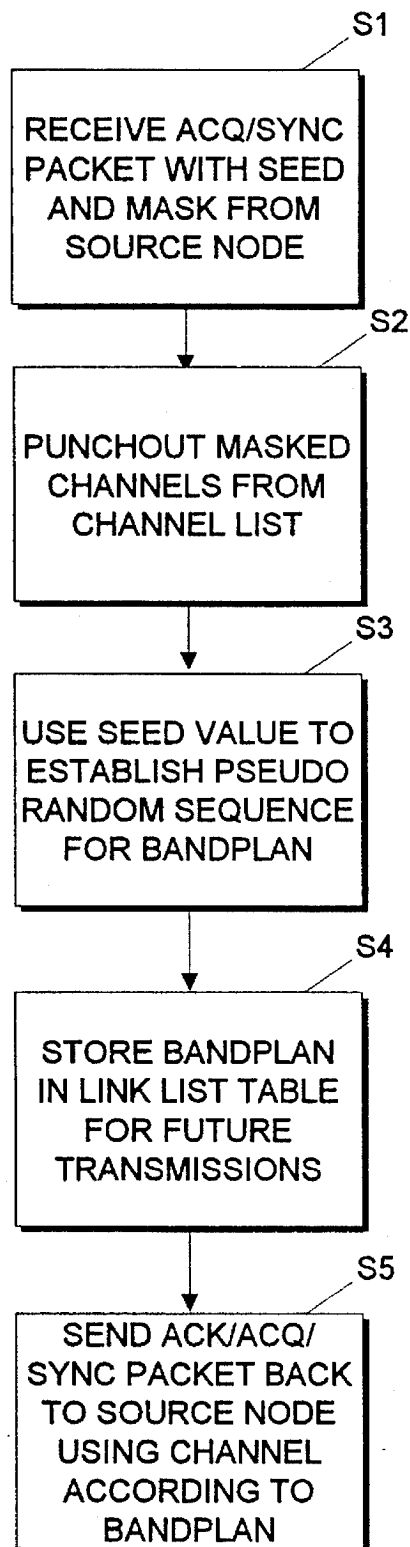


FIG. 1

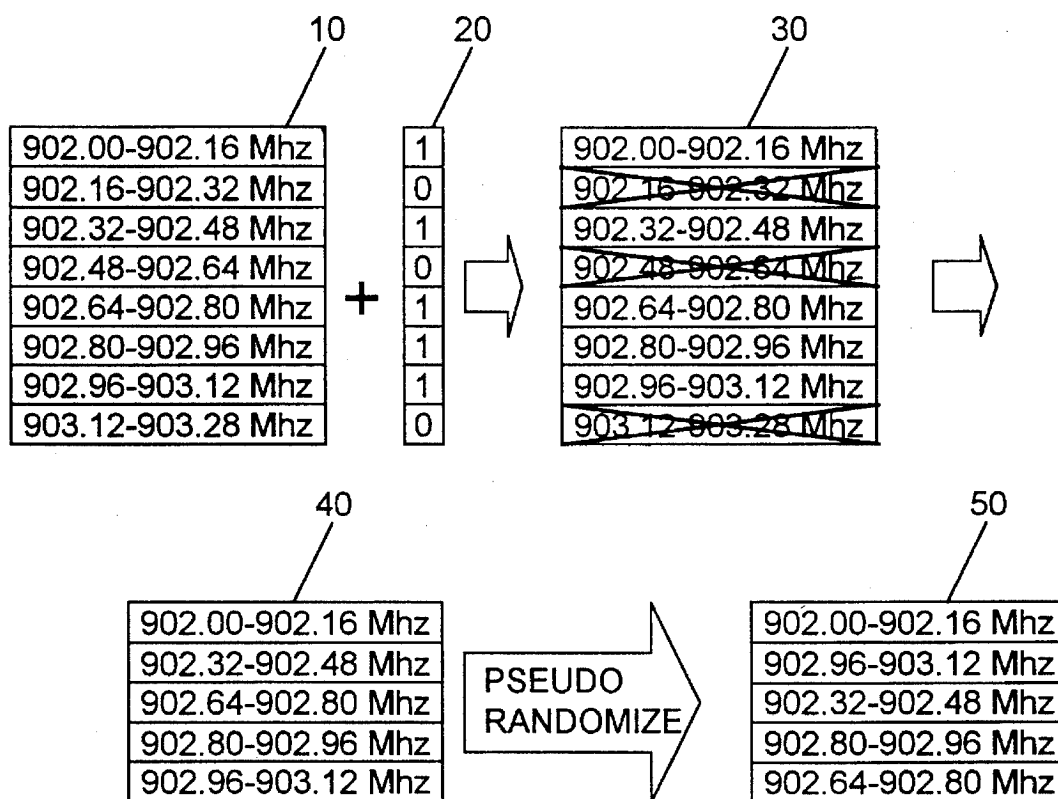


FIG. 2

5,515,369

1

METHOD FOR FREQUENCY SHARING AND FREQUENCY PUNCHOUT IN FREQUENCY HOPPING COMMUNICATIONS NETWORK

BACKGROUND OF THE INVENTION

The invention relates generally to the field of data communication. More particularly, this invention relates to a technique for establishing a channel band plan for a node in a communication network that utilizes multi-channel hopping. This invention has particular application to packet communication radio mesh networks using frequency hopping.

Packet communication networks provide for the transfer of data packets between various remote locations herein referred to as nodes. Nodes are equipped with transmitters and receivers that can transmit data over a medium, which may be radio waves, fiber optic cable, wire, etc. In order to accomplish successful data transfer, each node must operate in accordance with a protocol determining when it may transfer on the medium, for how long, and, in a multiple channel network, on what channel. Additional protocol tasks include error checking and error correction. Various network protocols and network topologies are discussed in earlier related patents in this field owned by the assignees of the present invention, including U.S. Pat. Nos. 5,115,433; 5,007,052; and other patents mentioned below.

U.S. Pat. No. 5,079,768 (Flammer et. al) issued to one of the inventors of the present invention, describes a peer-to-peer frequency-hopping radio-based communication network in which every receiver node is assigned a different starting point or home slot in a frequency hopping pattern. The frequency-hopping pattern is a randomized ordered list of all the channels available to nodes in the network. The channel order is shared by all the nodes in the network, but contention is reduced by having each node start its channel hopping at a different channel in the list. Transmitters wishing to transmit to a receiver node must switch to that receiver's current frequency in the hopping pattern to transmit a poll packet. The transmitter first listens at the assigned frequency of the receiver to determine if there is any traffic at that frequency. If there is traffic at that frequency, the transmitter waits an interval and the transmitter and receiver both hop to the next frequency in the pattern and the transmitter listens again. Once a frequency is found with no traffic, the transmitter sends a poll packet, and when that poll packet is acknowledged, the transmitter sends a data packet before the hop to the next frequency. In a particular embodiment of this network, frequency hopping occurs once every second.

As discussed the '768 patent, communication on certain frequencies may be restricted in duration in accordance with frequency allocation and bandwidth utilization rules and requirements. Such restrictions may be imposed by a licensing authority, such as the U.S. Federal Communications Commission (FCC). For example, in the 902-928 MHz frequency band, the FCC has proposed a rule that continuous transmission by a single transmitter of no more than 1 watt rf output power on any one channel be of no more than 400 ms duration each 30 seconds, and that at least some if not all other channels be selected prior to retransmission on the same frequency (FCC Rules, Part 15.247). Communication between any given pair of transceivers on a single frequency is thus restricted to packets of information which can be communicated in less than 400 ms, and means must be provided to accommodate communication on other frequencies.

2

Related co-pending U.S. patent application Ser. No. 08/193,338, claims improvements to the frequency-hopping communication network of Flammer. According to the invention disclosed in that application, when a target node returns an acknowledgement, the target node reserves access to itself for the polling station at a preselected time for a preselected duration on a specified frequency channel that is different from its assigned channel according to the band plan. The source node then transmits its data packet on the target node's data receive channel and waits for an acknowledgement on the same receive channel. The source node and the target node exchange information on the same channel throughout the interchange, even though the assigned receive channel of the target node according to the frequency-hopping band plan may have changed in the meantime. With this improvement, collisions between the data packet and other acquisition packets directed to that target node are avoided because all other nodes will direct poll packets to the target at the frequency according to the target's band plan, while the target remains at the data exchange frequency.

Performance of the network described in the '768 patent is limited in two respects. One is due to collisions that may arise when two nodes happen to start out at the same home slot. With the identical frequency-hopping pattern shared by all nodes in the network, two nodes that start out at the same home slot frequency will always hop together and remain on the same frequency. In a specific embodiment of the network described in the '768 patent, there were just 205 channels available. In a mesh network with a large number of nodes, having two nodes share the same starting frequency is a not unlikely occurrence. According to the network protocol, when a collision occurred, the transmitting nodes wait and retransmit at a subsequent frequency hop. If two nodes were hopping on the same band plan, and one node was very busy, an appreciable number of data packets would be lost and would need to be repeatedly transmitted due to repeated collisions.

A second factor limiting performance in the Flammer network is that the fixed frequency hopping sequence did not allow transmitters to skip channels on which the receivers could not receive data. This problem is particularly acute when nodes are located in possibly disparate locations throughout a geographic area. Since these nodes operate in the radio frequency spectrum, they are dependent upon it for the propagation of the data carrying signals between the nodes. At each particular location, the frequency spectra can have a unique level and pattern of spectral occupancy. Optimum network performance would dictate that those channels that cannot support robust communication at the time not be "bothered with"; unusable frequencies should be seamlessly eliminated, newly useable frequencies should be seamlessly integrated into the frequencies carrying data traffic. However, in the network disclosed in the '768 patent, all nodes were required to hop through all the available channels in the network, even if a particular node could not receive data on that channel.

What is needed is a network with a low-cost, reliable mechanism for establishing a unique channel hopping band plan for each node and that allows individualized seamless elimination of inoperable channels from a particular node's band plan.

SUMMARY OF THE INVENTION

In accordance with the invention, a frequency-hopping packet communication network establishes a unique fre-

5,515,369

3

quency hopping band plan for every receiver in the network. A transmitter establishes synchronization with a target node by receiving from that target a seed value useable by a pseudo-random number generator to determine a frequency-hopping band plan for that target node. In a specific embodiment, the transmitter also receives a "punchout" mask from the target indicating channels to be deleted from the target's band plan. Each node establishes a link table of receiver frequency hopping band plans of each other node in the network within its communication range and uses that table for subsequent transmissions. It is the responsibility of the transmitting node to follow the pre-established frequency-hopping pattern for an immediate target receiver based on information the node has previously acquired in its link table. The frequency-hopping band plan, involving the number of channels and the pseudo-random pattern of frequency change and nominal timing of changes, is universally known to each node in the network. The details and operation of the invention will be better understood by reference to the following description of specific embodiments in connection with the accompanying drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a flowchart illustrating how a table entry at a transmitter node is established when that transmitter receives an acquisition packet from a node.

FIG. 2 is a diagram illustrating the generation of a randomized channel-hopping band plan according to the invention.

DESCRIPTION OF SPECIFIC EMBODIMENTS

FIG. 1 depicts a flow chart illustrating one step in the establishment of a network connection according to the invention. In one specific embodiment of a network built according to the invention, a node on power up initially has no information about other nodes in the network. The node, when initialized on power-up, knows what channels are available for data transmission on the network, knows the network timing protocol, and has a pseudo-random number generator that it can use to establish its own and other nodes' channel hopping band plans. When initialized, the node is provided with a local frequency punchout mask indicating channels on which it cannot receive or transmit data.

Once a node is turned on, in order to become operational in the network it must acquire network links by transmitting acquisition/synchronization packets on various network channels to any nodes that can hear the transmission. FIG. 1 is a flow chart illustrating the steps a responding target node takes in establishing a network link when it receives an acquisition/synchronization packet. A network connection is established when a target node receives an acquisition/synchronization packet from a source node (Step S1). The acquisition/synchronization packet contains information about the node, including a seed value for randomly ordering a channel list and a frequency punch out mask for eliminating channels from the channel list. The responding target node then constructs a subset of the network channel list by eliminating from the list those frequencies in the punchout mask on which the source node cannot transmit or receive data (Step S2). The responding node then uses the seed value from the source node in the acquisition/synchronization packet as a seed value in a pseudo-random number generator and generates a channel hopping band plan for the source node by ordering the channels according to the sequence from the pseudo-random number generator (Step S3). Once

4

the target node has determined the frequency hopping band plan for the source node, it stores that information in its link list (Step S4). The responding node then switches to the source nodes channel according to the band plan and transmits an acknowledgement/acquisition/synchronization packet acknowledging to the source node that it has established a link and giving the source node its own seed value and punchout list so that the source node can determine the target node's band plan (Step S5).

In a specific embodiment, a network according to the invention operates between the frequencies 902–928 Mhz with 162 channels that are 160 Khz wide. Nodes in the network transmit in their acquisition/synchronization packet a seed value that is one byte long, is derived from their node address, and is co-prime with the number of available channels. Nodes also transmit a punchout mask that is 21 bytes (168 bits) long. FIG. 2 illustrates the generation of a particular node's randomized frequency hopping band plan from a network channel list and a punchout mask according to the invention using, as an example, a network channel list **10** of eight 160 Khz channels ranging from 902 to 903.28 Mhz and, as an example, a punchout frequency mask **20** of eight bits. Network channel list **10** is a list in natural order of all the channels frequencies (in this example eight) available to nodes in the network. Frequency mask **20** is a mask received from an acquiring node indicating channels that are to be eliminated from the channel list, with a zero indicating channels to be eliminated and a one indicating channels used by the source node. A target node logically ANDs together channel list **10** with mask **20** to generate channel list **30** and then collapses the channel list by deleting unused channels to generate channel list **40**, which lists the channels used by the target node in natural order. The target node then randomizes these remaining channels using a pseudo-random number generator seeded with the seed value of the source node to generate list **50**, which is the channel hopping band plan for the source node.

A pseudo-random number generator is a well known apparatus for generating a "pseudo-random" sequence of numbers. The random number generator is referred as "pseudo" because the method used to generate the sequence is actually deterministic. It typically depends on a seed value used to begin the pseudo-random number generator and whenever an identical seed value is used, the random number generator will produce an identical pseudo-random sequence. In a network according to the invention, each node in the network includes a pseudo-random number generator of identical operation. The generators are designed to accept a seed value and a range value and generate a pseudo-random non-repeating sequence of integers in the given range. According to the invention, each node, therefore, can reproduce an arbitrary length pseudo-random non-repeating integer sequence given the seed value for that sequence and the desired range.

In the example illustrated in FIG. 2, the pseudo-random number generator is provided the seed value from the source node and is provided a range equal to the number of channels remaining in channel list **40** after punchout; in this example, five. The generator then generates the pseudo-random sequence 1, 5, 2, 4, 3 and this is used to construct table **50**, with the first useable channel having the first position in the table, the fifth useable channel having the second position in the table, and so on.

The source node itself uses the process illustrated in FIG. 2 to construct its own channel hopping band plan from its seed value and punchout mask.

Once the nodes in a network built according to the invention have acquired link information about neighboring

5,515,369

5

nodes with which they can communicate, the nodes may communicate packets according to any number of frequency-hopping network protocols, including those disclosed in the Baran patent and the patent application Ser. No. 08/193,338, discussed above. As discussed in those patents, during network operation, transmitters are responsible for following their targets frequency-hopping band plans with the difference that each node in a network according to the invention, will have a different randomized frequency-hopping band plan of a length that will vary for each node based on the number of channels that are punched out by that node's punchout mask. In a further embodiment of the invention, a source node uses its own punchout mask when transmitting to avoid transmitting on channels on which it cannot effectively transmit. If a target node is at such a channel, the source node simply waits until the next channel hop before transmitting to that target node.

Other, less effective methods for exchanging a unique frequency hopping band plan for each node will be apparent. A node could transmit its entire band plan with each acquisition packet, thus eliminating the need for transmitting a seed value or punchout mask. This, however, would be more expensive in terms of use of network resources for overhead than the present invention. Or a node could pass information organized in any number of different ways to indicate the order of its channel hopping and what channels it used. It will be seen, however, that given that each node must include a pseudo-random number generator to generate its own band plan, having nodes exchange just a seed value and 21 byte mask to fully specify a unique randomized subset of 162 channels provides maximum flexibility while using the least amount of network resources.

The invention has now been explained with reference to specific embodiments. Other embodiments will be apparent to those of ordinary skill in the art. It is therefore not intended that this invention be limited except as indicated by the appended claims.

What is claimed is:

1. In a communications network having a plurality of channel-agile nodes each node capable of transmitting and receiving data over a plurality of shared channels, said shared channels having a first order, a method for enabling a first node and a second node to follow a shared randomized channel-hopping band plan for transmissions to said first node while avoiding channels containing interference, comprising the steps of:

- a) assigning to each node a unique seed value that can be used by a pseudo-random number generator to generate a list of channels in pseudo-random order;
- b) determining a channel punchout mask for each node, said channel mask indicating in said first order those channels on which that node experiences interference;
- c) at said first node, applying said first node's channel mask to a first ordered channel list to eliminate channels on which said first node experiences interference thereby deriving a masked channel list for said first node;
- d) at said first node, determining a channel-hopping band plan for receiving transmissions to said first node by ordering the channels in said first node's channel list according to a sequence generated by a pseudo-random number generator seeded with said first node's seed value;
- e) transmitting from said first node to said second node an acquisition packet, said acquisition packet including said first node's seed value and said first node's channel mask;

6

- f) at said second node, applying said transmitted channel mask from said first node to said first ordered channel list to eliminate channels on which said first node experiences interference to obtain a masked channel list for said first node at said second node;
 - g) at said second node, determining a channel-hopping band plan for transmissions to said first node by ordering the channels in said first node's channel list according to a sequence generated by a pseudo-random number generator seeded with said first node's transmitted seed value; and
 - h) thereafter transmitting data to said first node from said second node according to said first node's channel-hopping band plan.
2. The method according to claim 1 wherein said seed values are derived from the addresses of the nodes.
3. The method according to claim 1 wherein said mask is a sequence of bits, each bit having a value of either 0 or 1, where bits of one value correspond to channels in the channel list that are used by the node and bits of the other value correspond to channels in the channel list that are not used by the node and are therefore to be eliminated from the node's channel-hopping band plan.
4. The method according to claim 1 further comprising:
- i) storing at each node data from which to determine the masked channel hopping band plan of other nodes in the network to facilitate future data transfers.
5. In a node operable on a communications network having a plurality of shared-medium channels and having a plurality of channel-agile nodes each node capable of transmitting and receiving data over a plurality of said channels, a method for establishing a unique channel-hopping band plan for that node and communicating that band plan to other nodes in the network comprising the steps of:
- a) assigning to that node a unique seed value;
 - b) determining a channel punchout mask, said mask indicating those channels on which the node experiences interference or is otherwise unable to receive data;
 - c) applying said mask to a list of network channels to eliminate undesirable channels and therefore to obtain a list of available node channels;
 - d) randomizing said list of available node channels by using a deterministic pseudorandom number generator seeded with said seed value thereby obtaining a unique channel-hopping band plan; and
 - e) communicating said unique channel-hopping band plan to other nodes in the network by transmitting data from which said other nodes may derive said unique channel-hopping band plan.
6. The method according to claim 5 wherein said seed value is derived from an address of the node.
7. The method according to claim 5 wherein said mask is a sequence of bits, each bit having a value of either 0 or 1, where bits of one value correspond to channels in the channel list that are used by the node and bits of the other value correspond to channels in the channel list that are not used by the node and are therefore to be eliminated from the node's channel-hopping band plan.
8. A communications network comprising:
- a shared medium with a plurality of channels; and
 - a plurality of intelligent channel-agile nodes wherein each node has the ability of either transmitting on a plurality of channels of said shared medium or receiving on a plurality of channels of said shared medium or both

5,515,369

7

transmitting and receiving on a plurality of channels of
said shared medium;
wherein each of said nodes capable of receiving is
assigned a seed value and determines a frequency
punchout mask for itself from which any node is
capable of deriving a unique channel hopping band
plan for that node and wherein said band plan is
comprised of a random ordering of those network
channels on which the node can receive data and
wherein the band plans of different nodes in the same
communications network are allowed to contain a
different number of channels.

8

9. The method according to claim 5 wherein said data
from which said other nodes may derive said unique chan-
nel-hopping band plan comprises said unique seed value and
said mask.

10. The method according to claim 5 wherein said data
from which said other nodes may derive said unique chan-
nel-hopping band plan comprises an ordered list identifying
said channel-hopping band plan.

* * * * *

JS 44 (Rev. 12/07)

CIVIL COVER SHEET

The JS 44 civil cover sheet and the information contained herein neither replace nor supplement the filing and service of pleadings or other papers as required by law, except as provided by local rules of court. This form, approved by the Judicial Conference of the United States in September 1974, is required for the use of the Clerk of Court for the purpose of initiating the civil docket sheet. (SEE INSTRUCTIONS ON THE REVERSE OF THE FORM.)

<p>I. (a) PLAINTIFFS</p> <p>Wi-LAN Inc.</p> <p>(b) County of Residence of First Listed Plaintiff <u>Ontario, Canada</u> (EXCEPT IN U.S. PLAINTIFF CASES)</p> <p>(c) Attorney's (Firm Name, Address, and Telephone Number) Sam Baxter, McKool Smith, P.C., 104 East Houston Street, Suite 300, P.O. Box 0, Marshall, Texas 75670 (903) 923-9000</p>	<p>DEFENDANTS</p> <p>See Attachment "A"</p> <p>County of Residence of First Listed Defendant _____ (IN U.S. PLAINTIFF CASES ONLY)</p> <p>NOTE: IN LAND CONDEMNATION CASES, USE THE LOCATION OF THE LAND INVOLVED.</p> <p>Attorneys (If Known)</p>
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<p>II. BASIS OF JURISDICTION (Place an "X" in One Box Only)</p> <p><input type="checkbox"/> 1 U.S. Government Plaintiff</p> <p><input checked="" type="checkbox"/> 3 Federal Question (U.S. Government Not a Party)</p> <p><input type="checkbox"/> 2 U.S. Government Defendant</p> <p><input type="checkbox"/> 4 Diversity (Indicate Citizenship of Parties in Item III)</p>	<p>III. CITIZENSHIP OF PRINCIPAL PARTIES (Place an "X" in One Box for Plaintiff and One Box for Defendant)</p> <p>(For Diversity Cases Only)</p> <table style="width:100%;"> <tr> <td style="width:30%;"></td> <td style="width:10%;">PTF</td> <td style="width:10%;">DEF</td> <td style="width:40%;"></td> <td style="width:10%;">PTF</td> <td style="width:10%;">DEF</td> </tr> <tr> <td>Citizen of This State</td> <td><input type="checkbox"/> 1</td> <td><input type="checkbox"/> 1</td> <td>Incorporated or Principal Place of Business In This State</td> <td><input type="checkbox"/> 4</td> <td><input type="checkbox"/> 4</td> </tr> <tr> <td>Citizen of Another State</td> <td><input type="checkbox"/> 2</td> <td><input type="checkbox"/> 2</td> <td>Incorporated and Principal Place of Business In Another State</td> <td><input type="checkbox"/> 5</td> <td><input type="checkbox"/> 5</td> </tr> <tr> <td>Citizen or Subject of a Foreign Country</td> <td><input type="checkbox"/> 3</td> <td><input type="checkbox"/> 3</td> <td>Foreign Nation</td> <td><input type="checkbox"/> 6</td> <td><input type="checkbox"/> 6</td> </tr> </table>		PTF	DEF		PTF	DEF	Citizen of This State	<input type="checkbox"/> 1	<input type="checkbox"/> 1	Incorporated or Principal Place of Business In This State	<input type="checkbox"/> 4	<input type="checkbox"/> 4	Citizen of Another State	<input type="checkbox"/> 2	<input type="checkbox"/> 2	Incorporated and Principal Place of Business In Another State	<input type="checkbox"/> 5	<input type="checkbox"/> 5	Citizen or Subject of a Foreign Country	<input type="checkbox"/> 3	<input type="checkbox"/> 3	Foreign Nation	<input type="checkbox"/> 6	<input type="checkbox"/> 6
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IV. NATURE OF SUIT (Place an "X" in One Box Only)					
CONTRACT	TORTS	FORFEITURE/PENALTY	BANKRUPTCY	OTHER STATUTES	
<input type="checkbox"/> 110 Insurance <input type="checkbox"/> 120 Marine <input type="checkbox"/> 130 Miller Act <input type="checkbox"/> 140 Negotiable Instrument <input type="checkbox"/> 150 Recovery of Overpayment & Enforcement of Judgment <input type="checkbox"/> 151 Medicare Act <input type="checkbox"/> 152 Recovery of Defaulted Student Loans (Excl. Veterans) <input type="checkbox"/> 153 Recovery of Overpayment of Veteran's Benefits <input type="checkbox"/> 160 Stockholders' Suits <input type="checkbox"/> 190 Other Contract <input type="checkbox"/> 195 Contract Product Liability <input type="checkbox"/> 196 Franchise <input type="checkbox"/> 210 Land Condemnation <input type="checkbox"/> 220 Foreclosure <input type="checkbox"/> 230 Rent Lease & Ejectment <input type="checkbox"/> 240 Torts to Land <input type="checkbox"/> 245 Tort Product Liability <input type="checkbox"/> 290 All Other Real Property	<p>PERSONAL INJURY</p> <input type="checkbox"/> 310 Airplane <input type="checkbox"/> 315 Airplane Product Liability <input type="checkbox"/> 320 Assault, Libel & Slander <input type="checkbox"/> 330 Federal Employers' Liability <input type="checkbox"/> 340 Marine <input type="checkbox"/> 345 Marine Product Liability <input type="checkbox"/> 350 Motor Vehicle <input type="checkbox"/> 355 Motor Vehicle Product Liability <input type="checkbox"/> 360 Other Personal Injury <p>CIVIL RIGHTS</p> <input type="checkbox"/> 441 Voting <input type="checkbox"/> 442 Employment <input type="checkbox"/> 443 Housing/Accommodations <input type="checkbox"/> 444 Welfare <input type="checkbox"/> 445 Amer. w/Disabilities - Employment <input type="checkbox"/> 446 Amer. w/Disabilities - Other <input type="checkbox"/> 440 Other Civil Rights	<p>PERSONAL INJURY</p> <input type="checkbox"/> 362 Personal Injury - Med. Malpractice <input type="checkbox"/> 365 Personal Injury - Product Liability <input type="checkbox"/> 368 Asbestos Personal Injury Product Liability <p>PERSONAL PROPERTY</p> <input type="checkbox"/> 370 Other Fraud <input type="checkbox"/> 371 Truth in Lending <input type="checkbox"/> 380 Other Personal Property Damage <input type="checkbox"/> 385 Property Damage Product Liability <p>PRISONER PETITIONS</p> <input type="checkbox"/> 510 Motions to Vacate Sentence <p>Habeas Corpus:</p> <input type="checkbox"/> 530 General <input type="checkbox"/> 535 Death Penalty <input type="checkbox"/> 540 Mandamus & Other <input type="checkbox"/> 550 Civil Rights <input type="checkbox"/> 555 Prison Condition	<input type="checkbox"/> 610 Agriculture <input type="checkbox"/> 620 Other Food & Drug <input type="checkbox"/> 625 Drug Related Seizure of Property 21 USC 881 <input type="checkbox"/> 630 Liquor Laws <input type="checkbox"/> 640 R.R. & Truck <input type="checkbox"/> 650 Airline Regs. <input type="checkbox"/> 660 Occupational Safety/Health <input type="checkbox"/> 690 Other <p>LABOR</p> <input type="checkbox"/> 710 Fair Labor Standards Act <input type="checkbox"/> 720 Labor/Mgmt. Relations <input type="checkbox"/> 730 Labor/Mgmt. Reporting & Disclosure Act <input type="checkbox"/> 740 Railway Labor Act <input type="checkbox"/> 790 Other Labor Litigation <input type="checkbox"/> 791 Empl. Ret. Inc. Security Act <p>IMMIGRATION</p> <input type="checkbox"/> 462 Naturalization Application <input type="checkbox"/> 463 Habeas Corpus - Alien Detainee <input type="checkbox"/> 465 Other Immigration Actions	<input type="checkbox"/> 422 Appeal 28 USC 158 <input type="checkbox"/> 423 Withdrawal 28 USC 157 <p>PROPERTY RIGHTS</p> <input type="checkbox"/> 820 Copyrights <input checked="" type="checkbox"/> 830 Patent <input type="checkbox"/> 840 Trademark <p>SOCIAL SECURITY</p> <input type="checkbox"/> 861 HIA (1395ff) <input type="checkbox"/> 862 Black Lung (923) <input type="checkbox"/> 863 DIWC/DIWW (405(g)) <input type="checkbox"/> 864 SSID Title XVI <input type="checkbox"/> 865 RSI (405(g)) <p>FEDERAL TAX SUITS</p> <input type="checkbox"/> 870 Taxes (U.S. Plaintiff or Defendant) <input type="checkbox"/> 871 IRS—Third Party 26 USC 7609	<input type="checkbox"/> 400 State Reapportionment <input type="checkbox"/> 410 Antitrust <input type="checkbox"/> 430 Banks and Banking <input type="checkbox"/> 450 Commerce <input type="checkbox"/> 460 Deportation <input type="checkbox"/> 470 Racketeer Influenced and Corrupt Organizations <input type="checkbox"/> 480 Consumer Credit <input type="checkbox"/> 490 Cable/Sat TV <input type="checkbox"/> 810 Selective Service <input type="checkbox"/> 850 Securities/Commodities/Exchange <input type="checkbox"/> 875 Customer Challenge 12 USC 3410 <input type="checkbox"/> 890 Other Statutory Actions <input type="checkbox"/> 891 Agricultural Acts <input type="checkbox"/> 892 Economic Stabilization Act <input type="checkbox"/> 893 Environmental Matters <input type="checkbox"/> 894 Energy Allocation Act <input type="checkbox"/> 895 Freedom of Information Act <input type="checkbox"/> 900 Appeal of Fee Determination Under Equal Access to Justice <input type="checkbox"/> 950 Constitutionality of State Statutes

V. ORIGIN (Place an "X" in One Box Only)

1 Original Proceeding
 2 Removed from State Court
 3 Remanded from Appellate Court
 4 Reinstated or Reopened
 5 Transferred from another district (specify)
 6 Multidistrict Litigation
 7 Appeal to District Judge from Magistrate Judgment

Cite the U.S. Civil Statute under which you are filing (Do not cite jurisdictional statutes unless diversity):

VI. CAUSE OF ACTION Brief description of cause:
35 USC 271: Infringement of Patent

VII. REQUESTED IN COMPLAINT: CHECK IF THIS IS A CLASS ACTION UNDER F.R.C.P. 23 **DEMAND \$** _____ **JURY DEMAND:** Yes No

VIII. RELATED CASE(S) IF ANY (See instructions): **JUDGE** _____ **DOCKET NUMBER** _____

DATE 04/07/2010 **SIGNATURE OF ATTORNEY OF RECORD** /s/ Sam Baxter

FOR OFFICE USE ONLY

RECEIPT # _____ AMOUNT _____ APPLYING IFP _____ JUDGE _____ MAG. JUDGE _____

ATTACHMENT "A"

1. Acer, Inc.
2. Acer America Corporation
3. Apple, Inc.
4. Atheros Communications, Inc.
5. Belkin International, Inc.
6. Broadcom Corporation
7. D-Link Corporation
8. D-Link Systems, Inc.
9. Dell, Inc.
10. Gateway, Inc.
11. Hewlett-Packard Company
12. Intel Corporation
13. Lenovo Group Ltd.
14. Lenovo (United States) Inc.
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16. LG Electronics, Inc.
17. Marvell Semiconductor, Inc.
18. Motorola, Inc.
19. Personal Communications Devices, LLC
20. Sony Corporation
21. Sony Corporation of America
22. Sony Electronics, Inc.
23. Sony Computer Entertainment America, Inc.
24. Texas Instruments, Incorporated
25. Toshiba America, Inc.
26. Toshiba America Information Systems, Inc.
27. Toshiba Corporation
28. UTStarcom, Inc.