

## (12) United States Patent

#### Tang et al.

#### (54) CLEAR CHANNEL ASSESSMENT IN WIRELESS COMMUNICATIONS

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See application file for complete search history.

#### (56) References Cited

EP

DOCKE.

#### U.S. PATENT DOCUMENTS

6,067,291 A *	5/2000	Kamerman et al 370/338
6,469,997 B1*	10/2002	Dorenbosch et al 370/337
6,675,012 B2*	1/2004	Gray 455/423
6,834,045 B1*	12/2004	Lappetelainen et al 370/329
2002/0061738 A1*	5/2002	Simmons et al 455/234.1

#### FOREIGN PATENT DOCUMENTS

#### 1124337 A2 8/2001

#### OTHER PUBLICATIONS

IEEE std. 802.11b—1999, Sponsor LANMAN Standards Committee of IEEE Computer Society, "Part 11: Wireless LAN Medium Access

## (10) Patent No.: US 7,403,539 B1 (45) Date of Patent: Jul. 22, 2008

Control (MAC) and Physical Layer (PHY) Specifications, Higher-Speed Physical Layer Extension in 2.4 GHz Band," Sep. 1999, pp. 1-89.

International Standard, ANSI/IEEE std. 802.11, first edition, *Sponsor LAN MAN Standards Committee of IEEE Computer Society*, "Part 11: Wireless LAN Medium Access Control (MAC) and Physical Layer (PHY) specifications," 1999.

Geier, Jim, "Wireless LANs, Second Edition", SAMS Publishing, 2000, pp. 137-151.

IEEE Standards 802.16, "Local and Metropolitan Area Networks—Part 16: Interface for Fixed Broadband Wireless Access Systems," Oct, 1, 2004, 893 pages.

IEEE Std 802.11a-1999, *Sponsor LAN MAN Standards Committee of IEEE Computer Society*, "Part 11:Wireless LAN Medium Access Control (MAC) and Physical Layer (PHY) specifications: High-speed Physical Layer in the 5 GHZ Band." Sep. 1999, pp. 1-83.

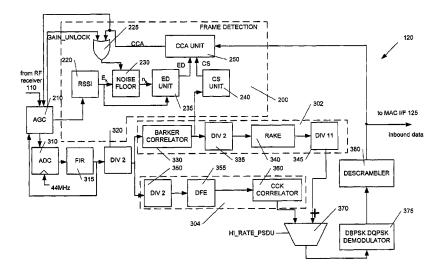
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#### (57) ABSTRACT

Techniques for and apparatus capable of implementing packet detection and signal recognition in wireless communications systems are disclosed. In particular, the disclosed techniques and apparatus incorporate at least one of relative energy detection operable on assessment of a relative energy threshold for an inbound signal borne across an RF channel, carrier sense operable upon on assessment of at least one of a peak-to-sidelobe ratio and peak-to-peak distance defined by the inbound signal, and comparison operable upon demodulated data corresponding to the inbound signal as compared to predetermined preamble data. Clear channel assessment is performed based on determinations undertaken by one or more of the aforementioned relative energy detection, carrier sense and comparison operations.

#### 145 Claims, 7 Drawing Sheets



#### OTHER PUBLICATIONS

IEEE P802.11g/D8.2-Apr. 2003, Sponsor LAN/MAN Standards Committee of the IEEE Computer Society, Part 11:Wireless LAN Medium Access Control (MAC) and Physical Layer (PHY) specifications, Further Higher Data Rate Extension in the 2.4 GHZ Band, 2003, pp. 1-69.

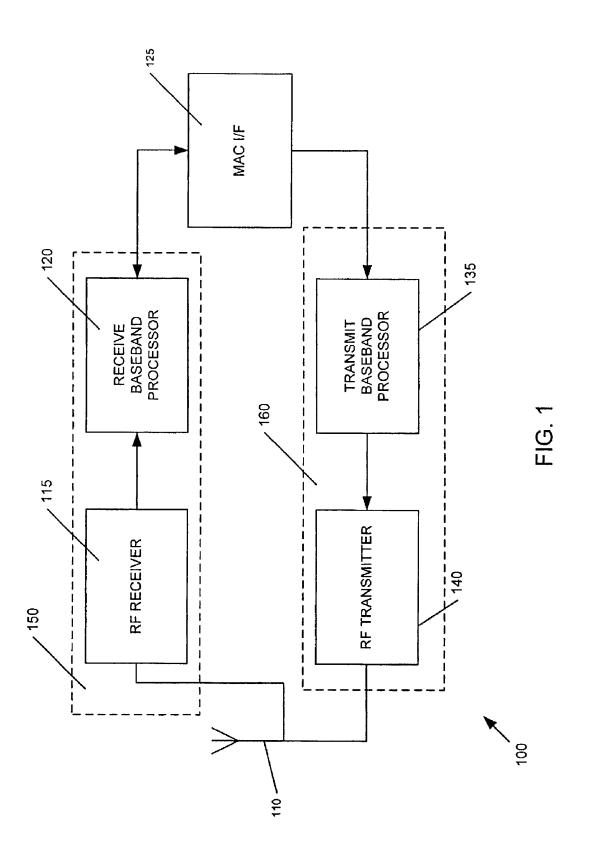
IEEE Std 802.16a-2003, Sponsor LAN/MAN Standards Committee of IEEE Computer Society and the IEEE Microwave Theory and Techniques Society, "Part 16: Air Interface for Fixed Broadband Wireless Access Systems-Amendment 2: Medium Access Control Modifications and Additional Physical Layer Specifications for 2-11 GHz." 2003, pp. 1-292.

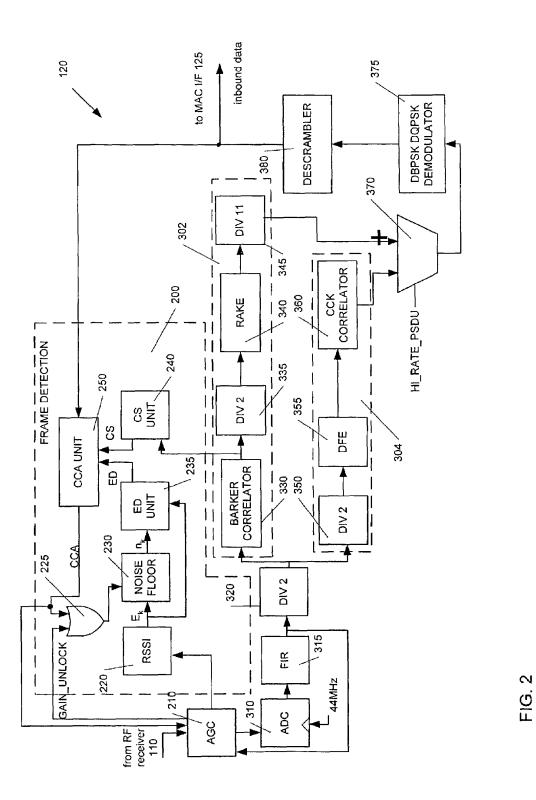
IEEE Std 802.11a-1999(Supplement to IEEE Std 802.11-1999) [Adopted by ISO/IEC and redesignated as ISO/IEC 8802-11: 1999/ Amd 1:2000(E)]; Supplement to IEEE Standard for Information technology - Telecommunications and information exchange between systems - Local and metropolitan area networks - Specific requirements - Part 11: Wireless LAN Medium Access Control (MAC) and Physical Layer (PHY) specifications High-speed Physical Layer in the 5 GHz Band; LAN/MAN Standards Committee of the IEEE Computer Society; 91 pages.

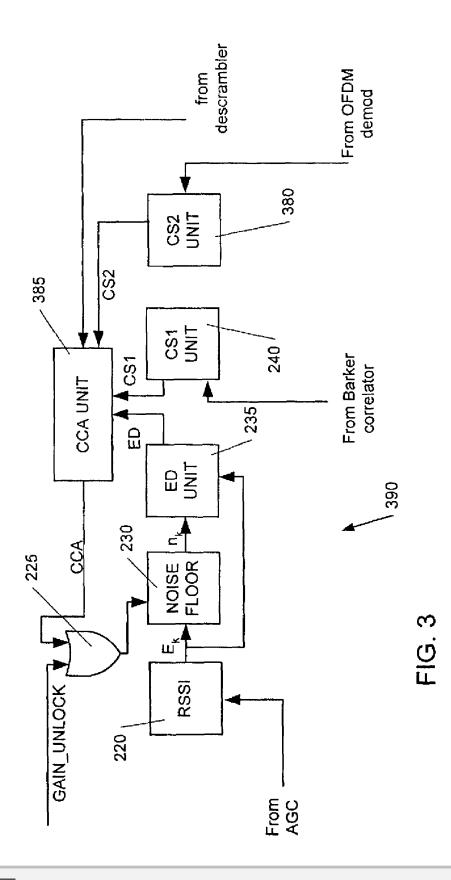
IEEE P802.11g/D8.2, Apr. 2003 (Supplement to ANSI/IEEE Std. 802.11-1999(Reaff 2003)); DRAFT Supplement to STANDARD [for] Information Technology - Telecommunications and information exchange between systems - Local and metropolitan area networks - Specific requirements - Part 11: Wireless LAN Medidum Access Control (MAC) and Physical Layer (PHY) specifications: Further Higher Data Rate Extension in the 2.4 GHz Band; LAN/MAN Standards Committee of the IEEE Computer Society; 69 pages.

IEEE Std 802.16a-2003 (Amendment to IEEE Std 802.16-2001), IEEE Standard for Local and metropolitan area networks; Part 16: Air Interface for Fixed Broadband Wireless Access Systems -- Amendment 2: Medium Access Control Modifications and Additional Physical Layer Specifications for 2-11 GHz; IEEE Computer Society and the IEEE Microwave Theory and Techniquest Society; Apr. 1, 2003; 318 pages.

\* cited by examiner







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