



US006996385B2

(12) **United States Patent**
Messier et al.

(10) **Patent No.:** **US 6,996,385 B2**
(45) **Date of Patent:** **Feb. 7, 2006**

(54) **CHANNEL CODE DECODING FOR THE CDMA FORWARD LINK**

(75) Inventors: **Geoffrey G. Messier**, Calgary (CA);
Witold A. Krzymien, Edmonton (CA)

(73) Assignee: **Telecommunications Research Laboratories**, Edmonton (CA)

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 440 days.

(21) Appl. No.: **10/260,226**

(22) Filed: **Sep. 27, 2002**

(65) **Prior Publication Data**

US 2003/0081658 A1 May 1, 2003

Related U.S. Application Data

(60) Provisional application No. 60/325,183, filed on Sep. 28, 2001.

(51) **Int. Cl.**
H04B 17/00 (2006.01)

(52) **U.S. Cl.** **455/226.3; 455/67.11; 370/320**

(58) **Field of Classification Search** 455/226.1, 455/226.2, 226.3, 226.4, 446, 447, 448, 452.2, 455/454, 522, 63.1, 67.11, 67.13, 550.1, 561
See application file for complete search history.

(56) **References Cited**

U.S. PATENT DOCUMENTS

6,088,335	A *	7/2000	I et al.	370/252
6,157,619	A *	12/2000	Ozluturk et al.	370/252
6,212,174	B1 *	4/2001	Lomp et al.	370/335
6,278,701	B1 *	8/2001	Ayyagari et al.	370/335
6,731,622	B1 *	5/2004	Frank et al.	370/342

OTHER PUBLICATIONS

Proakis, J.G., *Digital Communications*, McGraw Hill, 4th edition, 2001. p. 58.

TIA/EIA, *IS-95-B: TIA/EIA Interim Standard: Mobile Station Base Station Compatibility Standard for Dual-Mode Wideband Spread Spectrum Cellular System*, Telecommunications Industry Association, 1999. p. 7-5.

TIA/EIA, *IS-2000-2: TIA/EIA Physical layer standard for CDMA2000 spread spectrum systems*, Telecommunications Industry Association, 1999. pp. 3-76-3-88.

3rd Generation Partnership Project, "Technical specification group radio access network: Multiplexing and channel coding (FDD) (release 1999)," Mar. 2000, V3.2.0. pp. 16-22.
Rahnema, M. and Y. Antia, "Optimum soft decision decoding with channel state information in the presence of fading," *IEEE Communications Magazine*, vol. 35, No. 7, pp. 110-111, Jul. 1997.

Vucetic, B. and J. Yuan, *Turbo Codes: Principles and Applications*, Kluwer, 2000. p. 145.

(Continued)

Primary Examiner—Nguyen T. Vo

Assistant Examiner—Thuan T Nguyen

(74) *Attorney, Agent, or Firm*—Christensen O'Connor Johnson Kindness PLLC

(57) **ABSTRACT**

Channel coding is used on the forward link of a CDMA cellular telephone network to allow the CDMA mobile channel decoder to perform error correction. On a wireless link, channel code performance is improved by providing the channel decoder with an estimate of the reliability of each received symbol. This reliability information is typically the ratio of desired signal energy to interference plus noise variance at the channel decoder input. This invention improves CDMA mobile channel decoder performance using a new technique for calculating more accurate estimates of the signal to interference plus noise ratio at the input of the mobile channel decoder.

15 Claims, 4 Drawing Sheets

