



US006347122B1

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

(10) **Patent No.:** **US 6,347,122 B1**
(45) **Date of Patent:** **Feb. 12, 2002**

(54) **OPTIMAL COMPLEMENT PUNCTURED CONVOLUTIONAL CODES FOR USE IN DIGITAL AUDIO BROADCASTING AND OTHER APPLICATIONS**

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(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 0 days.

(21) Appl. No.: **09/006,570**

(22) Filed: **Jan. 13, 1998**

(51) Int. Cl.⁷ **H04L 5/12**

(52) U.S. Cl. **375/262; 375/219; 375/265; 375/270; 375/296**

(58) **Field of Search** **375/262, 340, 375/265, 270, 296, 216; 371/43.1; 714/786, 774, 755, 790, 792**

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Primary Examiner—Stephen Chin

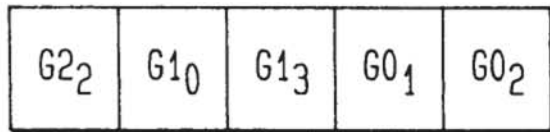
Assistant Examiner—Shuwang Liu

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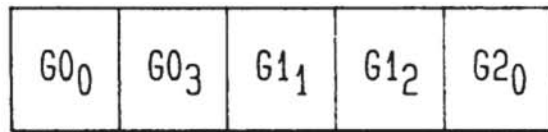
(57) **ABSTRACT**

The invention provides optimal complementary punctured convolutional codes for coding information bits in a communication system. In an illustrative embodiment, an optimal pair of complementary punctured codes is selected from a set of potential code pairs. The set of potential code pairs includes all non-catastrophic complementary punctured code pairs which combine to produce to a specified full-bandwidth code, and thus includes both equivalent and non-equivalent complementary codes. The optimal code pair may be selected, for example, as the pair of equivalent or non-equivalent codes which has the best free Hamming distance and minimum information error weight of all the pairs in the set. In addition, the invention provides both rate-compatible and rate-incompatible codes suitable for use in providing unequal error protection (UEP) for different classes of information bits. The invention further provides optimal bit assignment techniques for use in digital audio broadcasting or other applications in which digital information is transmitted on subcarriers in both an upper and a lower sideband of an analog carrier.

45 Claims, 3 Drawing Sheets



LOWER SIDEBAND



UPPER SIDEBAND

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FIG. 1
(PRIOR ART)

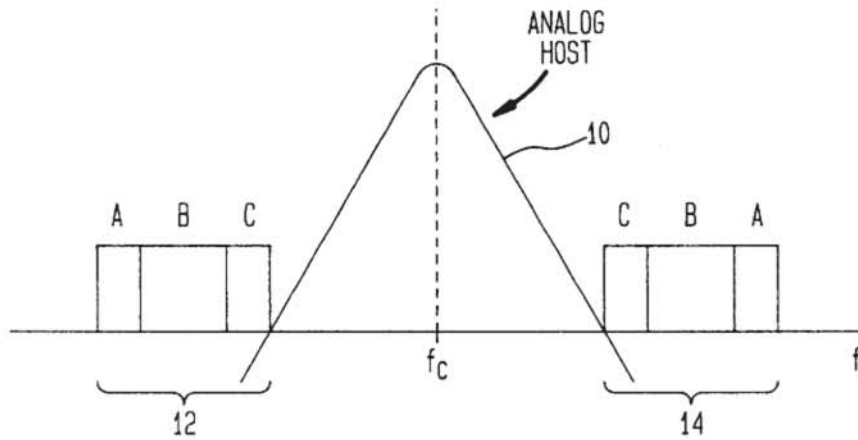


FIG. 2

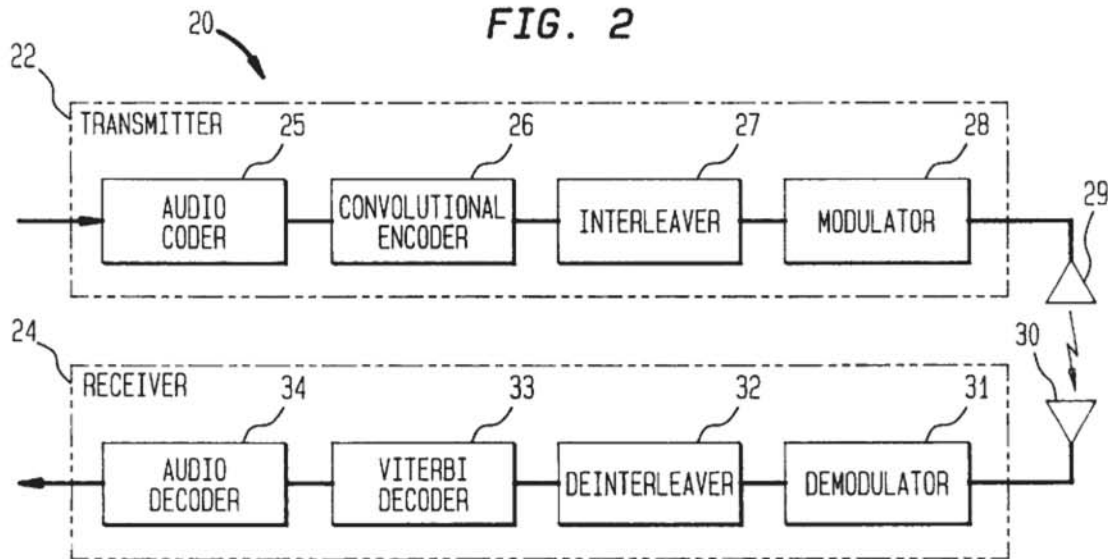
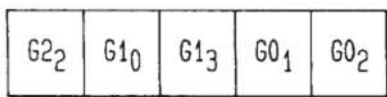
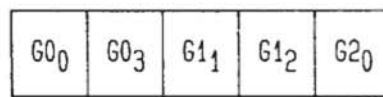


FIG. 3A



LOWER SIDEBAND

FIG. 3B



UPPER SIDEBAND

FIG. 4

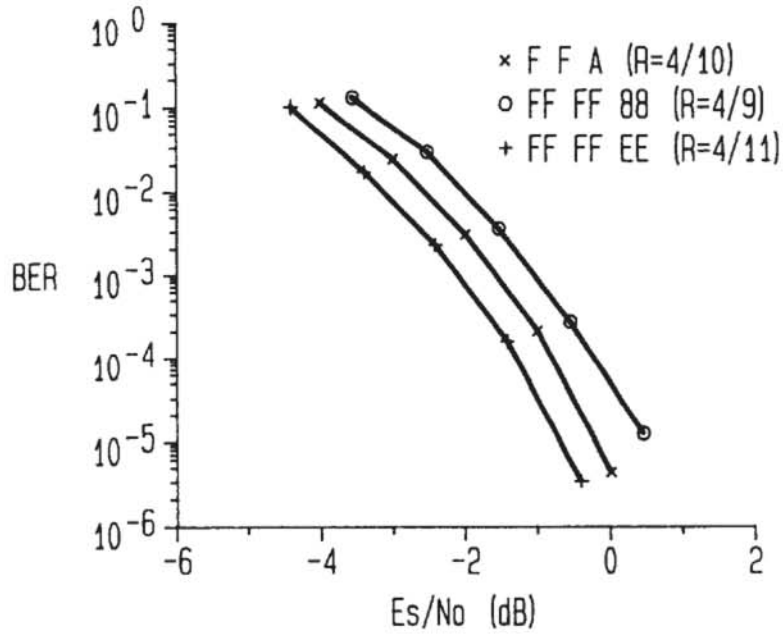


FIG. 5

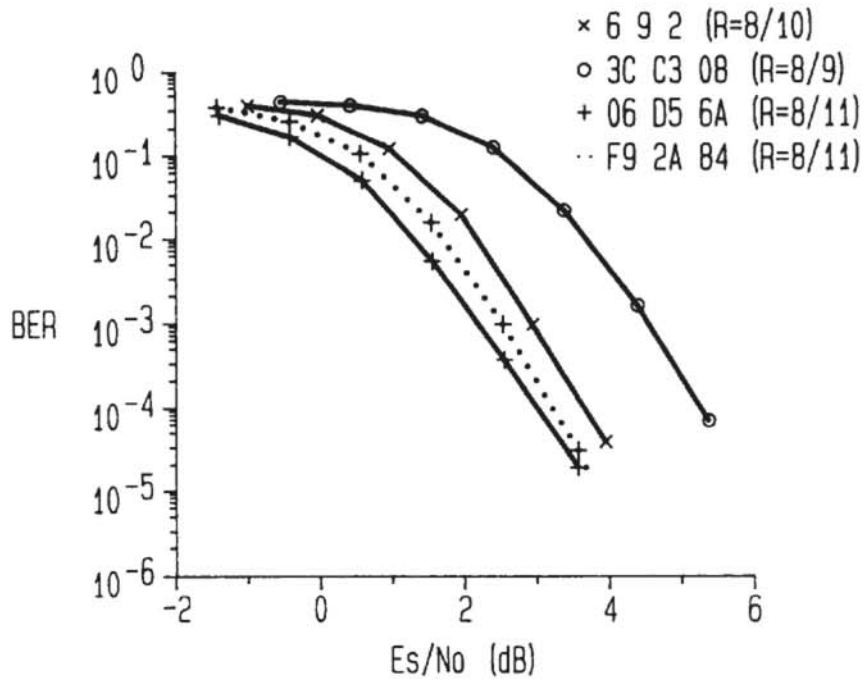


FIG. 6

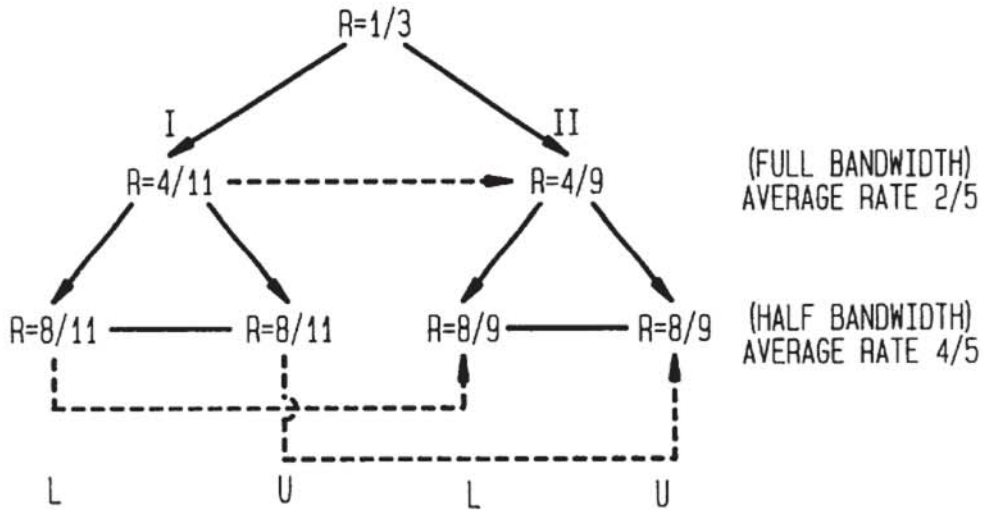
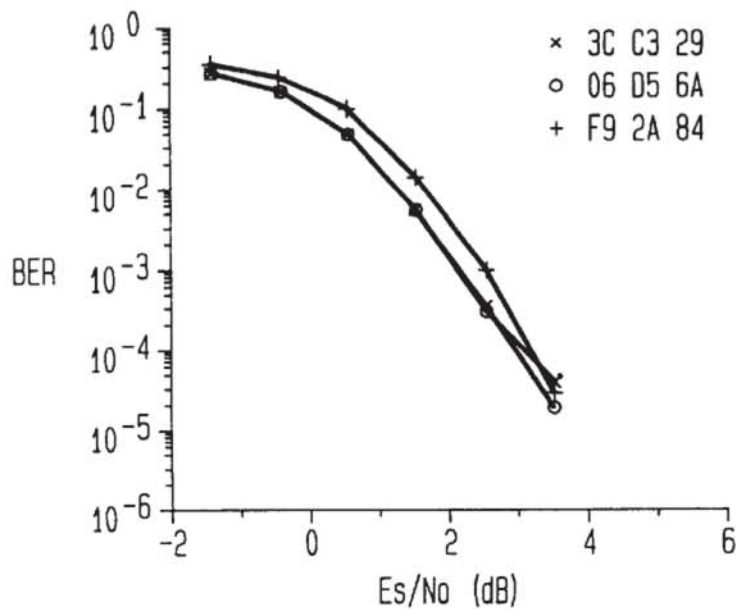


FIG. 7



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