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

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(54) **CHANNEL PROBING SIGNAL FOR A BROADBAND COMMUNICATION SYSTEM**

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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.

This patent is subject to a terminal disclaimer.

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H04L 12/26 (2006.01)
H04L 27/26 (2006.01)
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(52) **U.S. Cl.**
CPC ***H04L 27/2626*** (2013.01); ***H04B 1/707*** (2013.01); ***H04B 1/711*** (2013.01);
(Continued)

(58) **Field of Classification Search**
CPC H04L 12/26; H04L 5/0007; H04L 5/0028; H04L 25/03834; H04L 27/0008; H04L 27/0012
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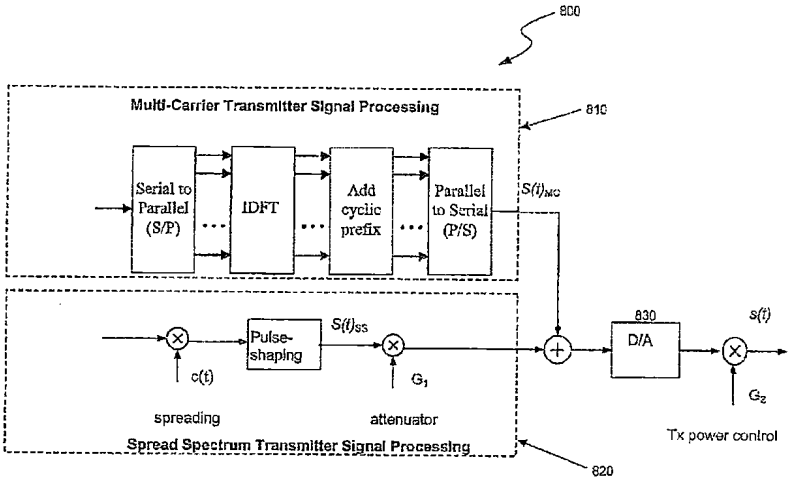
(57) **ABSTRACT**

In a broadband wireless communication system, a spread spectrum signal is intentionally overlapped with an OFDM signal, in a time domain, a frequency domain, or both. The OFDM signal, which inherently has a high spectral efficiency, is used for carrying broadband data or control information. The spread spectrum signal, which is designed to have a high spread gain for overcoming severe interference, is used for facilitating system functions such as initial random access, channel probing, or short messaging. Methods and techniques are devised to ensure that the mutual interference between the overlapped signals is minimized to
(Continued)



have insignificant impact on either signal and that both signals are detectable with expected performance by a receiver.

30 Claims, 18 Drawing Sheets

Related U.S. Application Data

continuation of application No. 14/321,615, filed on Jul. 1, 2014, now Pat. No. 9,948,488, which is a continuation of application No. 13/861,942, filed on Apr. 12, 2013, now Pat. No. 8,767,522, which is a continuation of application No. 13/347,644, filed on Jan. 10, 2012, now Pat. No. 8,428,009, which is a continuation of application No. 12/975,226, filed on Dec. 21, 2010, now Pat. No. 8,094,611, which is a continuation of application No. 10/583,229, filed as application No. PCT/US2005/003518 on Jan. 27, 2005, now Pat. No. 7,864,725.

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(58) **Field of Classification Search**

USPC 370/241, 252, 310, 328, 330, 464, 532

See application file for complete search history.

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