

Exhibit 1



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

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(54) **METHODS AND APPARATUS FOR RANDOM ACCESS IN MULTI-CARRIER COMMUNICATION SYSTEMS**

(75) Inventors: **Xiaodong Li**, Kirkland, WA (US); **Titus Lo**, Bellevue, WA (US); **Kemin Li**, Bellevue, WA (US); **Haiming Huang**, Bellevue, WA (US)

(73) Assignee: **Neocific, Inc.**, Bellevue, WA (US)

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 149 days.

This patent is subject to a terminal disclaimer.

(21) Appl. No.: **13/205,579**

(22) Filed: **Aug. 8, 2011**

(65) **Prior Publication Data**

US 2011/0292881 A1 Dec. 1, 2011

Related U.S. Application Data

(63) Continuation of application No. 10/583,158, filed as application No. PCT/US2005/008169 on Mar. 9, 2005, now Pat. No. 7,995,967.

(60) Provisional application No. 60/551,589, filed on Mar. 9, 2004.

(51) **Int. Cl.**
H04Q 7/216 (2006.01)

(52) **U.S. Cl.**
USPC 370/342; 370/329

(58) **Field of Classification Search**

USPC 370/342
See application file for complete search history.

(56) **References Cited**

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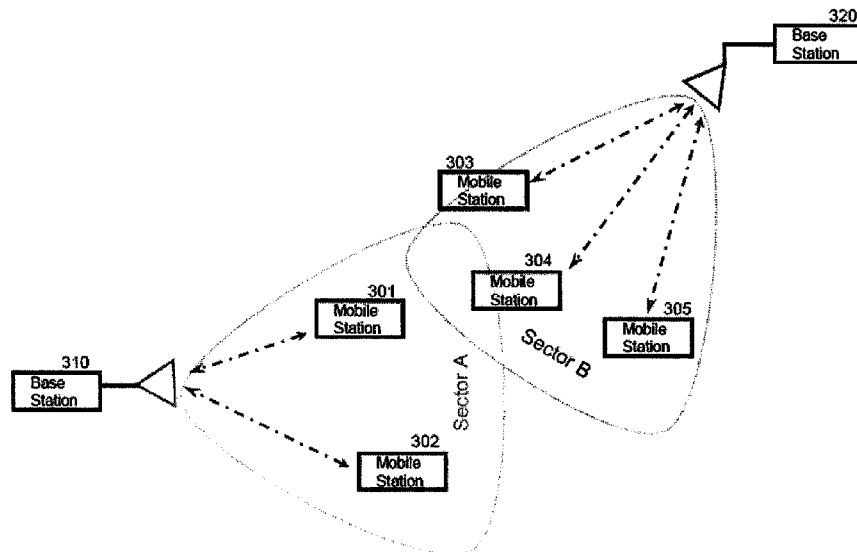
Primary Examiner — Ajibola Akinyemi

(74) *Attorney, Agent, or Firm* — Perkins Coie LLP

(57) **ABSTRACT**

Methods and apparatus in a multi-carrier cellular wireless network with random access improve receiving reliability and reduce interference of uplink signals of a random access, while improving the detection performance of a base station receiver by employing specifically configured ranging signals.

24 Claims, 8 Drawing Sheets



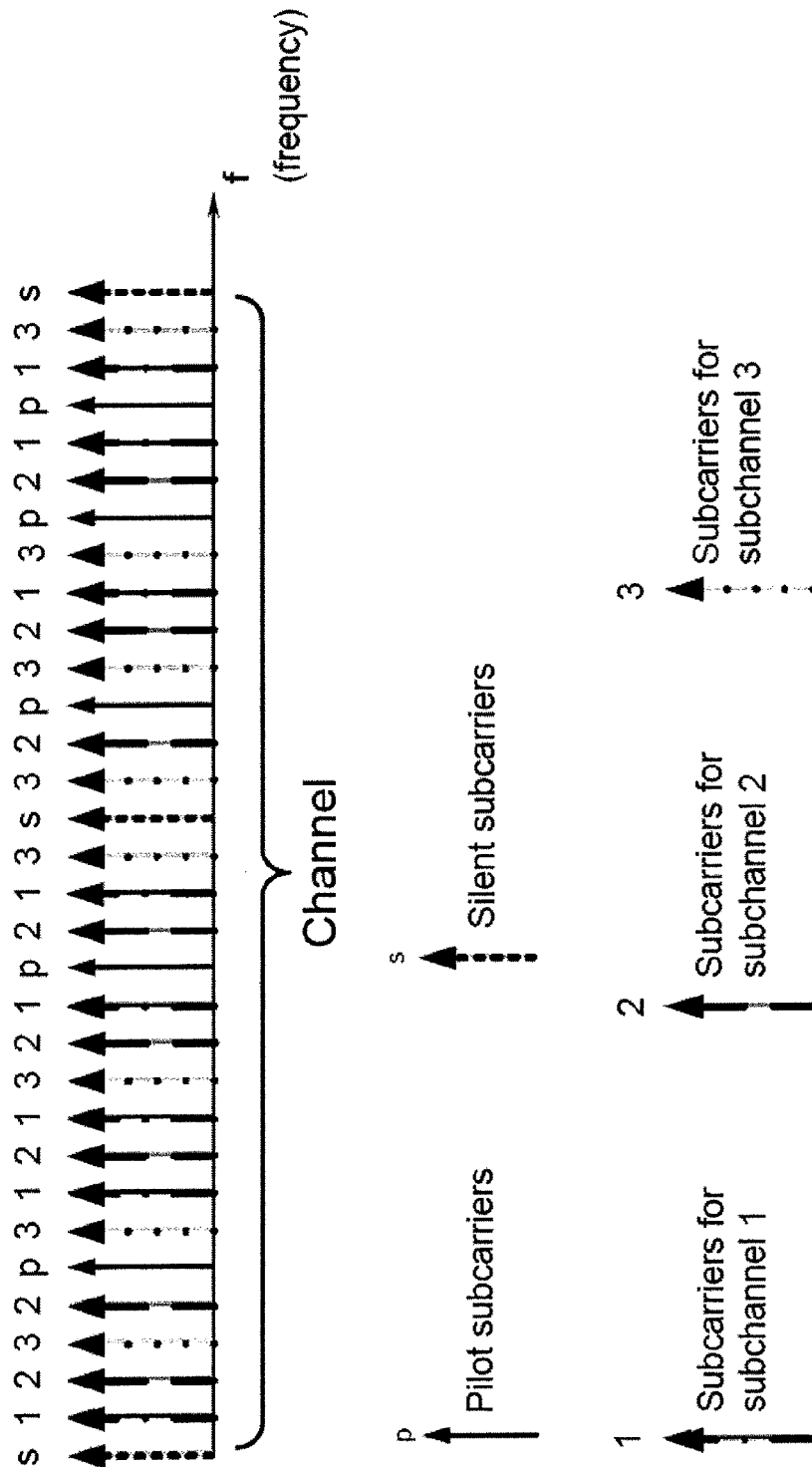


FIG. 1

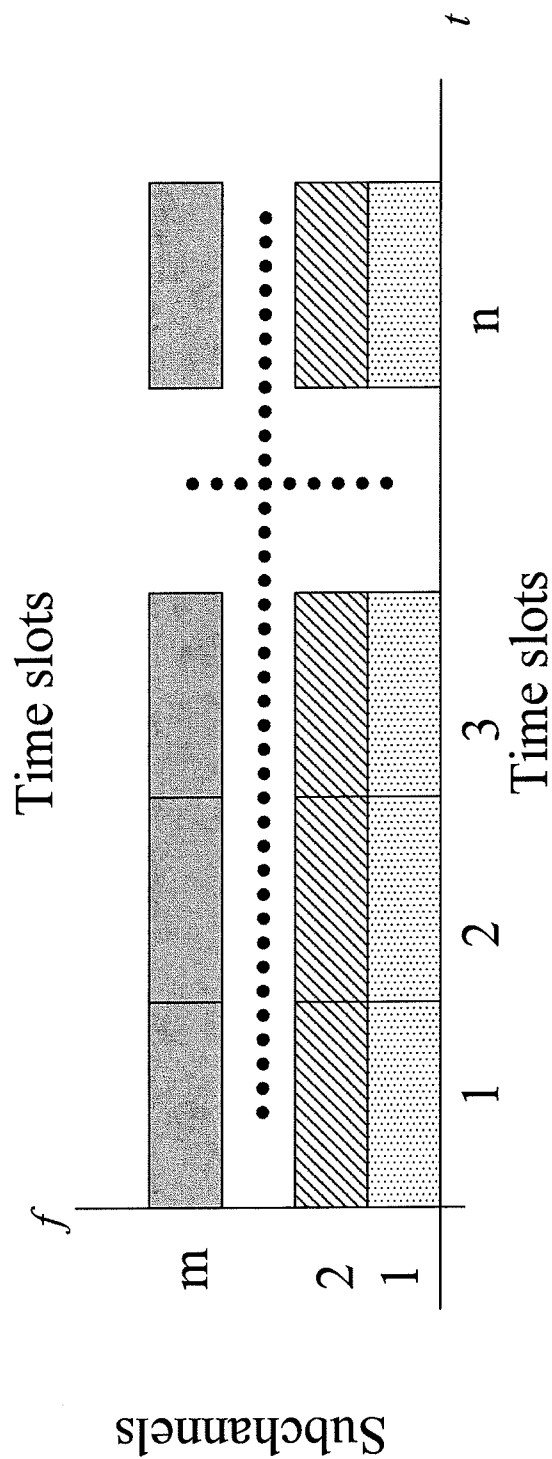
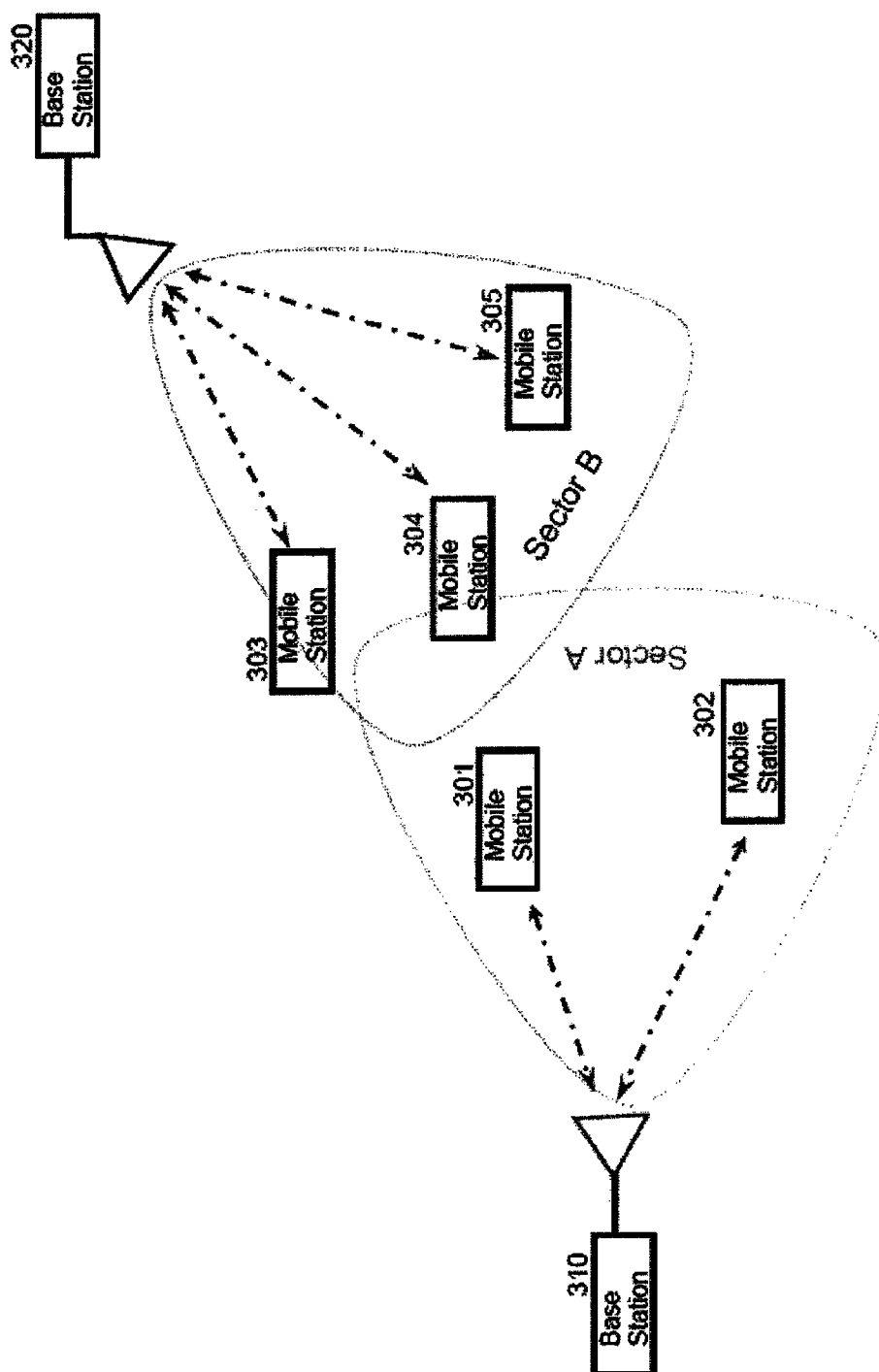


FIG. 2

**FIG. 3**

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