the AGC-output signal. The power means processes the received signal for generating a received-power level. Alternatively, the power means processes the received signal with the despread AGC-output signal for generating a received-power level. The power means generates a power-command signal by comparing the received-power level to a threshold level. The power-command signal may be an analog or digital data signal, or a data signal multiplexed with information data bits. The transmitter means at the base station transmits the power-command signal as the second spread-spectrum signal or as a data signal multiplexed with the information data bits.

At each mobile station, the mobile-despreading means despreads the power-command signal from the second spread-spectrum signal, as a power-adjust signal. The variable-gain means uses the power-adjust signal as a basis for adjusting a transmitter-power level of the first spread-spectrum signal transmitted from the mobile-station transmitter. The transmitter-power level may be adjusted linearly or nonlinearly.

The present invention also includes a method for automatic-power control of a spread-spectrum transmitter for a mobile station operating in a cellular-communications network using spread-spectrum modulation. A mobile station transmits a first spread-spectrum signal. The base station performs the steps of acquiring the first spread-spectrum signal transmitted from the mobile station, and detecting a received power level of the first spread-spectrum signal plus any interfering signal including noise. The steps also include generating an AGC-output signal from the received signal, and despreading the AGC-output signal. The despread AGC-output signal is processed to generate a received-power level. The despread AGC-output signal optionally may be processed with the received signal to generate a received-power level. The method further includes comparing the received-power level to the threshold level to generate a power-command signal. The power-command signal is transmitted from the base station as part of the second spread-spectrum signal.

At the mobile station the method despreads the power-command signal from the second spread-spectrum signal, and adjusts a transmitter power level of the first spread-spectrum signal in response to the power-command signal.

Additional objects and advantages of the invention are set forth in part in the description which follows, and in part are obvious from the description, or may be learned by practice of the invention. The objects and advantages of the invention also may be realized and attained by means of the instrumentalities and combinations particularly pointed out in the appended claims.

BRIEF DESCRIPTION OF THE DRAWINGS

The accompanying drawings, which are incorporated in and constitute a part of the specification, illustrate preferred embodiments of the invention, and together with the description serve to explain the principles of the invention.

FIG. **1** is a block diagram of a base station;

FIG. **2** is a block diagram of a mobile station;

FIG. **3** illustrates linear and nonlinear power adjustment;

FIG. **4** illustrates nonlinear power adjustment;

FIG. **5** is a block diagram for an interference rejection circuit;

FIG. **6** is a block diagram of a base station with interference rejection;

FIG. **7** illustrates during transmission time;

FIGS. **8** and **9** illustrate adaptive power control signal, the broadcast power, for fixed step algorithm; and

FIGS. **10** and **11** illustrate adaptive power control signal, the broadcast signal, for variable step algorithm.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

Reference now is made in detail to the present preferred embodiments of the invention, examples of which are illustrated in the accompanying drawings, wherein like reference numerals indicate like elements throughout the several views.

The present invention assumes that a plurality of mobile stations operate in a cellular-communications network using spread-spectrum modulation. The cellular communications network has a plurality of geographical regions, with a multiplicity of cells within a geographical region. The size of the cells in a first geographical region may differ from the size of the cells a second geographical region. In a first geographical region such as an urban environment, a cellular architecture within the region may have a large number of cells of small area which are close to each other. In a second geographical region such as a rural environment, a cellular architecture within the region may have cells of larger area. Further, within a specified geographic region, the size of the cells may vary.

A mobile station while in the first geographical region may be required to transmit a lower power level than while in the second geographical region. This requirement might be due to a decreased range of the mobile station from the base station. Within a particular cell, a mobile station near the base station of the cell may be required to transmit with a power level less than that when the mobile station is near an outer perimeter of the cell. This is done to ensure a constant power level at the base station, received from each mobile station.

For discussion purposes, a mobile station within a particular cell transmits a first spread-spectrum signal, and the base station transmits a second spread-spectrum signal.

In the exemplary arrangement shown in FIG. **1**, a block diagram of a base station as part of a system for adaptive-power control of a spread-spectrum transmitter is provided. The base station comprises automatic-gain-control (AGC) means, base-correlator means, power means, transmitter means, and an antenna **126**. The AGC means is coupled between the antenna **126** and the base-correlator means. The power means is coupled between the base-correlator means and the transmitter means. The transmitter means is coupled to the antenna **126**.

A received signal at the AGC means typically includes all of the incoming spread spectrum signals, unwanted interfering signals and thermal noise. The AGC means generates an AGC-output signal from the received signal.

The AGC-output signal is passed to the base-correlator means. The base-correlator means despreads the AGC-output signal as a despread AGC-output signal. The power means processes the AGC-output signal as a received-power level. In response to comparing the received-power level to a threshold, the power means generates a power-command signal. The power-command signal is transmitted by the transmitter means as a second spread-spectrum signal to the mobile station.

The power-command signal indicates whether the mobile station is to increase or decrease its power level. The determination of whether to increase or decrease the power