[0026] **FIG. 17** is a state transition diagram which illustrates exemplary transitions of transceiver devices between mode 1 and mode 3 according to the invention.

[0027] **FIG. 18** diagrammatically illustrates operations of an exemplary WPAN according to the invention.

[0028] **FIG. 19** is a timing diagram which illustrates the exemplary state transitions of **FIG. 17** and exemplary operations which can be performed in the mode 1 state.

[0029] **FIG. 19A** diagrammatically illustrates an exemplary embodiment of a transceiver which supports mode 1 and mode 3 according to the invention.

[0030] **FIG. 20** diagrammatically illustrates an exemplary format of a probe packet according to the invention.

[0031] **FIG. 21** illustrates in detail an example of the PLS portion of **FIG. 19**.

[0032] **FIG. 21A** diagrammatically illustrates pertinent portions of an exemplary embodiment of the mode controller of **FIG. 19A**.

[0033] **FIG. 21B** illustrates exemplary operations which can be performed by the mode controller of **FIGS. 19A and 21A**.

[0034] **FIG. 22** diagrammatically illustrates an exemplary format of a selection packet according to the invention.

[0035] **FIG. 23** graphically illustrates exemplary PLS sampling results obtained according to the invention.

[0036] **FIGS. 24 and 24**A diagrammatically illustrate exemplary time slot formats for mode 3 communication according to the invention.

[0037] **FIG. 24B** illustrates exemplary operations of a retransmission technique according to the invention.

[0038] **FIG. 24C** illustrates pertinent portions of an exemplary transceiver embodiment that can implement operations shown in **FIG. 24B**.

[0039] **FIG. 25** illustrates an exemplary packet format for use with the time slot formats of **FIG. 24**.

[0040] **FIG. 25A** illustrates an exemplary ARQ packet format according to the invention.

[0041] **FIG. 26** diagrammatically illustrates an exemplary format of a training sequence which can be used in conjunction with the packet format of **FIG. 25**.

[0042] **FIG. 27** illustrates a portion of the slot format of **FIG. 24** in more detail.

[0043] **FIG. 28** illustrates in tabular format exemplary transmission parameters which can be used for video transmission using mode 3 according to the invention.

[0044] **FIG. 29** diagrammatically illustrates exemplary acquisition and packet reception algorithms for mode 3 operation according to the invention.

[0045] **FIG. 30** diagrammatically illustrates an exemplary embodiment of a mode 3 receiver according to the invention which can implement the algorithms of **FIG. 29**.

[0046] **FIG. 31** diagrammatically illustrates an exemplary embodiment of a mode 3 transmitter according to the invention.

[0047] **FIG. 32** graphically illustrates an exemplary mapping of bits to symbols which can be used in mode 3 operation.

[0048] **FIG. 33** graphically illustrates another exemplary mapping of bits to symbols which can be used in mode 3 operation.

[0049] **FIG. 34** graphically illustrates a typical channel impulse response encountered by transceivers according to the invention.

[0050] **FIG. 35** diagrammatically illustrates an exemplary embodiment of an equalizer section which can be used to provide equalization of the channel model of **FIG. 34**.

[0051] **FIG. 36** diagrammatically illustrates another exemplary equalizer section which can be used to equalize the channel model of **FIG. 34**.

[0052] **FIG. 37** diagrammatically illustrates an exemplary turbo coder for use in conjunction with mode 3 operation according to the invention.

[0053] FIGS. **38-44** graphically illustrate exemplary simulation results for mode 3 operation in various communication channels.

## DETAILED DESCRIPTION

[0054] The invention includes a PHY layer solution to the IEEE 802.15 Task Group 3 that offers the best solution in terms of complexity vs. performance according to the criteria document of the IEEE P802.15 Working Group for Wireless Personal Area Networks (WPANs), "TG3-Criteria-Definitions", May 11, 2000, which outlines requirements for high rate wireless personal area network (WPAN) systems, and which is incorporated herein by reference. The required data rates to be supported by a high rate WPAN according to the invention are specified in the aforementioned criteria document. The data rates for audio are 128-1450 kbps, for video are from 2.5-18 Mbps and for computer graphics are 15, 38 Mbps. Due to the wide range for the required data rates, and in order to have a cost-effective solution covering all the data rates, the invention provides for a two or three mode system in the 2.4 GHz band. The available modes include:

[0055] (1) Mode 1 is a conventional Bluetooth 1.0 system giving a data rate of 1 Mbps.

[0056] (2) Mode 2 uses the same frequency hopping (FH) pattern as Bluetooth but uses a 64 QAM modulation giving a data rate of 3.9 Mbps.

[0057] (3) Mode 3 selects a good 22 MHz band in the 2.402-2.483 GHz ISM using a probe, listen and select (PLS) technique, and transmits up to 44 Mbps using direct sequence spread spectrum (DSSS).

[0058] Examples of system parameters according to the invention are summarized in **FIG. 1**. Wireless transceiver devices according to the invention can support any combination of the aforementioned operational modes. Examples include: devices capable of handling mode 1+mode 2 for covering audio and Internet streaming data rates of up to 2.5 Mbps; and devices capable of handling mode 1+mode 3 for covering DVD-High Quality Game applications of up to 38 Mbps. These exemplary configurations are shown diagrammatically in **FIG. 2**.