1, −1, 1 −1, 1, −1, 1, −1, 1, −1, 1, −1] and it aids in the initial symbol timing acquisition by the receiver. The preamble is followed in this **FIG. 26** example by the 64-bit Bluetooth sync. word transmitted using quadrature phase shift keying (QPSK), implying a 32 symbol transmission in mode 3. The sync. word is followed by the header transmitted using QPSK modulation. The farthest constellations in the 16 QAM are employed for the transmission of the preamble, sync. word and header (see **FIG. 6**). Referring also to **FIG. 27**, the header is followed by a payload such that the total time occupied by the packet is 200 microseconds. The payload is followed by the 32-bit CRC.

[**0129**] It should be understood that the above-described slot and packet formats are exemplary only and that, for example: the packet length can be set to any desired length; a different size polynomial can be used for the CRC; and a different size training sequence can be used with the preamble, sync word and header sized as desired. It should also be understood that the above-described slot and packet formats are readily applicable to two-way communications.

[**0130**] The exemplary slot and packet formats described above permit, for example, transmission of HDTV MPEG2 video at 18 Mbps. Assume, for example, that 24 frames/sec. is transmitted for MPEG 2 video. Thus, the master transmits to the slave 100 packets each of length 200 μsec. carrying a data payload of 2184 symbols. Assuming, for example, that 10 such packets are preceded by the training sequence of 81 symbols (**FIG. 26**), and that 16 QAM with rate V_2 coding is used, 206.8 msec. is needed for transmission of 6 video frames. Assuming a 9% ARQ rate implies that the total time required for 6 video frames is 225 msec. **FIG. 28** summarizes exemplary transmission parameters for HDTV MPEG2 video transmission using mode 3.

[**0131**] The receiver algorithms for acquisition and packet reception in mode 3 are similar to mode 2. An exemplary block diagram of mode 3 receiver algorithms is shown in **FIG. 29**. An exemplary receiver embodiment for mode 3 is shown diagrammatically in **FIG. 30**. The demodulator of **FIG. 30** shown generally at **301** can include, for example, channel estimation, equalization, and symbol-to-bit mapping.

[**0132**] An exemplary transmitter embodiment for mode 3 is shown in **FIG. 31**. Each D/A converter **310** on the I and Q channels can be, for example, an 6-bit 44 MHz converter. The transmitter and receiver of **FIGS. 31 and 30** can be used together to form the exemplary mode 3 transceiver of **FIG. 19A** above.

[**0133**] In some exemplary embodiments, modulation options such as QPSK, 16-QAM and 8-PSK (8-ary phase shit keying) can be used in mode 3, as shown in **FIGS. 32, 32A** and **33**. Referring to the QPSK example of **FIG. 32**, an exemplary cover sequence S, such as used in IEEE 802.11, is used to spread the transmitted symbols. The mapping from bits to symbols is shown in **FIG. 32**. Referring to the 8-PSK example of **FIG. 32**A, the cover sequence S, as used in IEEE 802.11, is used to spread the transmitted symbols. The mapping from bits to symbols is shown in **FIG. 32A**. Referring to the 16-QAM example of **FIG. 33**, the cover sequence (also referred to herein as a scrambling code) S, as used in IEEE 802.11, is used to spread the transmitted symbols. The mapping from bits to symbols is shown in **FIG. 33**. In the examples of FIGS. **32** and 33, Si represents the ith member of the sequence S, and is either 1 or 0. In some embodiments, no cover sequence is used, in which case the constellations associated with either value of S can be used.

[**0134**] The exponentially delayed Rayleigh channel example shown in **FIG. 34** is typical of an anticipated operating environment and may therefore be used to test performance. The complex amplitudes of the channel impulse response of **FIG. 34** are given by

$$h_i = N(0, \sigma_k^2/2) + jN(0, \sigma_k^2/2)$$

$$\sigma_k^2 = \sigma_0^2 e^{-kT_S/T_{RMS}}$$

$$\sigma_0^2 = 1 - e^{-T_S/T_{RMS}}$$

$$T_{RMS} = 25$$

[**0135**] This channel model requires equalization (at the outputs of the filters **305** in **FIG. 30**), and this can be done in a variety of ways, two conventional examples of which are described below with respect to **FIGS. 35 and 36**.

[**0136**] A block diagram of an exemplary MMSE (minimum mean squared error) equalizer section is shown in **FIG. 35**. The equalizer section includes an MMSE equalizer, followed by a block DFE (decision feedback equalizer). The MMSE produces at **350** decisions on all the symbols using the minimum mean squared error criterion and an estimate of the channel. The DFE subtracts the decisions of all the symbols obtained by the MMSE from the input signal and then produces at **351** matched filter soft-decisions on all the symbols. These are then fed to a soft-decisions block that produces at 352 soft decisions on the bit-level. These bit-level soft decisions are in turn fed to the turbo-decoder **307** (see **FIG. 30**) or to a threshold device in the case of an uncoded system.

[**0137**] The exemplary MAP equalizer section of **FIG. 36** maximizes the a posteriori probabilities of the transmitted symbols given the received signal and an estimate of the channel. These symbol probabilities **360** are then converted to bit probabilities by summing over the symbols at **361**. These bit probabilities **362** are then input to the turbo decoder or a threshold device.

[**0138**] Video transmission typically requires a BER of 10^{-8}, so turbo coding is used to achieve this error rate. Parallel concatenated convolutional codes (PCCC) are known to have an error floor at about 10^{-7}, while serial concatenated convolutional codes (SCCC) do not have an error floor and can meet the BER requirements. The SCCC in FIG. **37** is conventional, and was originally proposed by Divsalar and Pollara in "Serial and Hybrid Concatenated Codes with Applications," Proceedings International Symposium of Turbo Codes and Applications, Brest, France, September 1997, pp. 80-87, incorporated herein by reference.

[**0139**] Exemplary results of Monte-Carlo simulations for mode 3 are given in FIGS. **38-44**. In all simulations a frame size with 4096 information bits was used. **FIGS. 38 and 39** show the FER and BER in an AWGN channel. **FIGS. 40 and 41** show the FER and BER in the IEEE 802.15.3 multipath channel without fading. **FIGS. 42 and 43** show the FER and BER in the IEEE 802.15.3 multipath channel with fading. **FIG. 44** shows the FER in a single-path Rayleigh fading channel.