

In this work, various channel coding schemes that can be used in hybrid automatic repeat request (HARQ) transmission protocols are investigated from an energy efficiency point of view. Conventional HARQ, where only one bit is used to inform the transmitter about the decoding success or failure, is compared to adaptive HARQ where the transmitter adapts either the length or the transmit power of the codewords using outdated channel state information (i.e., experienced by the receiver during the past transmissions). Describing the problems within a Markov decision process framework, we find optimal adaptation policies for both persistent (unlimited number of transmission) and truncated HARQ protocols. Numerical examples obtained in a Rayleigh block fading channel show that, in terms of energy efficiency, the adaptation of the codewords length provides notable gains over power adaptation and conventional HARQ.