CLAIMS

1. A method of wireless communications, comprising:

generating a two-dimensional polar code of size *N*, wherein the two-dimensional polar code has K columns and M rows, wherein N = K x M, corresponding to an outer encoding operation with a code of length K, and an inner encoding operation with a code of length M;

determining a plurality of locations of row-wise block codes having a rate of 1 within the two-dimensional polar code;

generating redundancy check information based on portions of a sequence of information bits, the portions being defined by the plurality of locations of the row-wise block codes having a rate of 1;

inserting the redundancy check information in the sequence of information bits at locations corresponding to the plurality of locations of the row-wise block codes having a rate of 1;

generating a codeword based on the sequence of information bits, including the redundancy check information; and

transmitting the codeword over a wireless channel.

2. The method of claim 1, further comprising

encoding the information bits using a first polar code of length K to obtain bits for transmission via K channels; and

further encoding the bits in each of the K channels using a second polar code of length M.

3. The method of claim 2, further comprising inserting redundancy check information selectively generated for at least one of:

bits of one or more of the *K* channels encoded with the second polar code, wherein the second polar code is rate less than 1; or

bits of one or more of the *K* channels encoded with the second polar code, wherein the second polar code is rate 1.

4. The method of claim 1, wherein:

the redundancy check information comprises cyclic redundancy check, CRC, values generated from preset subsets of the information bits; and

each subset has a same number of information bits.

5. The method of claim 1, further comprising inserting into the codeword one or more codes indicating how to decode portions of the codeword, wherein the one or more codes comprise at least one of a single parity check, SPC, code, a repetition code, or a rate zero code.

6. A method of wireless communications, comprising:

receiving, over a wireless channel, a codeword encoded using a two-dimensional polar code of size N, wherein the two-dimensional polar code has K columns and M rows, wherein N = K x M, corresponding to an outer encoding operation with a code of length K, and an inner encoding operation with a code of length M;

decoding the codeword using the two-dimensional polar code to generate a sequence of information bits, wherein the decoding is successive cancelation list decoding; and

verifying portions of the sequence of information bits based on redundancy check information inserted in the sequence of information bits at locations corresponding to a plurality of row-wise block codes having a rate of 1 in the two-dimensional polar code, wherein the redundancy check information has been generated at the transmitter based on portions of the information bit sequence being defined by the plurality of locations of the row-wise block codes having a rate of 1.

7. The method of claim 6, wherein the codeword comprises:

information bits encoded using a first polar code of length K to obtain bits for transmission via K channels; and

bits in each of the K channels further encoded using a second polar code of length M.

8. The method of claim 7, wherein the decoding comprises:

decoding bits of the K channels encoded with the second polar code that is rate less than 1 using a first decoding approach, wherein the first decoding approach comprises performing successive cancelation, SC, list decoding; and

decoding bits of the K channels encoded with the second polar code that is rate 1 using a second decoding approach, wherein the second decoding approach involves taking hard decisions.

9. The method of claim 8, further comprising:

replicating at least a portion of the received codeword; and

using the replicated portion of the codeword to reduce latency of the SC list decoding.

10. The method of claim 6, wherein the redundancy check information comprises cyclic redundancy check, CRC, values generated from preset subsets of the sequence of information bits, and wherein each subset has a same number of information bits.

11. The method of claim 10, wherein decoding the codeword using the two-dimensional polar code comprises:

performing column-wise SC decoding of one or more bits of the sequence of information bits based on the CRC values; and

performing row-wise list decoding after the column-wise SC decoding.

12. The method of claim 6, wherein decoding comprises:

determining, from the codeword, one or more codes indicating how to decode the portions of the codeword, wherein the one or more codes comprise at least one of a single parity check, SPC, code, a repetition code, or a rate zero code; and

decoding the portions of the codeword based on the one or more codes.

13. An apparatus for wireless communications, comprising:

at least one processor configured to:

generate a two-dimensional polar code of size *N*, wherein the two-dimensional polar code has K columns and M rows, wherein N = K x M, corresponding to an outer encoding operation with a code of length K, and an inner encoding operation with a code of length M;

determine a plurality of row-wise block codes having a rate of 1 within the two-dimensional polar code;

generate redundancy check information based on portions of a sequence of information bits, the portions being defined by the plurality of row-wise block codes having a rate of 1;

insert the redundancy check information in the sequence of information bits at locations corresponding to the plurality of row-wise block codes having a rate of 1; and

generate a codeword based on the sequence of information bits, including the redundancy check information; and

a transmitter configured to transmit the codeword over a wireless channel.

14. The apparatus of claim 13, wherein the at least one processor is configured to generate the codeword by:

encoding the information bits using a first polar code of length *K* to obtain bits for transmission via *K* channels; and

further encoding the bits in each of the *K* channels using a second polar code of length M.

15. An apparatus for wireless communications, comprising:

a receiver configured to receive, over a wireless channel, a codeword encoded using a two-dimensional polar code of size *N*, wherein the two-dimensional polar code has K columns and M rows, wherein N = K x M, corresponding to an outer encoding operation with a code of length K, and an inner encoding operation with a code of length M;

at least one processor configured to:

decode the codeword using the two-dimensional polar code to generate a sequence of information bits, wherein the decoding is successive cancelation list decoding; and

verify portions of the sequence of information bits based on redundancy check information inserted in the sequence of information bits at locations corresponding to a plurality of row-wise block codes having a rate of 1 in the two-dimensional polar code, wherein the redundancy check information has been generated at the transmitter based on portions of the information bit sequence being defined by the plurality of locations of the row-wise block codes having a rate of 1; and

a memory coupled with the at least one processor.