CLAIMS

1. A method for wireless communications performed by a user equipment (UE), comprising:

iteratively segmenting a group of K information bits into a plurality of segments~~;~~

~~encoding the information bits of each of the plurality of segments using a polar code to generate a plurality of encoded segments; and~~

~~transmitting the plurality of encoded segments.~~

~~2. The method of claim 1~~ of information bits, wherein iteratively segmenting the group of K information bits comprises segmenting the group of K information bits in a series of stages, wherein a first stage of the series comprises:

~~—~~segmenting the K information bits into a first resulting segment including $K^{(1)}$ information bits and a second resulting segment including $K^{(2)}$ information bits, wherein:

~~—~~when K is even, $K^{(1)}=K/2$ and $K^{(2)}=K/2$, and

~~—~~when K is odd, $K^{(1)}=(K-1)/2$ and $K^{(2)}=(K+1)/2$;

~~—~~adding zero padding bits to the first resulting segment, when K is even; and

~~—~~adding one padding bit to the first resulting segment, when K is odd~~.~~;

encoding the information bits of each of the plurality of segments of information bits using a polar code to generate a plurality of encoded segments; and

transmitting the plurality of encoded segments.

~~3~~2. The method of claim ~~2~~1, wherein iteratively segmenting a second stage and each succeeding stage of the series comprises:

segmenting each of the resulting segments of the immediately preceding stage into two new resulting segments, wherein:

when a number of bits of the resulting segment of the immediately preceding stage is even, then each of the two new resulting segments has ½ of the number of bits of the resulting segment of the immediately preceding state,

when a number of bits of the resulting segment of the immediately preceding stage is odd, then a first new resulting segment has (the number of bits of the resulting segment of the immediately preceding stage – 1)/2 bits and a second new resulting segment has (the number of bits of the resulting segment of the immediately preceding stage + 1)/2 bits;

adding zero padding bits to the first new resulting segment, when the number of bits of the resulting segment of the immediately preceding stage is even; and

adding one padding bit to the first new resulting segment, when the number of bits of the resulting segment of the immediately preceding stage is odd.

3. The method of claim 1, further comprising determining to iteratively segment a group of K information bits into a plurality of segments of information bits based on a maximum mother code length, Nmax, of polar codes supported by the UE and K.

4. The method of claim 1, further comprising:

~~determining, based on one or more of K and parameters of the polar code, to iteratively segment the group of K information bits into the plurality of segments.~~

~~5. The method of claim 4, wherein the determination is based on a maximum mother code length, Nmax, of polar codes supported by the UE and K.~~

~~6. The method of claim 4, wherein the determination is based on K being greater than a threshold number of information bits, K_thr, a coding rate, R, being greater than a threshold coding rate, R_thr, and a coded bit length, M, being greater than a threshold coded bit length, M_thr.~~

~~7. The method of claim 4, further comprising:~~

~~determining a threshold coded bit length, M_thr, based on a maximum mother code length of polar codes supported by the UE, wherein the determination to iteratively segment the group of K information bits is based on K being greater than a threshold number of information bits, K_thr, and a coded bit length, M, being greater than M_thr.~~

~~8. The method of claim 4, further comprising:~~

determining a coding rate with segmentation, R_seg, based on K, a cyclic redundancy check (CRC) length, a mother code length of the polar code after rate matching with segmentation, and a coded bit length, M; and

determining a coding rate without segmentation, R_noseg, based on K, a cyclic redundancy check (CRC) length, a mother code length of the polar code after rate matching without segmentation, and a coded bit length, M~~; and~~

~~———~~, wherein the determination to iteratively segment the group of K information bits is based on R_seg being less than R_noseg.

~~9~~5. The method of claim ~~8~~4, wherein:

R_seg = (K/2 + CRC length) / min(mother code length of the polar code after rate matching with segmentation, (M/2)), and

R_noseg = (K + CRC length) / min(mother code length of the polar code after rate matching without segmentation, (M)).

~~10~~6. The method of claim 1, wherein transmitting each encoded segment comprises:

writing each coded bit of the encoded segment to a circular buffer having a size equal to a size, N, of the polar code, wherein the coded bits are written in an order dependent on N;

reading M coded bits from the circular buffer; and

transmitting the M coded bits.

7. A method for wireless communications performed by a user equipment (UE), comprising:

determining, based on one or more of K and parameters of a polar code, to iteratively segment a group of K information bits into a plurality of segments, wherein the determination is based on:

K being greater than a threshold number of information bits, K_thr,

a coding rate, R, being greater than a threshold coding rate, R_thr, and

a coded bit length, M, being greater than a threshold coded bit length, M_thr;

iteratively segmenting the group of K information bits into the plurality of segments;

encoding the information bits of each of the plurality of segments using a polar code to generate a plurality of encoded segments; and

transmitting the plurality of encoded segments.

8. A method for wireless communications performed by a user equipment (UE), comprising:

determining, based on one or more of K and parameters of a polar code, to iteratively segment a group of K information bits into a plurality of segments,

determining a threshold coded bit length, M_thr, based on a maximum mother code length of polar codes supported by the UE, wherein the determination to iteratively segment the group of K information bits is based on K being greater than a threshold number of information bits, K_thr, and a coded bit length, M, being greater than M_thr;

iteratively segmenting the group of K information bits into the plurality of segments;

encoding the information bits of each of the plurality of segments using a polar code to generate a plurality of encoded segments; and

transmitting the plurality of encoded segments.

~~11~~9. A method for wireless communications performed by a user equipment (UE), comprising:

determining, based on one or more of a payload size of a group of information bits and parameters of a polar code, to segment the group of information bits into a plurality of segments, wherein the payload size is K~~;~~, and wherein the determination is based on:

K being greater than a threshold number of bits, K_thr,

a coding rate, R, being greater than a threshold coding rate, R_thr, and

a coded bit length, M, being greater than a threshold coded bit length, M_thr;

segmenting the group of information bits into the plurality of segments;

encoding the information bits of each of the plurality of segments using the polar code to generate a plurality of encoded segments; and

transmitting the plurality of encoded segments.

~~12~~10. The method of claim ~~11~~9, wherein the determination is based on a maximum mother code length, Nmax, of polar codes supported by the UE, and K.

~~13~~11. The method of claim ~~11, wherein the determination is based on:~~

~~K being greater than a threshold number of bits, K_thr,~~

~~a coding rate, R, being greater than a threshold coding rate, R_thr, and~~

~~a coded bit length, M, being greater than a threshold coded bit length, M_thr.~~

~~14. The method of claim 11, wherein the determination to segment the group of information bits is based on:~~

~~K being greater than or equal to a threshold payload size, K_thr, and~~

~~a coded bit length, M, being greater than or equal to a threshold coded bit length M_thr.~~

~~15. The method of claim 14, wherein K_thr = 360 and M_thr = 1088.~~

~~16. The method of claim 11~~9, further comprising:

determining a coding rate with segmentation, R_seg, based on K, a cyclic redundancy check (CRC) length, a mother code length of a polar code after rate matching with segmentation, and a coded bit length, M; and

determining a coding rate without segmentation, R_noseg, based on K, a cyclic redundancy check (CRC) length, a mother code length of a polar code after rate matching without segmentation, and a coded bit length, M~~; and~~, wherein the determination to segment the group of information bits is based on R_seg being less than R_noseg.

~~wherein the determination to segment the group of K information bits is based on R_seg being less than R_noseg.~~

~~17~~12. The method of claim ~~16~~11, wherein:

R_seg = (K/2 + CRC length) / min(mother code length of the polar code after rate matching with segmentation, (M/2)), and

R_noseg = (K + CRC length) / min(mother code length of the polar code after rate matching without segmentation, (M)).

~~18~~13. The method of claim ~~11~~9, wherein transmitting each encoded segment comprises:

writing each coded bit of the encoded segment to a circular buffer having a size equal to a size, N, of the polar code, wherein the bits are written in an order dependent on N;

reading M coded bits from the circular buffer; and

transmitting the M coded bits.

~~19~~14. The method of claim ~~11~~9, wherein the determination to segment the group of ~~K~~ information bits is based on K being greater than or equal to a threshold payload size, K_thr.

~~20~~15. The method of claim ~~19~~14, wherein K_thr = 1013.

16. A method for wireless communications performed by a user equipment (UE), comprising:

determining, based on one or more of a payload size of a group of information bits and parameters of a polar code, to segment the group of information bits into a plurality of segments, wherein the payload size is K, and wherein the determination to segment the group of information bits is based on:

K being greater than or equal to a threshold payload size, K_thr, and

a coded bit length, M, being greater than or equal to a threshold coded bit length M_thr;

segmenting the group of information bits into the plurality of segments;

encoding the information bits of each of the plurality of segments using the polar code to generate a plurality of encoded segments; and

transmitting the plurality of encoded segments.

17. The method of claim 16, wherein K_thr = 360 and M_thr = 1088.

~~21~~18. An apparatus for wireless communications, comprising:

a processor configured to:

~~———~~iteratively segment a group of K information bits into a plurality of segments~~;~~

~~encode the information bits of each of the plurality of segments using a polar code to generate a plurality of encoded segments; and~~

~~cause the apparatus to transmit the plurality of encoded segments; and~~

~~a memory coupled with the processor.~~

~~22. The apparatus of claim 21, wherein the processor is configured to iteratively segment the group of K~~ of information bits by segmenting the group of K information bits in a series of stages ~~and the processor is configured to segment the group of K information bits in~~ , wherein a first stage of the series ~~by~~comprises:

~~segmenting~~ the K information bits into a first resulting segment including $K^{(1)}$ information bits and a second resulting segment including $K^{(2)}$ information bits, wherein:

~~when~~ K is even, $K^{(1)}=K/2$ and $K^{(2)}=K/2$,

~~when~~ K is odd, $K^{(1)}=(K-1)/2$ and $K^{(2)}=(K+1)/2$;

~~adding~~ zero padding bits to the first resulting segment, when K is even; and

~~adding~~ one padding bit to the first resulting segment, when K is odd~~.~~;

encode the information bits of each of the plurality of segments of information bits using a polar code to generate a plurality of encoded segments; and

cause the apparatus to transmit the plurality of encoded segments; and

a memory coupled with the processor.

~~23~~19. The apparatus of claim ~~22~~18, wherein the processor is configured to iteratively segment the group of K information bits in ~~s~~a second stage and each succeeding stage of the series by:

segmenting each of the resulting segments of the immediately preceding stage into two new resulting segments, wherein:

when a number of bits of the resulting segment of the immediately preceding stage is even, then each of the two new resulting segments has ½ of the number of bits of the resulting segment of the immediately preceding state,

when a number of bits of the resulting segment of the immediately preceding stage is odd, then a first new resulting segment has (the number of bits of the resulting segment of the immediately preceding stage – 1)/2 bits and a second new resulting segment has (the number of bits of the resulting segment of the immediately preceding stage + 1)/2 bits;

adding zero padding bits to the first new resulting segment, when the number of bits of the resulting segment of the immediately preceding stage is even; and

adding one padding bit to the first new resulting segment, when the number of bits of the resulting segment of the immediately preceding stage is odd.

~~24~~20. The apparatus of claim ~~21, wherein the processor is further configured to:~~

~~determine, based on one or more of K and parameters of the polar code, to iteratively segment the group of K information bits into the plurality of segments.~~

~~25. The apparatus of claim 24~~18, wherein the processor is further configured to determine to iteratively segment the group of K information bits based on a maximum mother code length, Nmax, of polar codes supported by the apparatus and K.

~~26. The apparatus of claim 24, wherein the processor is configured to determine to iteratively segment the group of K information bits based on K being greater than a threshold number of information bits, K_thr, a coding rate, R, being greater than a threshold coding rate, R_thr, and a coded bit length, M, being greater than a threshold coded bit length, M_thr.~~

~~27. The apparatus of claim 24, wherein the processor is further configured to:~~

~~determine a threshold coded bit length, M_thr, based on a maximum mother code length of polar codes supported by the apparatus, wherein the determination to iteratively segment the group of K information bits is based on K being greater than a threshold number of information bits, K_thr, and a coded bit length, M, being greater than M_thr.~~

~~28. The apparatus of claim 24~~21. The apparatus of claim 18, wherein the apparatus is further configured to:

determine a coding rate with segmentation, R_seg, based on K, a cyclic redundancy check (CRC) length, a mother code length of the polar code after rate matching with segmentation, and a coded bit length, M;

determine a coding rate without segmentation, R_noseg, based on K, a cyclic redundancy check (CRC) length, a mother code length of the polar code after rate matching without segmentation, and a coded bit length, M; and

determine to iteratively segment the group of K information bits based on R_seg being less than R_noseg.

~~29~~22. The apparatus of claim ~~28~~21, wherein the processor is configured to:

determine R_seg = (K/2 + CRC length) / min(mother code length of the polar code after rate matching with segmentation, (M/2)), and

determine R_noseg = (K + CRC length) / min(mother code length of the polar code after rate matching without segmentation, (M)).

~~30~~23. The apparatus of claim ~~21~~18, wherein causing the apparatus to transmit each encoded segment comprises:

writing each coded bit of the encoded segment to a circular buffer having a size equal to a size, N, of the polar code, wherein the coded bits are written in an order dependent on N;

reading M coded bits from the circular buffer; and

causing the apparatus to transmit the M coded bits.

24. An apparatus for wireless communications, comprising:

a processor configured to:

determine to iteratively segment a group of K information bits into a plurality of segments based on:

K being greater than a threshold number of information bits, K_thr,

a coding rate, R, being greater than a threshold coding rate, R_thr, and

a coded bit length, M, being greater than a threshold coded bit length, M_thr;

iteratively segment the group of K information bits into the plurality of segments;

encode the information bits of each of the plurality of segments using a polar code to generate a plurality of encoded segments; and

cause the apparatus to transmit the plurality of encoded segments; and

a memory coupled with the processor.

25. An apparatus for wireless communications, comprising:

a processor configured to:

determine to iteratively segment a group of K information bits into a plurality of segments;

determine a threshold coded bit length, M_thr, based on a maximum mother code length of polar codes supported by the apparatus, wherein the determination to iteratively segment the group of K information bits is based on K being greater than a threshold number of information bits, K_thr, and a coded bit length, M, being greater than M_thr;

iteratively segment the group of K information bits into the plurality of segments;

encode the information bits of each of the plurality of segments using a polar code to generate a plurality of encoded segments; and

cause the apparatus to transmit the plurality of encoded segments; and

a memory coupled with the processor.

~~31~~26. An apparatus for wireless communications, comprising:

a processor configured to:

determine, based on one or more of a payload size of a group of information bits and parameters of a polar code, to segment the group of information bits into a plurality of segments, wherein the payload size is K~~;~~, and wherein the determination is based on:

K being greater than a threshold number of bits, K_thr,

a coding rate, R, being greater than a threshold coding rate, R_thr, and

a coded bit length, M, being greater than a threshold coded bit length, M_thr;

segment the group of information bits into the plurality of segments;

encode the information bits of each of the plurality of segments using the polar code to generate a plurality of encoded segments; and

cause the apparatus to transmit the plurality of encoded segments; and

a memory coupled with the processor.

~~32~~27. The apparatus of claim ~~31~~26, wherein the processor is configured to determine to segment the group of information bits based on a maximum mother code length, Nmax, of polar codes supported by the apparatus, and K.

~~33~~28. The apparatus of claim ~~31, wherein the processor is configured to determine to segment the group of information bits based on:~~

~~K being greater than a threshold number of bits, K_thr,~~

~~a coding rate, R, being greater than a threshold coding rate, R_thr, and~~

~~a coded bit length, M, being greater than a threshold coded bit length, M_thr.~~

~~34. The apparatus of claim 31, wherein the processor is configured to determine to segment the group of information bits based on:~~

~~K being greater than or equal to a threshold payload size, K_thr, and~~

~~a coded bit length, M, being greater than or equal to a threshold coded bit length M_thr.~~

~~35. The apparatus of claim 34, wherein K_thr = 360 and M_thr = 1088.~~

~~36. The apparatus of claim 31~~26, wherein the processor is further configured to:

determine a coding rate with segmentation, R_seg, based on K, a cyclic redundancy check (CRC) length, a mother code length of a polar code after rate matching with segmentation, and a coded bit length, M;

determine a coding rate without segmentation, R_noseg, based on K, a cyclic redundancy check (CRC) length, a mother code length of a polar code after rate matching without segmentation, and a coded bit length, M; and

determine to segment the group of information bits based on R_seg being less than R_noseg.

~~37~~29. The apparatus of claim ~~36~~28, wherein the processor is configured to:

calculate R_seg = (K/2 + CRC length) / min(mother code length of the polar code after rate matching with segmentation, (M/2)), and

calculate R_noseg = (K + CRC length) / min(mother code length of the polar code after rate matching without segmentation, (M)).

~~38~~30. The apparatus of claim ~~31~~26, wherein causing the apparatus to transmit each encoded segment comprises:

writing each coded bit of the encoded segment to a circular buffer having a size equal to a size, N, of the polar code, wherein the bits are written in an order dependent on N;

reading M coded bits from the circular buffer; and

causing the apparatus to transmit the M coded bits.

~~39~~31. The apparatus of claim ~~31~~26, wherein the processor is configured to determine to segment the group of information bits based on K being greater than or equal a threshold payload size, K_thr.

~~40~~32. The apparatus of claim ~~39~~31, wherein K_thr = 1013.

33. An apparatus for wireless communications, comprising:

a processor configured to:

determine, based on one or more of a payload size of a group of information bits and parameters of a polar code, to segment the group of information bits into a plurality of segments, wherein the payload size is K, and wherein the determination is based on:

K being greater than or equal to a threshold payload size, K_thr, and

a coded bit length, M, being greater than or equal to a threshold coded bit length M_thr;

segment the group of information bits into the plurality of segments;

encode the information bits of each of the plurality of segments using the polar code to generate a plurality of encoded segments; and

cause the apparatus to transmit the plurality of encoded segments; and

a memory coupled with the processor.

34. The apparatus of claim 33, wherein K_thr = 360 and M_thr = 1088.