CLAIMS

1. A method of transmitting data in a transport block (TB) in wireless communication, comprising:

determining a maximum code block size;

determining a transport block level cyclic redundancy check size;

determining a code block level cyclic redundancy check size;

determining a number of code blocks associated with the TB based on the maximum code block size, the transport block level cyclic redundancy check size, and the code block level cyclic redundancy check size;

determining a code block size based on the number of code blocks;

determining a transport block size (TBS) for the TB in a single pass as a function of the determined maximum code block size, the transport block level cyclic redundancy check size, the code block level cyclic redundancy check size, the number of code blocks, and the code block size; and

transmitting the TB with the data based on the determined TBS.

2. The method of claim 1, wherein the determining the code block size comprises determining a byte-aligned code block size.

3. The method of claim 2, wherein the transmitted TB has no padding bits.

4. The method of claim 1, wherein the determining the maximum code block size comprises:

determining a base graph for encoding a code block based on at least one of a code rate or an intermediate number of information bits; and

determining the maximum code block size based on the determined base graph.

5. The method of claim 4, wherein the determining the maximum code block size based on the determined base graph, comprises:

selecting the maximum code block size from a plurality of values.

6. The method of claim 1, wherein the determining the transport block level cyclic redundancy check size comprises:

if $N_{RE} \cdot Q_m \cdot R \cdot v$ is less than a predetermined value, setting the transport block level cyclic redundancy check size to a first value; and

otherwise, setting the transport block level cyclic redundancy check size to a second value that is greater than the first value, wherein v is a number of MIMO layers, Q_m is a modulation order, R is a code rate, and N_{RE} is a number of resource elements.

7. The method of claim 1, wherein the determining the code block level cyclic redundancy check size comprises:

if the condition $N_{RE} \cdot Q_m \cdot R \cdot v - X$ + $L_{TB,CRC}$ is less than or equal to the maximum code block size, setting the code block level cyclic redundancy check size to a first value; and

otherwise, setting the code block level cyclic redundancy check size to a second value that is greater than the first value,

wherein v is a number of MIMO layers, Q_m is a modulation order, R is a code rate, N_{RE} is a number of resource elements, X is a rate back-off factor, $L_{TB,CRC}$ is the transport block level cyclic redundancy check size.

8. The method of claim 1, wherein the determining the TBS comprises:

determining a plurality of intermediate values for use with the function in one or more lookup tables, based on $N_{RE} \cdot Q_m \cdot R \cdot v$, wherein v is a number of MIMO layers, Q_m is a modulation order, R is a code rate, and N_{RE} is a number of resource elements.

9. The method of claim 1, wherein the function determines the TBS based on $N_{RE} \cdot Q_m \cdot R \cdot v - X$, where X is a rate back-off factor that has a value equal to or greater than zero, v is a number of MIMO layers, Q_m is a modulation order, R is a code rate, and N_{RE} is a number of resource elements.

10. The method of claim 9, wherein the function comprises:

$$TBS = \left\lceil \frac{1}{8} \frac{L_{TB,CRC}+N_{RE}\cdot Q_m \cdot R \cdot v - X}{\left\lceil \frac{L_{TB,CRC}+N_{RE}\cdot Q_m \cdot R \cdot v - X}{K_{cb}-L_{CB,CRC}} \right\rceil} \right\rceil 8 \left\lceil \frac{L_{TB,CRC}+N_{RE}\cdot Q_m \cdot R \cdot v - X}{K_{cb}-L_{CB,CRC}} \right\rceil - L_{TB,CRC},$$

wherein K_{cb} is the maximum code block size, $L_{TB,CRC}$ is the transport block level cyclic redundancy check size, and $L_{CB,CRC}$ is the code block level cyclic redundancy check size.

11. The method of claim 9, wherein X comprises a predetermined value based on the values of N_{RE}, Q_m, R, and v.

12. A method of transmitting data in a transport block (TB) in wireless communication, comprising:

determining a transport block size (TBS) for the TB in a non-recursive procedure using a function including a plurality of parameters,

wherein the plurality of parameters comprise a maximum code block size, a transport block level cyclic redundancy check size, a code block level cyclic redundancy check size, a number of code blocks associated with the TB, and a code block size K.; and

transmitting the TB with the data based on the determined TBS.

13. The method of claim 12, wherein the determining the TBS for the TB in the non-recursive procedure is based on $N_{RE} \cdot Q_m \cdot R \cdot v - X$, wherein X is a rate back-off factor that has a value equal to or greater than zero, v is a number of MIMO layers, Q_m is a modulation order, R is a code rate, and N_{RE} is a number of resource elements.

14. The method of claim 13, wherein the determining the TBS for the TB in the non-recursive procedure determines:

$$TBS = \left\lceil \frac{1}{8} \frac{L_{TB,CRC} + N_{RE} \cdot Q_m \cdot R \cdot v - X}{\left\lceil \frac{L_{TB,CRC} + N_{RE} \cdot Q_m \cdot R \cdot v - X}{K_{cb} - L_{CB,CRC}} \right\rceil} \right\rceil 8 \left\lceil \frac{L_{TB,CRC} + N_{RE} \cdot Q_m \cdot R \cdot v - X}{K_{cb} - L_{CB,CRC}} \right\rceil - L_{TB,CRC},$$

wherein K_{cb} is the maximum code block size, $L_{TB,CRC}$ is the transport block level cyclic redundancy check size, $L_{CB,CRC}$ is the code block level cyclic redundancy check size, X is a rate back-off factor that has a value equal to or greater than zero, v is a number of MIMO layers, Q_m is a modulation order, R is a code rate, and N_{RE} is a number of resource element.

15. The method of claim 13, wherein X comprises a predetermined value based on the values of N_{RE}, Q_m, R, and v.

16. An apparatus of wireless communication, comprising:

a communication interface configured to transmit data in a transport block (TB);

a memory stored with executable code; and

a processor operatively coupled with the communication interface and the memory,

wherein the processor is configured by the executable code to:

determine a maximum code block size;

determine a transport block level cyclic redundancy check size;

determine a code block level cyclic redundancy check size;

determine a number of code blocks associated with the TB based on the maximum code block size, the transport block level cyclic redundancy check size, and the code block level cyclic redundancy check size;

determine a code block size based on the number of code blocks;

determine a transport block size (TBS) for the TB in a single pass as a function of the determined maximum code block size, the transport block level cyclic redundancy check size, the code block level cyclic redundancy check size, the number of code blocks, and the code block size; and

transmit the TB with the data based on the determined TBS.

17. The apparatus of claim 16, wherein the processor is further configured to determine the code block size by determining a byte-aligned code block size.

18. The apparatus of claim 16, wherein the transmitted TB has no padding bit.

19. The apparatus of claim 16, wherein the processor is further configured to determine the maximum code block size by:

determining a base graph for encoding a code block based on at least one of a code rate or an intermediate number of information bits; and

determining the maximum code block size based on the determined base graph.

20. The apparatus of claim 19, wherein the processor is further configured to determine the maximum code block size based on the determined base graph by selecting the maximum code block size from a plurality of values.

21. The apparatus of claim 16, wherein the processor is further configured to determine the transport block level cyclic redundancy check size by:

if $N_{RE} \cdot Q_m \cdot R \cdot v$ is less than a predetermined value, setting the transport block level cyclic redundancy check size to a first value; and

otherwise, setting the transport block level cyclic redundancy check size to a second value that is greater than the first value, wherein v is a number of MIMO layers, Q_m is a modulation order, R is a code rate, N_{RE} is a number of resource elements.

22. The apparatus of claim 16, wherein the processor is further configured to determine the code block level cyclic redundancy check size by:

if the condition $N_{RE} \cdot Q_m \cdot R \cdot v - X$ + $L_{TB,CRC}$ is less than or equal to the maximum code block size, setting the code block level cyclic redundancy check size to a first value; and

otherwise, setting the code block level cyclic redundancy check size to a second value that is greater than the first value,

wherein v is a number of MIMO layers, Q_m is a modulation order, R is a code rate, N_{RE} is a number of resource elements, X is a rate back-off factor, $L_{TB,CRC}$ is the transport block level cyclic redundancy check size, and K_{cb} is the maximum code block size.

23. The apparatus of claim 16, wherein the processor is further configured to determine the TBS by:

determining a plurality of intermediate values for use with the function in one or more lookup tables, based on $N_{RE} \cdot Q_m \cdot R \cdot v$, wherein v is a number of MIMO layers, Q_m is a modulation order, R is a code rate, and N_{RE} is a number of resource elements.

24. The apparatus of claim 16, wherein the function determines the TBS based on $N_{RE} \cdot Q_m \cdot R \cdot v - X$, wherein X is a rate back-off factor that has a value equal to or greater

than zero, v is a number of MIMO layers, Q_m is a modulation order, R is a code rate, and N_{RE} is a number of resource elements.

25. The apparatus of claim 24, wherein the function comprises:

$$TBS = \left\lceil \frac{1}{8} \frac{L_{TB,CRC} + N_{RE} \cdot Q_m \cdot R \cdot v - X}{\left\lceil \frac{L_{TB,CRC} + N_{RE} \cdot Q_m \cdot R \cdot v - X}{K_{cb} - L_{CB,CRC}} \right\rceil} \right\rceil 8 \left\lceil \frac{L_{TB,CRC} + N_{RE} \cdot Q_m \cdot R \cdot v - X}{K_{cb} - L_{CB,CRC}} \right\rceil - L_{TB,CRC},$$

wherein K_{cb} is the maximum code block size, $L_{TB,CRC}$ is the transport block level cyclic redundancy check size, $L_{CB,CRC}$ is the code block level cyclic redundancy check size, X is a rate back-off factor that has a value equal to or greater than zero, v is a number of MIMO layers, Q_m is a modulation order, R is a code rate, and N_{RE} is a number of resource elements.

26. The apparatus of claim 24,

wherein X comprises a predetermined value based on the values of N_{RE}, Q_m, R, and v.

27. An apparatus of wireless communication, comprising:

a communication interface configured to transmit data in a transport block (TB);

a memory; and

a processor coupled with the communication interface and memory,

wherein the processor is configured to:

determine a transport block size (TBS) for the TB in a non-recursive procedure using a function including a plurality of parameters,

wherein the plurality of parameters comprise a maximum code block size, a transport block level cyclic redundancy check size, a code block level cyclic redundancy check size, a number of code blocks associated with the TB, and a code block size; and

transmit the TB with the data based on the determined TBS.

28. The apparatus of claim 27, wherein in the non-recursive procedure, the processor is further configured to determine the TBS based on $N_{RE} \cdot Q_m \cdot R \cdot v - X$, wherein X is a rate back-off factor that has a value equal to or greater than zero, v is a number of MIMO layers, Q_m is a modulation order, R is a code rate, and N_{RE} is a number of resource elements.

29. The apparatus of claim 28, wherein the non-recursive procedure comprises:

$$TBS = \left\lceil \frac{1}{8} \frac{L_{TB,CRC}+N_{RE}\cdot Q_m\cdot R\cdot v-X}{\left\lceil \frac{L_{TB,CRC}+N_{RE}\cdot Q_m\cdot R\cdot v-X}{K_{cb}-L_{CB,CRC}} \right\rceil} \right\rceil 8 \left\lceil \frac{L_{TB,CRC}+N_{RE}\cdot Q_m\cdot R\cdot v-X}{K_{cb}-L_{CB,CRC}} \right\rceil - L_{TB,CRC},$$

wherein K_{cb} is the maximum code block size, $L_{TB,CRC}$ is the transport block level cyclic redundancy check size, $L_{CB,CRC}$ is the code block level cyclic redundancy check size, X is a rate back-off factor that has a value equal to or greater than zero, v is a number of MIMO layers, Q_m is a modulation order, R is a code rate, and N_{RE} is a number of resource elements.

30. The apparatus of claim 28, wherein X comprises a predetermined value based on the values of N_{RE}, Q_m, R, and v.

31. An apparatus of wireless communication comprising:

means for determining a maximum code block size of a transport block (TB);

means for determining a transport block level cyclic redundancy check size;

means for determining a code block level cyclic redundancy check size;

means for determining a number of code blocks associated with the TB based on the maximum code block size, the transport block level cyclic redundancy check size, and the code block level cyclic redundancy check size;

means for determining a code block size based on the number of code blocks;

means for determining a transport block size (TBS) for the TB in a single pass as a function of the determined maximum code block size, the transport block level cyclic redundancy check size, the code block level cyclic redundancy check size, the number of code blocks, and the code block size; and

means for transmitting the TB with the data based on the determined TBS.

32. The apparatus of claim 31, wherein the means for determining the code block size is configured to determine a byte-aligned code block size.

33. The apparatus of claim 31, wherein the transmitted TB has no padding bit.

34. The apparatus of claim 31, wherein the means for determining the maximum code block size comprises:

means for determining a base graph for encoding a code block based on at least one of a code rate or an intermediate number of information bits; and

means for determining the maximum code block size based on the determined base graph.

35. The apparatus of claim 34, wherein the means for determining the maximum code block size based on the determined base graph is configured to select the maximum code block size from a plurality of values.

36. The apparatus of claim 31, wherein the means for determining the transport block level cyclic redundancy check size is configured to:

if $N_{RE} \cdot Q_m \cdot R \cdot v$ is less than a predetermined value, set the transport block level cyclic redundancy check size to a first value; and

otherwise, set the transport block level cyclic redundancy check size to a second value that is greater than the first value, wherein v is a number of MIMO layers, Q_m is a modulation order, R is a code rate, and N_{RE} is a number of resource elements.

37. The apparatus of claim 31, wherein the means for determining the code block level cyclic redundancy check size comprises:

if the condition $N_{RE} \cdot Q_m \cdot R \cdot v - X + \mathrm{L_{TB,CRC}}$ is less than or equal to the maximum code block size, setting the code block level cyclic redundancy check size to a first value; and

otherwise, setting the code block level cyclic redundancy check size to a second value that is greater than the first value,

wherein v is a number of MIMO layers, Q_m is a modulation order, R is a code rate, N_{RE} is a number of resource elements, X is a rate back-off factor, $\mathrm{L_{TB,CRC}}$ is the transport block level cyclic redundancy check size, and $\mathrm{K_{cb}}$ is the maximum code block size.

38. The apparatus of claim 31, wherein the means for determining the TBS comprises:

determining a plurality of intermediate values for use with the function in one or more lookup tables, based on $N_{RE} \cdot Q_m \cdot R \cdot v$, wherein v is a number of MIMO layers, Q_m is a modulation order, R is a code rate, and N_{RE} is a number of resource elements.

39. The apparatus of claim 31, wherein the function determines the TBS based on $N_{RE} \cdot Q_m \cdot R \cdot v - X$, wherein X is a rate back-off factor that has a value equal to or greater than zero, v is a number of MIMO layers, Q_m is a modulation order, R is a code rate, and N_{RE} is a number of resource elements.

40. The apparatus of claim 39, wherein the function comprises:

$$TBS = \left\lceil \frac{1}{8} \frac{L_{TB,CRC} + N_{RE} \cdot Q_m \cdot R \cdot v - X}{\left\lceil \frac{L_{TB,CRC} + N_{RE} \cdot Q_m \cdot R \cdot v - X}{K_{cb} - L_{CB,CRC}} \right\rceil} \right\rceil 8 \left\lceil \frac{L_{TB,CRC} + N_{RE} \cdot Q_m \cdot R \cdot v - X}{K_{cb} - L_{CB,CRC}} \right\rceil - L_{TB,CRC},$$

wherein K_{cb} is the maximum code block size, $L_{TB,CRC}$ is the transport block level cyclic redundancy check size, $L_{CB,CRC}$ is the code block level cyclic redundancy check size, X is a rate back-off factor that has a value equal to or greater than zero, v is a number of MIMO layers, Q_m is a modulation order, R is a code rate, and N_{RE} is a number of resource elements.

41. The apparatus of claim 39, wherein X comprises a predetermined value based on the values of N_{RE}, Q_m, R, and v.