What is claimed is:

1. A decoding device, comprising:

at least one processor, and a non-transitory medium storing instruction for execution by the at least one processor;

wherein, by executing the instructions, the decoding device is configured to:

receive a second code word, wherein the second code word is transmitted from an encoding device based on a first code word, and the first code word is generated by the encoding device based on a first encoded data sequence, wherein the first encoded data sequence is generated according to to-be-transmitted data using a generator matrix, wherein the generator matrix corresponds to a check matrix prestored in the decoding device, wherein the second code word comprises M code elements, and the check matrix comprises M columns and N rows, M and N are positive integers;

determine whether a second encoded data sequence corresponding to the second code word is a correct replica of the first encoded data sequence;

based on a determination that the second encoded data sequence is not a correct replica of the first encoded data sequence, perform a code element update process to obtain a third code word; and

determine whether a third encoded data sequence corresponding to the third code word is a correct replica of the first encoded data sequence;

wherein the code element update process comprises:

corresponding to each non-zero element in an nth row of the check matrix, obtaining a code element $E_{n,m}$ from the second code word, where $1 \leq n \leq N$, $1 \leq m \leq M$, wherein $E_{n,m}$ represents the mth code element of the second code word;

for each $E_{n,m}$, obtaining a first update value $E'_{n,m}$ and a second update value $E''_{n,m}$, wherein the $E''_{n,m}$ is a sum of the $E_{n,m}$ and the $E'_{n,m}$;

for each $E_{n,m}$, determining whether the $E''_{n,m}$ exceeds a code element quantization range;

when the $E''_{n,m}$ exceeds the code element quantization range, keeping the $E_{n,m}$ not updated; or

when the $E''_{n,m}$ does not exceed the code element quantization range, updating the $E_{n,m}$ with the $E''_{n,m}$; and

obtaining the third code word based on the second code word and update results of the $E_{n,m}$.

2. The decoding device according to claim 1, wherein in determining whether each of the $E''_{n,m}$ exceeds a code element quantization range, the decoding device is configured to:

sequentially determine whether each of the $E''_{n,m}$ exceeds the code element quantization range.

3. The decoding device according to claim 1, further comprising a storage unit configured to store the check matrix, the second code word, the code elements $E_{n,m}$, the first update values $E'_{n,m}$ and the second update values $E''_{n,m}$.

4. The decoding device according to claim 1, wherein in determining whether the second encoded data sequence corresponding to the second code word is a correct replica of the first encoded data sequence, the decoding device is configured to:

perform an exclusive OR operation to data bits of the second encoded data sequence corresponding to each non-zero element in the nth row of the check matrix; and

determine whether the second encoded data sequence corresponding to the second code word is a correct replica of the first encoded data sequence according to a result of the exclusive OR operation.

5. The decoding device according to claim 1, wherein, by executing the instructions, the decoding device is further configured to:

based on a determination that the third encoded data sequence is not a correct replica of the first encoded data sequence, perform the code element update process again using a different row of the check matrix to obtain a fourth code word; and

determine whether a fourth encoded data sequence corresponding to the fourth code word is a correct replica of the first encoded data sequence.

6. A decoding device, comprising:

at least one processor, and a non-transitory medium storing instruction for execution by the at least one processor;

wherein, by executing the instructions, the decoding device is configured to:

receive a second code word, wherein the second code word is transmitted from an encoding device based on a first code word, and the first code word is generated by the encoding device based on a first encoded data sequence, wherein the first encoded data sequence is generated according to to-be-transmitted data using a generator matrix, wherein the generator matrix corresponds to a check matrix prestored in the decoding device, wherein the second code word comprises M code elements, and the check matrix comprises M columns and N rows, M and N are positive integers;

determine whether a second encoded data sequence corresponding to the second code word is a correct replica of the first encoded data sequence;

based on a determination that the second encoded data sequence is not a correct replica of the first encoded data sequence, perform a code element update process to obtain a third code word; and

determine whether a third encoded data sequence corresponding to the third code word is a correct replica of the first encoded data sequence;

wherein the code element update process comprises:

corresponding to each non-zero element in an nth row of the check matrix, obtaining a code element $E_{n,m}$ from the second code word, where $1 \le n \le N$, $1 \le m \le M$, wherein $E_{n,m}$ represents the mth code element of the second code word;

for each $E_{n,m}$, obtaining a first update value $E'_{n,m}$ and a second update value $E''_{n,m}$, wherein the $E''_{n,m}$ is a sum of the $E_{n,m}$ and the $E'_{n,m}$;

for each $E_{n,m}$, determining whether the $E''_{n,m}$ exceeds a code element quantization range;

when one of the $E''_{n,m}$ exceeds the code element quantization range, keeping all code elements $E_{n,m}$ not updated; or

when all the $E''_{n,m}$ do not exceed the code element quantization range, updating the $E_{n,m}$ with the $E''_{n,m}$; and

obtaining the third code word based on the second code word and update results of the $E_{n,m}$.

7. The decoding device according to claim 6, wherein in determining whether each of the $E''_{n,m}$ exceeds a code element quantization range, the decoding device is configured to:

sequentially determine whether each of the $E''_{n,m}$ exceeds the code element quantization range.

8. The decoding device according to claim 6, further comprising a storage unit configured to store the check matrix, the second code word, the code elements $E_{n,m}$, the first update values $E'_{n,m}$ and the second update values $E''_{n,m}$.

9. The decoding device according to claim 6, wherein in determining whether the second encoded data sequence corresponding to the second code word is a correct replica of the first encoded data sequence, the decoding device is configured to:

perform an exclusive OR operation to data bits of the second encoded data sequence corresponding to each non-zero element in the nth row of the check matrix; and

determine whether the second encoded data sequence corresponding to the second code word is a correct replica of the first encoded data sequence according to a result of the exclusive OR operation.

10. The decoding device according to claim 6, wherein, by executing the instructions, the decoding device is further configured to:

based on a determination that the third encoded data sequence is not a correct replica of the first encoded data sequence, perform the code element update process again using a different row of the check matrix to obtain a fourth code word; and

determine whether a fourth encoded data sequence corresponding to the fourth code word is a correct replica of the first encoded data sequence.

11. A decoding method, comprising:

receiving, by a decoding device, a second code word, wherein the second code word is transmitted from an encoding device based on a first code word, and the first code word is generated by the encoding device based on a first encoded data sequence, wherein the first encoded data sequence is generated according to to-be-transmitted data using a generator matrix, wherein the generator matrix corresponds to a check matrix prestored in the decoding device, wherein the second code word comprises M code elements, and the check matrix comprises M columns and N rows, M and N are positive integers;

determining, by the decoding device, whether a second encoded data sequence corresponding to the second code word is a correct replica of the first encoded data sequence;

based on a determination that the second encoded data sequence is not a correct replica of the first encoded data sequence, performing, by the decoding device, a code element update process to obtain a third code word; and

determining, by the decoding device, whether a third encoded data sequence corresponding to the third code word is a correct replica of the first encoded data sequence;

wherein the code element update process comprises:

corresponding to each non-zero element in an nth row of the check matrix, obtaining a code element $E_{n,m}$ from the second code word, where $1 \le n \le N$, $1 \le m \le M$, wherein $E_{n,m}$ represents the mth code element of the second code word;

for each $E_{n,m}$, obtaining a first update value $E'_{n,m}$ and a second update value $E''_{n,m}$, wherein the $E''_{n,m}$ is a sum of the $E_{n,m}$ and the $E'_{n,m}$;

for each $E_{n,m}$, determining whether the $E''_{n,m}$ exceeds a code element quantization range;

when the $E''_{n,m}$ exceeds the code element quantization range, keeping the $E_{n,m}$ not updated; or

when the $E''_{n,m}$ does not exceed the code element quantization range, updating the $E_{n,m}$ with the $E''_{n,m}$; and

obtaining the third code word based on the second code word and update results of the $E_{n,m}$.

12. The decoding method according to claim 11, wherein determining whether each of the $E''_{n,m}$ exceeds a code element quantization range comprises:

sequentially determining, by the decoding device, whether each of the $E''_{n,m}$ exceeds the code element quantization range.

13. The decoding method according to claim 11, wherein determining whether a second encoded data sequence corresponding to the second code word is a correct replica of the first encoded data sequence comprises:

performing, by the decoding device, an exclusive OR operation to data bits of the second encoded data sequence corresponding to each non-zero element in the nth row of the check matrix; and

determining, by the decoding device, whether the second encoded data sequence corresponding to the second code word is a correct replica of the first encoded data sequence according to a result of the exclusive OR operation.

14. The decoding method according to claim 11, further comprising:

based on a determination that the third encoded data sequence is not a correct replica of the first encoded data sequence, performing, by the decoding device, the code element update process again using a different row of the check matrix to obtain a fourth code word; and

determining, by the decoding device, whether a fourth encoded data sequence corresponding to the fourth code word is a correct replica of the first encoded data sequence.

15. A decoding method, comprising:

receiving, by a decoding device, a second code word, wherein the second code word is transmitted from an encoding device based on a first code word, and the first code word is generated by the encoding device based on a first encoded data sequence, wherein the first encoded data sequence is generated according to to-be-transmitted data using a generator matrix, wherein the generator matrix corresponds to a check matrix prestored in the decoding device, wherein the second code word comprises M code elements, and the check matrix comprises M columns and N rows, M and N are positive integers;

determining, by the decoding device, whether a second encoded data sequence corresponding to the second code word is a correct replica of the first encoded data sequence;

based on a determination that the second encoded data sequence is not a correct replica of the first encoded data sequence, performing, by the decoding device, a code element update process to obtain a third code word; and

determining, by the decoding device, whether a third encoded data sequence corresponding to the third code word is a correct replica of the first encoded data sequence;

wherein the code element update process comprises:

corresponding to each non-zero element in an nth row of the check matrix, obtaining a code element $E_{n,m}$ from the second code word, where $1 \le n \le N$, $1 \le m \le M$, wherein $E_{n,m}$ represents the mth code element of the second code word;

for each $E_{n,m}$, obtaining a first update value $E'_{n,m}$ and a second update value $E''_{n,m}$, wherein the $E''_{n,m}$ is a sum of the $E_{n,m}$ and the $E'_{n,m}$;

for each $E_{n,m}$, determining whether the updated value $E''_{n,m}$ exceeds a code element quantization range;

when one of the $E''_{n,m}$ exceeds the code element quantization range, keeping all code elements $E_{n,m}$ not updated; or

when all the $E''_{n,m}$ do not exceed the code element quantization range, updating the $E_{n,m}$ with the $E''_{n,m}$; and

obtaining the third code word based on the second code word and update results of the $E_{n,m}$.

16. The decoding method according to claim 15, wherein determining whether each of the $E''_{n,m}$ exceeds a code element quantization range comprises:

sequentially determining, by the decoding device, whether each of the $E''_{n,m}$ exceeds the code element quantization range.

17. The decoding method according to claim 15, wherein determining whether the second encoded data sequence corresponding to the second code word is a correct replica of the first encoded data sequence comprises:

performing, by the decoding device, an exclusive OR operation to data bits of the second encoded data sequence corresponding to each non-zero element in the nth row of the check matrix; and

determining, by the decoding device, whether the second encoded data sequence corresponding to the second code word is a correct replica of the first encoded data sequence according to a result of the exclusive OR operation.

18. The decoding method according to claim 15, further comprising:

based on a determination that the third encoded data sequence is not a correct replica of the first encoded data sequence, performing, by the decoding device, the code element update process again using a different row of the check matrix to obtain a fourth code word; and

determining, by the decoding device, whether a fourth encoded data sequence corresponding to the fourth code word is a correct replica of the first encoded data sequenc