Claim No. HP-2019-000006

IN THE HIGH COURT OF JUSTICE
BUSINESS AND PROPERTY COURTS OF ENGLAND AND WALES
INTELLECTUAL PROPERTY LIST (ChD)
PATENTS COURT

B E T W E E N:

(1) OPTIS CELLULAR TECHNOLOGY LLC

(A company incorporated under the laws of the State of Delaware)

(2) OPTIS WIRELESS TECHNOLOGY LLC

(A company incorporated under the laws of the State of Delaware)

(3) UNWIRED PLANET INTERNATIONAL LIMITED

(A company incorporated under the laws of the Republic of Ireland)

Claimants

-and-

(1) APPLE RETAIL UK LIMITED

(2) APPLE DISTRIBUTION INTERNATIONAL LIMITED

(A company incorporated under the laws of the Republic of Ireland)

(3) APPLE INC

(A company incorporates under the laws of the State of California)

Defendants

ANNEX A
TO THE STATEMENT OF GROUNDS FOR
AMENDMENT OF EP(UK) 2,187,549

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549 Patent unconditional amendments

1. A radio communication apparatus of a mobile station adapted to spread and transmit an ACK/NACK signal or a CQI signal in accordance with a code-multiplexing structure for code-multiplexing ACK/NACK signals and CQI signals from a plurality of mobile stations, the radio communication apparatus comprising:

a first spreading unit (214) adapted to spread ~~an~~ the ACK/NACK signal with a sequence defined by one of a plurality of cyclic shift values, the sequence being one of a plurality of sequences that are mutually separable because of mutually different cyclic shift values of the plurality of cyclic shift values;

a second spreading unit (219) adapted to spread ~~a~~ the CQI signal with a sequence defined by another one of ~~a~~ the plurality of cyclic shift values, the sequence being another of the plurality of sequences;

a third spreading unit (216) adapted to spread the ACK/NACK signal, after the ACK/NACK signal has been spread with the sequence defined by one of a plurality of cyclic shift values, with a sequence that is one of a plurality of orthogonal sequences that each have a different respective orthogonal sequence number of a plurality of orthogonal sequence numbers;

a control section adapted to:

control the spreading of the ACK/NACK signal by the first spreading unit (214) by setting a code-multiplexing cyclic shift value, of first cyclic shift values for spreading ACK/NACK signals, in accordance with the code-multiplexing structure;

control the spreading of the CQI signal by the second spreading unit (219) by setting a code-multiplexing cyclic shift value, of second cyclic shift values for spreading CQI signals, in accordance with the code-multiplexing structure; and

control the spreading of the ACK/NACK signal by the third spreading unit (216) by setting a code-multiplexing orthogonal sequence number, of the plurality of orthogonal sequence numbers, in accordance with the code-multiplexing structure; and

a transmitting unit (223) adapted to transmit the ACK/NACK signal, and adapted to transmit the CQI signal,

characterized in that said first spreading unit (214), in each symbol that forms the ACK/NACK signal, uses ~~one of~~ said code-multiplexing cyclic shift value of said first cyclic shift values, and said first cyclic shift values form a portion of the plurality of the cyclic shift values, for the ACK/NACK signal;

said second spreading unit (219), in each symbol that forms the CQI signal, uses ~~one of~~ said code-multiplexing cyclic shift value of said second cyclic shift values, and said second cyclic shift values are not within the portion of the plurality of the cyclic shift values, for the CQI signal; and

a cyclic shift value between the first cyclic shift values and the second cyclic shift values is not used for either the ACK/NACK signal or the CQI signal,

wherein the first cyclic shift values for spreading ACK/NACK signals and the plurality of orthogonal sequence numbers are arranged in a 2-cyclic shift interval mesh structure in the code-multiplexing structure, and

the unused cyclic shift value is positioned after an immediately preceding cyclic shift value for spreading CQI signals, and before an immediately subsequent cyclic shift value for spreading ACK/NACK signals, in the code-multiplexing structure,

so that a minimum value of a difference in cyclic shift values between the CQI signals and the ACK/NACK signals, after said immediately preceding cyclic shift value in the code-multiplexing structure, is equal to the 2-cyclic-shift interval in cyclic shift values between the ACK/NACK signals in the mesh structure.

2. A radio communication apparatus of a mobile station adapted to spread and transmit an ACK/NACK signal or a CQI signal in accordance with a code-multiplexing structure for code-multiplexing ACK/NACK signals and CQI signals from a plurality of mobile stations, the radio communication apparatus comprising:

a first spreading unit (214) adapted to spread ~~an~~ the ACK/NACK signal with a sequence defined by one of a plurality of cyclic shift values, the sequence being one of a plurality of sequences that are mutually separable because of mutually different cyclic shift values of the plurality of cyclic shift values;

a second spreading unit (219) adapted to spread ~~a~~ the CQI signal with a sequence defined by another one of ~~a~~ the plurality of cyclic shift values, the sequence being another of the plurality of sequences;

a third spreading unit (216) adapted to spread the ACK/NACK signal, after the ACK/NACK signal has been spread with the sequence defined by one of a plurality of cyclic shift values, with a sequence that is one of a plurality of orthogonal sequences that each have a different respective orthogonal sequence number of a plurality of orthogonal sequence numbers;

a control section adapted to:

control the spreading of the ACK/NACK signal by the first spreading unit (214) by setting a code-multiplexing cyclic shift value, of cyclic shift values for spreading ACK/NACK signals in the plurality of cyclic shift values, in accordance with the code-multiplexing structure;

control the spreading of the CQI signal by the second spreading unit (219) by setting a code-multiplexing cyclic shift value for spreading CQI signals, in accordance with the code-multiplexing structure; and

control the spreading of the ACK/NACK signal by the third spreading unit (216) by setting a code-multiplexing orthogonal sequence number, of the plurality of orthogonal sequence numbers, in accordance with the code-multiplexing structure; and

a transmitting unit (223) adapted to transmit the ACK/NACK signal, and adapted to transmit the CQI signal,

characterized in that said first spreading unit (214), in each symbol that forms the ACK/NACK signal, uses ~~one of~~said code-multiplexing cyclic shift value of said cyclic shift values for spreading ACK/NACK signals, and said cyclic shift values form a portion of the plurality of the cyclic shift values, for the ACK/NACK signal; and

said second spreading unit (219), in each symbol that forms the CQI signal, uses ~~a~~ said code-multiplexing cyclic shift value for spreading CQI signals, which is separated by a predefined interval from the cyclic shift values forming the portion of the plurality of cyclic shift values, for the CQI signal.

wherein the cyclic shift values for spreading ACK/NACK signals and the plurality of orthogonal sequence numbers are arranged in a 2-cyclic-shift-interval mesh structure in the code-multiplexing structure, and

the predefined interval includes an unused cyclic shift value positioned after an immediately preceding cyclic shift value for spreading CQI signals, and before an immediately subsequent cyclic shift value for spreading ACK/NACK signals, in the code-multiplexing structure,

so that a minimum value of a difference in cyclic shift values between the CQI signals and the ACK/NACK signals, after said immediately preceding cyclic shift value in the code-multiplexing structure, is equal to the 2-cyclic-shift interval in cyclic shift values between the ACK/NACK signals in the mesh structure.

~~3. The radio communication apparatus according to claim 2, wherein the predefined interval is greater than a minimum interval between the cyclic shift values used for the ACK/NACK signal.~~

~~4. The radio communication apparatus according to claim 2 or 3, wherein the predefined interval is 2.~~

~~5~~3. The radio communication apparatus according to ~~any of claims 1 to 4~~claim 1 or 2, wherein both a symbol that forms the ACK/NACK signal and a symbol that forms a CQI signal transmitted from another radio communication apparatus are mapped to a same symbol, or both a symbol that forms the CQI signal and a symbol that forms an ACK/NACK signal transmitted from another radio communication apparatus are mapped to a same symbol.

~~6~~4. The radio communication apparatus according to any of claims 1 to ~~5~~3, wherein both the ACK/NACK signal and a CQI signal which is transmitted from another radio communication apparatus, or both the CQI signal and an ACK/NACK signal which is transmitted from another radio communication apparatus, are mapped to a resource in a same frequency and in a same slot.

~~7~~5. The radio communication apparatus according to any of claims 1 to ~~4~~6, wherein the ACK/NACK signal is code-multiplexed with a CQI signal transmitted from another radio communication apparatus, or the CQI signal is code-multiplexed with an ACK/NACK signal transmitted from another radio communication apparatus.

~~8~~6. The radio communication apparatus according to any of claims 1 to ~~5~~7, wherein said first and second spreading units use a sequence having a length 12 as the sequence defined by a cyclic shift value.

~~9. The radio communication apparatus according to any of claims 1 to 8, further comprising a third spreading unit (216) adapted to spread the ACK/NACK signal with one of a plurality of orthogonal sequences.~~

~~10~~7. The radio communication apparatus according to ~~claim 9~~any of claims 1 to 6, wherein said third spreading unit uses a sequence having a length 4 as the orthogonal sequence.

~~11. The radio communication apparatus according to any of claims 1 to 10, wherein:~~

~~said transmitting unit transmits the ACK/NACK signal using a control channel, and said first spreading unit uses the sequence defined by a cyclic shift value which is determined from the control channel; and~~

~~said transmitting unit transmits the CQI signal using a control channel, and said second spreading unit uses the sequence defined by a cyclic shift value which is determined from the control channel.~~

8. The radio communication apparatus according to any of claims 1 to 7, wherein a second unused cyclic shift value is positioned after an immediately preceding cyclic shift value for spreading ACK/NACK signals, and before an immediately subsequent cyclic shift value for spreading CQI signals, in the code-multiplexing structure.

9. The radio communication apparatus according to any of claims 1 to 8, wherein the cyclic shift values for spreading ACK/NACK signals consists of a single set of consecutive cyclic shift values.

~~12~~10. A method for spreading ~~a signal~~ an ACK/NACK signal and a CQI signal in accordance with a code-multiplexing structure for code-multiplexing ACK/NACK signals and CQI signals from a plurality of mobile stations, the method comprising:

spreading ~~an~~ the ACK/NACK signal with a sequence defined by one of a plurality of cyclic shift values, the sequence being one of a plurality of sequences that are mutually separable because of mutually different cyclic shift values of the plurality of cyclic shift values;

spreading ~~a~~ the CQI signal with a sequence defined by another one of ~~a~~ the plurality of cyclic shift values, the sequence being another of the plurality of sequences;

spreading the ACK/NACK signal, after the ACK/NACK signal has been spread with the sequence defined by one of a plurality of cyclic shift values, with a sequence that is one of a plurality of orthogonal sequences that each have a different respective orthogonal sequence number of a plurality of orthogonal sequence numbers;

controlling the spreading of the ACK/NACK signal by setting a code-multiplexing cyclic shift value, of first cyclic shift values for spreading ACK/NACK signals, in accordance with the code-multiplexing structure;

controlling the spreading of the CQI signal by setting a code-multiplexing cyclic shift value, of second cyclic shift values for spreading CQI signals, in accordance with the code-multiplexing structure; and

controlling the spreading of the ACK/NACK signal by setting a code-multiplexing orthogonal sequence number, of the plurality of orthogonal sequence numbers, in accordance with the code-multiplexing structure,

characterized ~~in that~~by:

in each symbol that forms the ACK/NACK signal, spreading the ACK/NACK signal with a sequence defined by ~~one of~~ said code-multiplexing cyclic shift value of said first cyclic shift values, and said first cyclic shift values form a portion of the~~a~~ plurality of cyclic shift values; and

in each symbol that forms the CQI signal, spreading the CQI signal with a sequence defined by ~~one of~~ said code-multiplexing cyclic shift value of said second cyclic shift values, and said second cyclic shift values are not within the portion of the plurality of the cyclic shift values,

wherein a cyclic shift value between the first cyclic shift values and the second cyclic shift values is not used for either the ACK/NACK signal or the CQI signal~~; and~~

~~spreading the ACK/NACK signal with one of another plurality of orthogonal sequences~~,

the first cyclic shift values for spreading ACK/NACK signals and the plurality of orthogonal sequence numbers are arranged in a 2-cyclic shift interval mesh structure in the code-multiplexing structure, and

the unused cyclic shift value is positioned after an immediately preceding cyclic shift value for spreading CQI signals, and before an immediately subsequent cyclic shift value for spreading ACK/NACK signals, in the code-multiplexing structure,

so that a minimum value of a difference in cyclic shift values between the CQI signals and the ACK/NACK signals, after said immediately preceding cyclic shift value in the code-multiplexing structure, is equal to the 2-cyclic-shift interval in cyclic shift values between the ACK/NACK signals in the mesh structure.

~~13~~11. A method for spreading ~~a signal~~ an ACK/NACK signal and a CQI signal in accordance with a code-multiplexing structure for code-multiplexing ACK/NACK signals and CQI signals from a plurality of mobile stations, the method comprising:

spreading ~~an~~ the ACK/NACK signal with a sequence defined by one of a plurality of cyclic shift values, the sequence being one of a plurality of sequences that are mutually separable because of mutually different cyclic shift values of the plurality of cyclic shift values;

spreading ~~a~~ the CQI signal with a sequence defined by another one of the~~a~~ plurality of cyclic shift values, the sequence being another of the plurality of sequences;

spreading the ACK/NACK signal, after the ACK/NACK signal has been spread with the sequence defined by one of a plurality of cyclic shift values, with a sequence that is one of a plurality of orthogonal sequences that each have a different respective orthogonal sequence number of a plurality of orthogonal sequence numbers;

controlling the spreading of the ACK/NACK signal by setting a code-multiplexing cyclic shift value, of cyclic shift values for spreading ACK/NACK signals in the plurality of cyclic shift values, in accordance with the code-multiplexing structure;

controlling the spreading of the CQI signal by setting a code-multiplexing cyclic shift value for spreading CQI signals, in accordance with the code-multiplexing structure; and

control the spreading of the ACK/NACK signal by setting a code-multiplexing orthogonal sequence number, of the plurality of orthogonal sequence numbers, in accordance with the code-multiplexing structure,

characterized ~~in that~~by:

in each symbol that forms the ACK/NACK signal, spreading the ACK/NACK signal with a sequence defined by ~~one of~~ said code-multiplexing cyclic shift value of said cyclic shift values for spreading ACK/NACK signals, said cyclic shift values forming a portion of ~~a~~ the plurality of cyclic shift values; and

in each symbol that forms the CQI signal, spreading the CQI signal with a sequence defined by said code-multiplexing~~a~~ cyclic shift value for spreading CQI signals, which is separated by a predefined interval from the cyclic shift values forming the portion of the plurality of cyclic shift values,

wherein the cyclic shift values for spreading ACK/NACK signals and the plurality of orthogonal sequence numbers are arranged in a 2-cyclic-shift-interval mesh structure in the code-multiplexing structure, and

the predefined interval includes an unused cyclic shift value positioned after an immediately preceding cyclic shift value for spreading CQI signals, and before an immediately subsequent cyclic shift value for spreading ACK/NACK signals, in the code-multiplexing structure,

so that a minimum value of a difference in cyclic shift values between the CQI signals and the ACK/NACK signals, after said immediately preceding cyclic shift value in the code-multiplexing structure, is equal to the 2-cyclic-shift interval in cyclic shift values between the ACK/NACK signals in the mesh structure~~; and~~

~~spreading the ACK/NACK signal with one of another plurality of orthogonal sequences~~.

12. The method according to claim 10 or 11, wherein a second unused cyclic shift value is positioned after an immediately preceding cyclic shift value for spreading ACK/NACK signals, and before an immediately subsequent cyclic shift value for spreading CQI signals, in the code-multiplexing structure.

13. The method according to any of claims 10 to 12, wherein the cyclic shift values for spreading ACK/NACK signals consist of a single set of consecutive cyclic shift values.

Claim No. HP-2019-000006

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Defendants

ANNEX B
TO THE STATEMENT OF GROUNDS FOR
AMENDMENT OF EP(UK) 2,187,549

Part 1 - 549 Patent Unconditional Amendment

Claim (granted)	Claim (amended)	Reference in application for 549
1	1	Description of Figure 9 in [0015] [0005], [0009], [0010], [0011], [0013], [0019], [0021], [0049], [0050], [0057] Figures 6, 7, 9 to 13 Claim 3
2	2	Description of Figure 9 in [0015] [0005], [0009], [0010], [0011], [0013], [0019], [0021], [0049], [0050], [0057] Figures 6, 7, 9 to 13 Claim 3
3, 4	deleted	
5	3	
6	4	
7	5	
8	6	
9	deleted	
10	7	
11	deleted	
-	8	Figure 13
-	9	Figures 10 to 13
12	10	Description of Figure 9 in [0015] [0005], [0009], [0010], [0011], [0013], [0019], [0021], [0049], [0050], [0057] Figures 6, 7, 9 to 13 Claim 3
13	11	Description of Figure 9 in [0015] [0005], [0009], [0010], [0011], [0013], [0019], [0021], [0049], [0050], [0057] Figures 6, 7, 9 to 13 Claim 3
-	12	Figure 13
-	13	Figures 10 to 13

Part 2 - 549 Patent Conditional Amendment

Claim (granted)	Claim (amended)	Reference
1	1	Description of Figure 9 in [0015] [0005], [0007], [0009], [0010], [0011], [0013], [0019], [0021], [0049], [0050], [0057] Figures 6, 7, 9 to 13 Claim 3
2	2	Description of Figure 9 in [0015] [0005], [0007], [0009], [0010], [0011], [0013], [0019], [0021], [0049], [0050], [0057] Figures 6, 7, 9 to 13 Claim 3
3, 4	deleted	
5	3	
6	4	
7	5	
8	6	
9	deleted	
10	7	
11	deleted	
-	8	Figure 13
-	9	Figures 10 to 13
12	10	Description of Figure 9 in [0015] [0005], [0007], [0009], [0010], [0011], [0013], [0019], [0021], [0049], [0050], [0057] Figures 6, 7, 9 to 13 Claim 3
13	11	Description of Figure 9 in [0015] [0005], [0007], [0009], [0010], [0011], [0013], [0019], [0021], [0049], [0050], [0057] Figures 6, 7, 9 to 13 Claim 3
-	12	Figure 13
-	13	Figures 10 to 13

Claim No. HP-2019-000006

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Defendants

ANNEX C
TO THE STATEMENT OF GROUNDS FOR
AMENDMENT OF EP(UK) 2,187,549

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549 Patent – conditional amendments

1. A radio communication apparatus of a mobile station adapted to spread and transmit an ACK/NACK signal or a CQI signal in accordance with a code-multiplexing structure for code-multiplexing ACK/NACK signals and CQI signals from a plurality of mobile stations, the radio communication apparatus comprising:

a first spreading unit (214) adapted to spread ~~an~~ the ACK/NACK signal with a sequence defined by one of ~~a plurality of~~twelve cyclic shift values, the sequence being one of twelve sequences that are mutually separable because of mutually different cyclic shift values of the twelve cyclic shift values;

a second spreading unit (219) adapted to spread ~~a~~ the CQI signal with a sequence defined by another one of ~~a plurality of~~ the twelve cyclic shift values, the sequence being another of the twelve sequences;

a third spreading unit (216) adapted to spread the ACK/NACK signal, after the ACK/NACK signal has been spread with the sequence defined by one of twelve cyclic shift values, with a sequence that is one of three orthogonal sequences that each have a different respective orthogonal sequence number of first, second and third orthogonal sequence numbers;

a control section adapted to:

control the spreading of the ACK/NACK signal by the first spreading unit (214) by setting a code-multiplexing cyclic shift value, of first cyclic shift values for spreading ACK/NACK signals, in accordance with the code-multiplexing structure;

control the spreading of the CQI signal by the second spreading unit (219) by setting a code-multiplexing cyclic shift value, of second cyclic shift values for spreading CQI signals, in accordance with the code-multiplexing structure; and

control the spreading of the ACK/NACK signal by the third spreading unit (216) by setting a code-multiplexing orthogonal sequence number, of the first, second and third of orthogonal sequence numbers, in accordance with the code-multiplexing structure; and

a transmitting unit (223) adapted to transmit the ACK/NACK signal, and adapted to transmit the CQI signal,

characterized in that said first spreading unit (214), in each symbol that forms the ACK/NACK signal, uses ~~one of~~ said code-multiplexing cyclic shift value of said first cyclic shift values, and said first cyclic shift values form a portion of the ~~plurality of the~~ twelve cyclic shift values, for the ACK/NACK signal;

said second spreading unit (219), in each symbol that forms the CQI signal, uses ~~one of~~ said code-multiplexing cyclic shift value of said second cyclic shift values, and said second cyclic shift values are not within the portion of the ~~plurality of the~~twelve cyclic shift values, for the CQI signal; and

a cyclic shift value between the first cyclic shift values and the second cyclic shift values is not used for either the ACK/NACK signal or the CQI signal,

wherein the first cyclic shift values for spreading ACK/NACK signals and the first, second and third orthogonal sequence numbers are arranged in a 2-cyclic shift interval mesh structure in the code-multiplexing structure, according to which ACK/NACK signals for which the second orthogonal sequence number is set have 2-cyclic-shift-interval cyclic shift values set that are offset by one cyclic shift value with respect to 2-cyclic-shift-interval cyclic shift values that set for the ACK/NACK signals for which the first and third orthogonal sequence numbers are set,

the CQI signals in the code-multiplexing structure are not spread with any of the orthogonal sequences, and

the unused cyclic shift value is positioned after an immediately preceding cyclic shift value for spreading CQI signals, and before an immediately subsequent cyclic shift value for spreading ACK/NACK signals, in the code-multiplexing structure,

so that a minimum value of a difference in cyclic shift values between the CQI signals and the ACK/NACK signals, after said immediately preceding cyclic shift value in the code-multiplexing structure, is equal to the 2-cyclic-shift interval in cyclic shift values between the ACK/NACK signals in the mesh structure.

2. A radio communication apparatus of a mobile station adapted to spread and transmit an ACK/NACK signal or a CQI signal in accordance with a code-multiplexing structure for code-multiplexing ACK/NACK signals and CQI signals from a plurality of mobile stations, the radio communication apparatus comprising:

a first spreading unit (214) adapted to spread ~~an~~ the ACK/NACK signal with a sequence defined by one of ~~a plurality of~~twelve cyclic shift values, the sequence being one of twelve sequences that are mutually separable because of mutually different cyclic shift values of the twelve cyclic shift values;

a second spreading unit (219) adapted to spread ~~a~~ the CQI signal with a sequence defined by another one of ~~a plurality of~~the twelve cyclic shift values, the sequence being another of the twelve sequences;

a third spreading unit (216) adapted to spread the ACK/NACK signal, after the ACK/NACK signal has been spread with the sequence defined by one of the twelve cyclic shift values, with a sequence that is one of three orthogonal sequences that each have a different respective orthogonal sequence number of first, second and third orthogonal sequence numbers;

a control section adapted to:

control the spreading of the ACK/NACK signal by the first spreading unit (214) by setting a code-multiplexing cyclic shift value, of cyclic shift values for spreading ACK/NACK signals in the twelve cyclic shift values, in accordance with the code-multiplexing structure;

control the spreading of the CQI signal by the second spreading unit (219) by setting a code-multiplexing cyclic shift value for spreading CQI signals, in accordance with the code-multiplexing structure; and

control the spreading of the ACK/NACK signal by the third spreading unit (216) by setting a code-multiplexing orthogonal sequence number, of the first, second and third orthogonal sequence numbers, in accordance with the code-multiplexing structure; and

a transmitting unit (223) adapted to transmit the ACK/NACK signal, and adapted to transmit the CQI signal,

characterized in that said first spreading unit (214), in each symbol that forms the ACK/NACK signal, uses ~~one of~~said code-multiplexing cyclic shift value of said cyclic shift values for spreading ACK/NACK signals, and said cyclic shift values form a portion of the ~~plurality of the~~twelve cyclic shift values, for the ACK/NACK signal; and

said second spreading unit (219), in each symbol that forms the CQI signal, uses ~~a~~ said code-multiplexing cyclic shift value for spreading CQI signals, which is separated by a predefined interval from the cyclic shift values forming the portion of the ~~plurality of~~twelve cyclic shift values, for the CQI signal,

wherein the cyclic shift values for spreading ACK/NACK signals and the first, second and third orthogonal sequence numbers are arranged in a 2-cyclic-shift-interval mesh structure in the code-multiplexing structure, according to which ACK/NACK signals for which the second orthogonal sequence number is set have 2-cyclic-shift-interval cyclic shift values set that are offset by one cyclic shift value with respect to 2-cyclic-shift-interval cyclic shift values that are set for the ACK/NACK signals for which the first and third orthogonal sequence numbers are set,

the CQI signals in the code-multiplexing structure are not spread with any of the orthogonal sequences, and

the predefined interval includes an unused cyclic shift value positioned after an immediately preceding cyclic shift value for spreading CQI signals, and before an immediately subsequent cyclic shift value for spreading ACK/NACK signals, in the code-multiplexing structure,

so that a minimum value of a difference in cyclic shift values between the CQI signals and the ACK/NACK signals, after said immediately preceding cyclic shift value in the code-multiplexing structure, is equal to the 2-cyclic-shift interval in cyclic shift values between the ACK/NACK signals in the mesh structure.

~~3. The radio communication apparatus according to claim 2, wherein the predefined interval is greater than a minimum interval between the cyclic shift values used for the ACK/NACK signal.~~

~~4. The radio communication apparatus according to claim 2 or 3, wherein the predefined interval is 2.~~

~~5~~3. The radio communication apparatus according to ~~any of claims 1 to 4~~claim 1 or 2, wherein both a symbol that forms the ACK/NACK signal and a symbol that forms a CQI signal transmitted from another radio communication apparatus are mapped to a same symbol, or both

a symbol that forms the CQI signal and a symbol that forms an ACK/NACK signal transmitted from another radio communication apparatus are mapped to a same symbol.

~~6~~4. The radio communication apparatus according to any of claims 1 to ~~5~~3, wherein both the ACK/NACK signal and a CQI signal which is transmitted from another radio communication apparatus, or both the CQI signal and an ACK/NACK signal which is transmitted from another radio communication apparatus, are mapped to a resource in a same frequency and in a same slot.

~~7~~5. The radio communication apparatus according to any of claims 1 to ~~4~~6, wherein the ACK/NACK signal is code-multiplexed with a CQI signal transmitted from another radio communication apparatus, or the CQI signal is code-multiplexed with an ACK/NACK signal transmitted from another radio communication apparatus.

~~8~~6. The radio communication apparatus according to any of claims 1 to ~~5~~7, wherein said first and second spreading units use a sequence having a length 12 as the sequence defined by a cyclic shift value.

~~9. The radio communication apparatus according to any of claims 1 to 8, further comprising a third spreading unit (216) adapted to spread the ACK/NACK signal with one of a plurality of orthogonal sequences.~~

~~10~~7. The radio communication apparatus according to ~~claim 9~~any of claims 1 to 6, wherein said third spreading unit uses a sequence having a length 4 as the orthogonal sequence.

~~11. The radio communication apparatus according to any of claims 1 to 10, wherein:~~

~~said transmitting unit transmits the ACK/NACK signal using a control channel, and said first spreading unit uses the sequence defined by a cyclic shift value which is determined from the control channel; and~~

~~said transmitting unit transmits the CQI signal using a control channel, and said second spreading unit uses the sequence defined by a cyclic shift value which is determined from the control channel.~~

8. The radio communication apparatus according to any of claims 1 to 7, wherein a second unused cyclic shift value is positioned after an immediately preceding cyclic shift value for spreading ACK/NACK signals, and before an immediately subsequent cyclic shift value for spreading CQI signals, in the code-multiplexing structure.

9. The radio communication apparatus according to any of claims 1 to 8, wherein the cyclic shift values for spreading ACK/NACK signals consist of a single set of consecutive cyclic shift values.

~~12~~10. A method for spreading ~~a signal~~ an ACK/NACK signal and a CQI signal in accordance with a code-multiplexing structure for code-multiplexing ACK/NACK signals and CQI signals from a plurality of mobile stations, the method comprising:

spreading ~~an~~ the ACK/NACK signal with a sequence defined by one of ~~a plurality of~~twelve cyclic shift values, the sequence being one of twelve sequences that are mutually separable because of mutually different cyclic shift values of the twelve cyclic shift values;

spreading ~~a~~ the CQI signal with a sequence defined by another one of ~~a plurality of~~the twelve cyclic shift values, the sequence being another of the twelve sequences;

spreading the ACK/NACK signal, after the ACK/NACK signal has been spread with the sequence defined by one of twelve cyclic shift values, with a sequence that is one of three orthogonal sequences that each have a different respective orthogonal sequence number of first, second and third orthogonal sequence numbers;

controlling the spreading of the ACK/NACK signal by setting a code-multiplexing cyclic shift value, of first cyclic shift values for spreading ACK/NACK signals, in accordance with the code-multiplexing structure;

controlling the spreading of the CQI signal by setting a code-multiplexing cyclic shift value, of second cyclic shift values for spreading CQI signals, in accordance with the code-multiplexing structure; and

controlling the spreading of the ACK/NACK signal by setting a code-multiplexing orthogonal sequence number, of the first, second and third orthogonal sequence numbers, in accordance with the code-multiplexing structure,

characterized ~~in that~~by:

in each symbol that forms the ACK/NACK signal, spreading the ACK/NACK signal with a sequence defined by ~~one of~~ said code-multiplexing cyclic shift value of said first cyclic shift values, and said first cyclic shift values form a portion of ~~a plurality of~~the twelve cyclic shift values; and

in each symbol that forms the CQI signal, spreading the CQI signal with a sequence defined by ~~one of~~ said code-multiplexing cyclic shift value of said second cyclic shift values, and said second cyclic shift values are not within the portion of the ~~plurality of the~~twelve cyclic shift values,

wherein a cyclic shift value between the first cyclic shift values and the second cyclic shift values is not used for either the ACK/NACK signal or the CQI signal~~; and~~

~~spreading the ACK/NACK signal with one of another plurality of orthogonal sequences~~,

the first cyclic shift values for spreading ACK/NACK signals and the first, second and third orthogonal sequence numbers are arranged in a 2-cyclic shift interval mesh structure in the code-multiplexing structure, according to which ACK/NACK signals for which the second orthogonal sequence number is set have 2-cyclic-shift-interval cyclic shift values set that are offset by one cyclic shift value with respect to 2-cyclic-shift-interval cyclic shift values that are set for the ACK/NACK signals for which the first and third orthogonal sequence numbers are set,

the CQI signals in the code-multiplexing structure are not spread with any of the orthogonal sequences, and

the unused cyclic shift value is positioned after an immediately preceding cyclic shift value for spreading CQI signals, and before an immediately subsequent cyclic shift value for spreading ACK/NACK signals, in the code-multiplexing structure,

so that a minimum value of a difference in cyclic shift values between the CQI signals and the ACK/NACK signals, after said immediately preceding cyclic shift value in the code-multiplexing structure, is equal to the 2-cyclic-shift interval in cyclic shift values between the ACK/NACK signals in the mesh structure.

~~13~~11. A method for spreading ~~a signal~~ an ACK/NACK signal and a CQI signal in accordance with a code-multiplexing structure for code-multiplexing ACK/NACK signals and CQI signals from a plurality of mobile stations, the method comprising:

spreading ~~an~~ the ACK/NACK signal with a sequence defined by one of ~~a plurality of~~twelve cyclic shift values, the sequence being one of twelve sequences that are mutually separable because of mutually different cyclic shift values of the twelve cyclic shift values;

spreading ~~a~~ the CQI signal with a sequence defined by another one of ~~a plurality of~~ the twelve cyclic shift values, the sequence being another of the twelve sequences;

spreading the ACK/NACK signal, after the ACK/NACK signal has been spread with the sequence defined by one of twelve cyclic shift values, with a sequence that is one of three orthogonal sequences that each have a different respective orthogonal sequence number of first, second and third orthogonal sequence numbers;

controlling the spreading of the ACK/NACK signal by setting a code-multiplexing cyclic shift value, of cyclic shift values for spreading ACK/NACK signals in the twelve cyclic shift values, in accordance with the code-multiplexing structure;

controlling the spreading of the CQI signal by setting a code-multiplexing cyclic shift value for spreading CQI signals, in accordance with the code-multiplexing structure; and

control the spreading of the ACK/NACK signal by setting a code-multiplexing orthogonal sequence number, of the first, second and third orthogonal sequence numbers, in accordance with the code-multiplexing structure,

characterized ~~in that~~by:

in each symbol that forms the ACK/NACK signal, spreading the ACK/NACK signal with a sequence defined by ~~one of~~ said code-multiplexing cyclic shift value of said cyclic shift values for spreading ACK/NACK signals, and said cyclic shift values form a portion of ~~a plurality of~~the twelve cyclic shift values; and

in each symbol that forms the CQI signal, spreading the CQI signal with a sequence defined by said code-multiplexing~~a~~ cyclic shift value for spreading CQI signals, which is separated by a predefined interval from the cyclic shift values forming the portion of the ~~plurality of~~twelve cyclic shift values,

wherein the cyclic shift values for spreading ACK/NACK signals and the first, second and third orthogonal sequence numbers are arranged in a 2-cyclic-shift-interval mesh structure in the code-multiplexing structure, according to which ACK/NACK signals for which the second orthogonal sequence number is set have 2-cyclic-shift-interval cyclic shift values set that are offset by one cyclic shift value with respect to 2-cyclic-shift-interval cyclic shift values that are set for the ACK/NACK signals for which the first and third orthogonal sequence numbers are set,

the CQI signals in the code-multiplexing structure are not spread with any of the orthogonal sequences, and

the predefined interval includes an unused cyclic shift value positioned after an immediately preceding cyclic shift value for spreading CQI signals, and before an immediately subsequent cyclic shift value for spreading ACK/NACK signals, in the code-multiplexing structure,

so that a minimum value of a difference in cyclic shift values between the CQI signals and the ACK/NACK signals, after said immediately preceding cyclic shift value in the code-multiplexing structure, is equal to the 2-cyclic-shift interval in cyclic shift values between the ACK/NACK signals in the mesh structure~~; and~~

~~spreading the ACK/NACK signal with one of another plurality of orthogonal sequences~~.

12. The method according to claim 10 or 11, wherein a second unused cyclic shift value is positioned after an immediately preceding cyclic shift value for spreading ACK/NACK signals, and before an immediately subsequent cyclic shift value for spreading CQI signals, in the code-multiplexing structure.

13. The method according to any of claims 10 to 12, wherein the cyclic shift values for spreading ACK/NACK signals consist of a single set of consecutive cyclic shift values.

Claim No. HP-2019-000006

IN THE HIGH COURT OF JUSTICE
BUSINESS AND PROPERTY COURTS OF ENGLAND AND WALES
INTELLECTUAL PROPERTY LIST (ChD)
PATENTS COURT

B E T W E E N:

(1) OPTIS CELLULAR TECHNOLOGY LLC

(A company incorporated under the laws of the State of Delaware)

(2) OPTIS WIRELESS TECHNOLOGY LLC

(A company incorporated under the laws of the State of Delaware)

(3) UNWIRED PLANET INTERNATIONAL LIMITED

(A company incorporated under the laws of the Republic of Ireland)

Claimants

-and-

(1) APPLE RETAIL UK LIMITED

(2) APPLE DISTRIBUTION INTERNATIONAL LIMITED

(A company incorporated under the laws of the Republic of Ireland)

(3) APPLE INC

(A company incorporates under the laws of the State of California)

Defendants

ANNEX D
TO THE STATEMENT OF GROUNDS FOR
AMENDMENT OF EP(UK) 2,187,549

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549 Patent – comparison of unconditional and conditional amendments

1. A radio communication apparatus of a mobile station adapted to spread and transmit an ACK/NACK signal or a CQI signal in accordance with a code-multiplexing structure for code-multiplexing ACK/NACK signals and CQI signals from a plurality of mobile stations, the radio communication apparatus comprising:

a first spreading unit (214) adapted to spread the ACK/NACK signal with a sequence defined by one of ~~a plurality of~~ twelve cyclic shift values, the sequence being one of ~~a plurality of~~ twelve sequences that are mutually separable because of mutually different cyclic shift values of the ~~plurality of~~ twelve cyclic shift values;

a second spreading unit (219) adapted to spread the CQI signal with a sequence defined by another one of the ~~plurality of~~ twelve cyclic shift values, the sequence being another of the ~~plurality of~~ twelve sequences;

a third spreading unit (216) adapted to spread the ACK/NACK signal, after the ACK/NACK signal has been spread with the sequence defined by one of ~~a plurality of~~ twelve cyclic shift values, with a sequence that is one of ~~a plurality of~~ three orthogonal sequences that each have a different respective orthogonal sequence number of ~~a plurality of~~ first, second and third orthogonal sequence numbers;

a control section adapted to:

control the spreading of the ACK/NACK signal by the first spreading unit (214) by setting a code-multiplexing cyclic shift value, of first cyclic shift values for spreading ACK/NACK signals, in accordance with the code-multiplexing structure;

control the spreading of the CQI signal by the second spreading unit (219) by setting a code-multiplexing cyclic shift value, of second cyclic shift values for spreading CQI signals, in accordance with the code-multiplexing structure; and

control the spreading of the ACK/NACK signal by the third spreading unit (216) by setting a code-multiplexing orthogonal sequence number, of the ~~plurality~~ first, second and third of orthogonal sequence numbers, in accordance with the code-multiplexing structure; and

a transmitting unit (223) adapted to transmit the ACK/NACK signal, and adapted to transmit the CQI signal,

characterized in that said first spreading unit (214), in each symbol that forms the ACK/NACK signal, uses said code-multiplexing cyclic shift value of said first cyclic shift values, and said first cyclic shift values form a portion of the ~~plurality of the~~ twelve cyclic shift values, for the ACK/NACK signal;

said second spreading unit (219), in each symbol that forms the CQI signal, uses said code-multiplexing cyclic shift value of said second cyclic shift values, and said second cyclic shift values are not within the portion of the ~~plurality of the~~ twelve cyclic shift values, for the CQI signal; and

a cyclic shift value between the first cyclic shift values and the second cyclic shift values is not used for either the ACK/NACK signal or the CQI signal,

wherein the first cyclic shift values for spreading ACK/NACK signals and the ~~plurality of~~ first, second and third orthogonal sequence numbers are arranged in a 2-cyclic shift interval mesh structure in the code-multiplexing structure, ~~and~~according to which ACK/NACK signals for which the second orthogonal sequence number is set have 2-cyclic-shift-interval cyclic shift values set that are offset by one cyclic shift value with respect to 2-cyclic-shift-interval cyclic shift values that set for the ACK/NACK signals for which the first and third orthogonal sequence numbers are set,

the CQI signals in the code-multiplexing structure are not spread with any of the orthogonal sequences, and

the unused cyclic shift value is positioned after an immediately preceding cyclic shift value for spreading CQI signals, and before an immediately subsequent cyclic shift value for spreading ACK/NACK signals, in the code-multiplexing structure,

so that a minimum value of a difference in cyclic shift values between the CQI signals and the ACK/NACK signals, after said immediately preceding cyclic shift value in the code-multiplexing structure, is equal to the 2-cyclic-shift interval in cyclic shift values between the ACK/NACK signals in the mesh structure.

2. A radio communication apparatus of a mobile station adapted to spread and transmit an ACK/NACK signal or a CQI signal in accordance with a code-multiplexing structure for code-multiplexing ACK/NACK signals and CQI signals from a plurality of mobile stations, the radio communication apparatus comprising:

a first spreading unit (214) adapted to spread the ACK/NACK signal with a sequence defined by one of ~~a plurality of~~ twelve cyclic shift values, the sequence being one of ~~a plurality of~~ twelve sequences that are mutually separable because of mutually different cyclic shift values of the ~~plurality of~~ twelve cyclic shift values;

a second spreading unit (219) adapted to spread the CQI signal with a sequence defined by another one of the ~~plurality of~~ twelve cyclic shift values, the sequence being another of the ~~plurality of~~ twelve sequences;

a third spreading unit (216) adapted to spread the ACK/NACK signal, after the ACK/NACK signal has been spread with the sequence defined by one of ~~a plurality of~~ the twelve cyclic shift values, with a sequence that is one of ~~a plurality of~~ three orthogonal sequences that each have a different respective orthogonal sequence number of ~~a plurality of~~ first, second and third orthogonal sequence numbers;

a control section adapted to:

control the spreading of the ACK/NACK signal by the first spreading unit (214) by setting a code-multiplexing cyclic shift value, of cyclic shift values for spreading ACK/NACK signals in the ~~plurality of~~ twelve cyclic shift values, in accordance with the code-multiplexing structure;

control the spreading of the CQI signal by the second spreading unit (219) by setting a code-multiplexing cyclic shift value for spreading CQI signals, in accordance with the code-multiplexing structure; and

control the spreading of the ACK/NACK signal by the third spreading unit (216) by setting a code-multiplexing orthogonal sequence number, of the ~~plurality of~~ first, second and third orthogonal sequence numbers, in accordance with the code-multiplexing structure; and

a transmitting unit (223) adapted to transmit the ACK/NACK signal, and adapted to transmit the CQI signal,

characterized in that said first spreading unit (214), in each symbol that forms the ACK/NACK signal, uses said code-multiplexing cyclic shift value of said cyclic shift values for spreading ACK/NACK signals, and said cyclic shift values form a portion of the ~~plurality of the~~ twelve cyclic shift values, for the ACK/NACK signal; and

said second spreading unit (219), in each symbol that forms the CQI signal, uses said code-multiplexing cyclic shift value for spreading CQI signals, which is separated by a predefined interval from the cyclic shift values forming the portion of the ~~plurality of~~ twelve cyclic shift values, for the CQI signal,

wherein the cyclic shift values for spreading ACK/NACK signals and the ~~plurality of~~ first, second and third orthogonal sequence numbers are arranged in a 2-cyclic-shift-interval mesh structure in the code-multiplexing structure, ~~and~~according to which ACK/NACK signals for which the second orthogonal sequence number is set have 2-cyclic-shift-interval cyclic shift values set that are offset by one cyclic shift value with respect to 2-cyclic-shift-interval cyclic shift values that are set for the ACK/NACK signals for which the first and third orthogonal sequence numbers are set,

the CQI signals in the code-multiplexing structure are not spread with any of the orthogonal sequences, and

the predefined interval includes an unused cyclic shift value positioned after an immediately preceding cyclic shift value for spreading CQI signals, and before an immediately subsequent cyclic shift value for spreading ACK/NACK signals, in the code-multiplexing structure,

so that a minimum value of a difference in cyclic shift values between the CQI signals and the ACK/NACK signals, after said immediately preceding cyclic shift value in the code-multiplexing structure, is equal to the 2-cyclic-shift interval in cyclic shift values between the ACK/NACK signals in the mesh structure.

3. The radio communication apparatus according to claim 1 or 2, wherein both a symbol that forms the ACK/NACK signal and a symbol that forms a CQI signal transmitted from another radio communication apparatus are mapped to a same symbol, or both a symbol that forms the CQI signal and a symbol that forms an ACK/NACK signal transmitted from another radio communication apparatus are mapped to a same symbol.

4. The radio communication apparatus according to any of claims 1 to 3, wherein both the ACK/NACK signal and a CQI signal which is transmitted from another radio communication apparatus, or both the CQI signal and an ACK/NACK signal which is transmitted from another

radio communication apparatus, are mapped to a resource in a same frequency and in a same slot.

5. The radio communication apparatus according to any of claims 1 to 4, wherein the ACK/NACK signal is code-multiplexed with a CQI signal transmitted from another radio communication apparatus, or the CQI signal is code-multiplexed with an ACK/NACK signal transmitted from another radio communication apparatus.

6. The radio communication apparatus according to any of claims 1 to 5, wherein said first and second spreading units use a sequence having a length 12 as the sequence defined by a cyclic shift value.

7. The radio communication apparatus according to any of claims 1 to 6, wherein said third spreading unit uses a sequence having a length 4 as the orthogonal sequence.

8. The radio communication apparatus according to any of claims 1 to 7, wherein a second unused cyclic shift value is positioned after an immediately preceding cyclic shift value for spreading ACK/NACK signals, and before an immediately subsequent cyclic shift value for spreading CQI signals, in the code-multiplexing structure.

9. The radio communication apparatus according to any of claims 1 to 8, wherein the cyclic shift values for spreading ACK/NACK signals consist of a single set of consecutive cyclic shift values.

10. A method for spreading an ACK/NACK signal and a CQI signal in accordance with a code-multiplexing structure for code-multiplexing ACK/NACK signals and CQI signals from a plurality of mobile stations, the method comprising:

spreading the ACK/NACK signal with a sequence defined by one of ~~a plurality of~~ twelve cyclic shift values, the sequence being one of ~~a plurality of~~ twelve sequences that are

mutually separable because of mutually different cyclic shift values of the ~~plurality of~~ twelve cyclic shift values;

spreading the CQI signal with a sequence defined by another one of the ~~plurality of~~ twelve cyclic shift values, the sequence being another of the ~~plurality of~~ twelve sequences;

spreading the ACK/NACK signal, after the ACK/NACK signal has been spread with the sequence defined by one of ~~a plurality of~~ twelve cyclic shift values, with a sequence that is one of ~~a plurality of~~ three orthogonal sequences that each have a different respective orthogonal sequence number of ~~a plurality of~~ first, second and third orthogonal sequence numbers;

controlling the spreading of the ACK/NACK signal by setting a code-multiplexing cyclic shift value, of first cyclic shift values for spreading ACK/NACK signals, in accordance with the code-multiplexing structure;

controlling the spreading of the CQI signal by setting a code-multiplexing cyclic shift value, of second cyclic shift values for spreading CQI signals, in accordance with the code-multiplexing structure; and

controlling the spreading of the ACK/NACK signal by setting a code-multiplexing orthogonal sequence number, of the ~~plurality of~~ first, second and third orthogonal sequence numbers, in accordance with the code-multiplexing structure,

characterized by:

in each symbol that forms the ACK/NACK signal, spreading the ACK/NACK signal with a sequence defined by said code-multiplexing cyclic shift value of said first cyclic shift values, and said first cyclic shift values form a portion of the ~~plurality of~~ twelve cyclic shift values; and

in each symbol that forms the CQI signal, spreading the CQI signal with a sequence defined by said code-multiplexing cyclic shift value of said second cyclic shift values, and said second cyclic shift values are not within the portion of the ~~plurality of the~~ twelve cyclic shift values,

wherein a cyclic shift value between the first cyclic shift values and the second cyclic shift values is not used for either the ACK/NACK signal or the CQI signal,

the first cyclic shift values for spreading ACK/NACK signals and the ~~plurality of~~ first, second and third orthogonal sequence numbers are arranged in a 2-cyclic shift interval mesh

structure in the code-multiplexing structure, ~~and~~according to which ACK/NACK signals for which the second orthogonal sequence number is set have 2-cyclic-shift-interval cyclic shift values set that are offset by one cyclic shift value with respect to 2-cyclic-shift-interval cyclic shift values that are set for the ACK/NACK signals for which the first and third orthogonal sequence numbers are set,

the CQI signals in the code-multiplexing structure are not spread with any of the orthogonal sequences, and

the unused cyclic shift value is positioned after an immediately preceding cyclic shift value for spreading CQI signals, and before an immediately subsequent cyclic shift value for spreading ACK/NACK signals, in the code-multiplexing structure,

so that a minimum value of a difference in cyclic shift values between the CQI signals and the ACK/NACK signals, after said immediately preceding cyclic shift value in the code-multiplexing structure, is equal to the 2-cyclic-shift interval in cyclic shift values between the ACK/NACK signals in the mesh structure.

11. A method for spreading an ACK/NACK signal and a CQI signal in accordance with a code-multiplexing structure for code-multiplexing ACK/NACK signals and CQI signals from a plurality of mobile stations, the method comprising:

spreading the ACK/NACK signal with a sequence defined by one of ~~a plurality of~~ twelve cyclic shift values, the sequence being one of ~~a plurality of~~ twelve sequences that are mutually separable because of mutually different cyclic shift values of the ~~plurality of~~ twelve cyclic shift values;

spreading the CQI signal with a sequence defined by another one of the ~~plurality of~~ twelve cyclic shift values, the sequence being another of the ~~plurality of~~ twelve sequences;

spreading the ACK/NACK signal, after the ACK/NACK signal has been spread with the sequence defined by one of ~~a plurality of~~ twelve cyclic shift values, with a sequence that is one of ~~a plurality of~~ three orthogonal sequences that each have a different respective orthogonal sequence number of ~~a plurality of~~ first, second and third orthogonal sequence numbers;

controlling the spreading of the ACK/NACK signal by setting a code-multiplexing cyclic shift value, of cyclic shift values for spreading ACK/NACK signals in the ~~plurality of~~ twelve cyclic shift values, in accordance with the code-multiplexing structure;

controlling the spreading of the CQI signal by setting a code-multiplexing cyclic shift value for spreading CQI signals, in accordance with the code-multiplexing structure; and

control the spreading of the ACK/NACK signal by setting a code-multiplexing orthogonal sequence number, of the ~~plurality of~~ first, second and third orthogonal sequence numbers, in accordance with the code-multiplexing structure,

characterized by:

in each symbol that forms the ACK/NACK signal, spreading the ACK/NACK signal with a sequence defined by said code-multiplexing cyclic shift value of said cyclic shift values for spreading ACK/NACK signals, and said cyclic shift values ~~forming~~ form a portion of the ~~plurality of~~ twelve cyclic shift values; and

in each symbol that forms the CQI signal, spreading the CQI signal with a sequence defined by said code-multiplexing cyclic shift value for spreading CQI signals, which is separated by a predefined interval from the cyclic shift values forming the portion of the ~~plurality of~~ twelve cyclic shift values,

wherein the cyclic shift values for spreading ACK/NACK signals and the ~~plurality of~~ first, second and third orthogonal sequence numbers are arranged in a 2-cyclic-shift-interval mesh structure in the code-multiplexing structure, ~~and~~according to which ACK/NACK signals for which the second orthogonal sequence number is set have 2-cyclic-shift-interval cyclic shift values set that are offset by one cyclic shift value with respect to 2-cyclic-shift-interval cyclic shift values that are set for the ACK/NACK signals for which the first and third orthogonal sequence numbers are set,

the CQI signals in the code-multiplexing structure are not spread with any of the orthogonal sequences, and

the predefined interval includes an unused cyclic shift value positioned after an immediately preceding cyclic shift value for spreading CQI signals, and before an immediately subsequent cyclic shift value for spreading ACK/NACK signals, in the code-multiplexing structure,

so that a minimum value of a difference in cyclic shift values between the CQI signals and the ACK/NACK signals, after said immediately preceding cyclic shift value in the code-multiplexing structure, is equal to the 2-cyclic-shift interval in cyclic shift values between the ACK/NACK signals in the mesh structure.

12. The method according to claim 10 or 11, wherein a second unused cyclic shift value is positioned after an immediately preceding cyclic shift value for spreading ACK/NACK signals, and before an immediately subsequent cyclic shift value for spreading CQI signals, in the code-multiplexing structure.

13. The method according to any of claims 10 to 12, wherein the cyclic shift values for spreading ACK/NACK signals consist of a single set of consecutive cyclic shift values.