CLAIMS

1. A transmission apparatus configured to transmit ~~one or more~~ a reference signals using one or more component carriers, the transmission apparatus comprising:

a generator configured to generate ~~two~~one or more sequences~~, each respectively corresponding to a frequency bandwidth of each of the component carriers, when a number of the component carriers is two or more~~; and

a mapper configured to map each of the generated sequences to a frequency resources in each of the component carriers~~, respectively~~, ~~each~~ as athe reference signal, the frequency resource being comprised of one or more consecutive frequency resources,

wherein

a maximum number of the consecutive frequency resources that are assigned to each of the component carriers is two,

when one component carriers is configured, one sequence is generated and the generated sequence is mapped to the frequency resource in one component carrier, and

when plural component carriers are configured, plural sequences are generated and the generated sequences are mapped to plural frequency resources in plural component carriers, respectively.

2. The transmission apparatus according to claim 1, wherein each of the generated sequences is mapped to a plurality of consecutive frequency resources in each of the component carriers~~, respectively~~.

3. The transmission apparatus according to claim 1, wherein, the generated sequences are cyclic shift sequences.

~~4. The transmission apparatus according to claim 1, wherein when the number of the component carriers is one, one sequence is generated for the one component carrier and is mapped to a plurality of consecutive frequency resources in the one component carrier as a reference signal.~~

~~5~~4. The transmission apparatus according to claim 1, wherein when the number of the component carriers is two, a number of the generated sequences is two.

~~6~~5. The transmission apparatus according to claim 1, wherein when the number of the component carriers is two, a sequence number of the generated sequence for a first component carrier is different from a sequence number of the generated sequence for a second component carrier.

~~7. The transmission apparatus according to claim 2, wherein a number of the plurality of consecutive frequency resources is two in each of the component carriers.~~

~~8~~6. A transmission method performed by a transmission apparatus for transmitting ~~one or more~~ a reference signals using one or more component carriers, the transmission method comprising:
generating ~~two~~ one or more sequences~~, each respectively corresponding to a frequency bandwidth of each of the component carriers, when a number of the component carriers is two or more~~; and
mapping each of the generated sequences to a frequency resources in each of the component carriers~~, respectively~~, ~~each~~ as ~~a~~the reference signal, the frequency resource being comprised of one or more consecutive frequency resources,

wherein

a maximum number of the consecutive frequency resources that are assigned to each of the component carriers is two,

when one component carriers is configured, one sequence is generated and the generated sequence is mapped to the frequency resource in one component carrier, and
when plural component carriers are configured, plural sequences are generated and the generated sequences are mapped to plural frequency resources in plural component carriers, respectively.

~~9~~7. A integrated circuit for controlling a process performed by ~~configured to transmit one or more reference signals using one or more component carriers~~a transmission apparatus for transmitting a reference signal using one or more component carriers, the ~~integrated circuit~~ process comprising:
~~a generation section configured to control~~ generation~~ing of two~~ one or more sequences~~, each respectively corresponding to a frequency bandwidth of each of the component carriers, when a number of the component carriers is two or more~~; and
~~a mapping section configured to control~~ mapping ~~of~~ each of the generated sequences to a frequency resources in each of the component carriers~~, respectively~~, ~~each~~ as ~~a~~the reference signal, the frequency resource being comprised of one or more consecutive frequency resources,

wherein

a maximum number of the consecutive frequency resources that are assigned to each of the component carriers is two,

when one component carriers is configured, one sequence is generated and the generated sequence is mapped to the frequency resource in one component carrier, and
when plural component carriers are configured, plural sequences are generated and the generated sequences are mapped to plural frequency resources in plural component carriers, respectively.

~~10~~8. A reception apparatus configured to receive ~~one or more~~ a reference signals transmitted using one or more component carriers, the reception apparatus comprising:

~~an extractor~~ receiver configured to ~~extract~~ receive ~~two or more component carriers used for transmitting two or more~~ the reference signals ~~respectively, when a number of the component carriers is two or more, the two or more reference signals being two or more sequences each respectively corresponding to a frequency bandwidth of each of the component carriers~~ generated from one or more sequences, each of which is mapped to a frequency resource in each of the component carriers, the

frequency resource being comprised of one or more consecutive frequency resources; and

an estimation value calculator configured to ~~calculate~~ estimate a channel ~~estimation value for the each of component carriers with each of~~ based on the reference signals~~, respectively~~

wherein

a maximum number of the consecutive frequency resources that are assigned to each of the component carriers is two,

when one component carriers is configured, the reference signal is generated from one sequence, which is mapped to the frequency resource in one component carrier, and

when plural component carriers are configured, the reference signal is generated from plural sequences, which are mapped to plural frequency resources in plural component carriers, respectively.

~~11~~9. The reception apparatus according to claim ~~10~~8, wherein each of the sequences is mapped to a plurality of consecutive frequency resources in each of component carriers ~~respectively, each as the reference signal~~.

~~12~~10. The reception apparatus according to claim ~~10~~8, wherein, the sequences ~~as the reference signals~~ are cyclic shift sequences.

~~13. The reception apparatus according to claim 10, wherein when the number of the component carriers is one, the estimation value calculator combines partial sequences mapped to a plurality of consecutive frequency resources in the one component carrier to generate one sequence as a reference signal, and calculates the channel estimation value for the one component carrier with the reference signal.~~

~~14~~11. The reception apparatus according to claim ~~10~~8, wherein when the number of the component carriers is two, a number of the sequences ~~as the reference signals~~ is two.

~~15~~12. The reception apparatus according to claim ~~10~~8, wherein when the number of the component carriers is two, a sequence number of a first sequence ~~as a reference signal~~ for a first component carrier is different from a sequence number of a second sequence ~~as a reference signal~~ for a second component carrier.

~~16. The reception apparatus according to claim 11, wherein a number of the plurality of consecutive frequency resources is two in each of the component carriers.~~

~~17~~13. A reception method performed by a reception apparatus for receiving ~~one or more~~ a reference signals transmitted using one or more component carriers, the reception method comprising:

~~extracting~~ receiving ~~two or more component carriers used for transmitting two or more~~ the reference signals ~~respectively, when a number of the component carriers is two or more, the two or more reference signals being two or more sequences each respectively corresponding to a frequency~~

~~bandwidth of each of the component carriers~~ generated from one or more sequences, each of which is mapped to a frequency resource in each of the component carriers, the frequency resource being comprised of one or more consecutive frequency resources; and

~~calculating~~ estimating a channel ~~estimation value for the each of component carriers with~~ based on ~~each of~~ the reference signals~~, respectively~~,

wherein

a maximum number of the consecutive frequency resources that are assigned to each of the component carriers is two,

when one component carriers is configured, the reference signal is generated from one sequence, which is mapped to the frequency resource in one component carrier, and

when plural component carriers are configured, the reference signal is generated from plural sequences, which are mapped to plural frequency resources in plural component carriers, respectively.

~~18~~14. A integrated circuit for controlling a process performed by a reception apparatus ~~configured to~~for receiveing ~~one or more~~ a reference signals transmitted using one or more component carriers, the ~~integrated circuit~~ process comprising:

~~an extracting section configured to control extracting of two or more component carriers used for transmitting two or more~~ receiving a reference signals ~~respectively, when a number of the component carriers is two or more, the two or more reference signals being two or more sequences each respectively corresponding to a frequency bandwidth of each of the component carriers~~ generated from one or more sequences, each of which is mapped to a frequency resource in each of the component carriers, the frequency resource being comprised of one or more consecutive frequency resources; and

~~an estimation value calculation section configured to control of calculation~~ estimating a channel ~~estimation value for the each of component carriers with~~ based on ~~each of~~ the reference signals~~, respectively~~,

wherein

a maximum number of the consecutive frequency resources that are assigned to each of the component carriers is two,

when one component carriers is configured, the reference signal is generated from one sequence, which is mapped to the frequency resource in one component carrier, and

when plural component carriers are configured, the reference signal is generated from plural sequences, which are mapped to plural frequency resources in plural component carriers, respectively.