

Claims

[Claim 1]

A method for performing early data transmission, the method comprising:
receiving a random access response message and a broadcast message, the random access response message comprising an uplink grant for user equipment to perform the early data transmission, wherein the uplink grant comprises information indicating resource allocation and information indicating a repetition number;
determining, according to the uplink grant and/or the broadcast message, a maximum transmission block size allowed during the early data transmission and a resource and a repetition number corresponding thereto;
obtaining, according to the allowed maximum transmission block size, candidate values of available transmission block sizes and a resource and a repetition number corresponding to each candidate value; and
selecting, according to the size of uplink data to be transmitted, a candidate value of a suitable transmission block size and a resource and a repetition number corresponding thereto to perform the early data transmission in a random access message 3.

[Claim 2]

The method according to claim 1, wherein the determining the allowed maximum transmission block size comprises:
using a maximum transmission block size broadcast by a base station and corresponding to a coverage enhancement level of the user equipment to serve as the maximum transmission block size allowed when the early data transmission is performed.

[Claim 3]

The method according to claim 1, wherein the uplink grant further comprises index information indicating the allowed maximum transmission block size, and the determining the allowed maximum transmission block size comprises:
determining, according to the index information, the maximum transmission block size allowed when early data transmission is performed from a group of transmission block sizes pre-associated with a maximum transmission block size broadcast by a base station and corresponding to a coverage enhancement level of the user equipment.

[Claim 4]

The method according to claim 1, wherein
each allowed maximum transmission block size and candidate values of a group of available transmission block sizes associated therewith have a predetermined mapping relationship; or

each allowed maximum transmission block size is pre-associated with the candidate values of a group of available transmission block sizes.

[Claim 5]

The method according to claim 1, wherein the information indicating resource allocation comprised in the uplink grant comprises: information indicating resource allocation corresponding to a time when the allowed maximum transmission block size is used at the coverage enhancement level of the user equipment.

[Claim 6]

The method according to claim 1, wherein the information indicating a repetition number comprised in the uplink grant comprises:

information indicating a unified repetition number corresponding to the coverage enhancement level of the user equipment; or

information indicating a repetition number corresponding to a time when the allowed maximum transmission block size is used at the coverage enhancement level of the user equipment.

[Claim 7]

A method for performing early data transmission, the method comprising:

transmitting a random access response message and a broadcast message, the random access response message comprising an uplink grant for user equipment to perform the early data transmission, wherein the uplink grant comprises information indicating resource allocation and information indicating a repetition number;

determining, according to the uplink grant and/or the broadcast message, a maximum transmission block size allowed during the early data transmission and a resource and a repetition number corresponding thereto; obtaining, according to the allowed maximum transmission block size, candidate values of available transmission block sizes and a resource and a repetition number corresponding to each candidate value; and

performing blind demodulation detection, based on the candidate values of the available transmission block sizes and the resource and the repetition number corresponding to each candidate value, on the early data transmission performed by the user equipment in a random access message 3.

[Claim 8]

The method according to claim 7, wherein the uplink grant further comprises index information indicating the allowed maximum transmission block size.

[Claim 9]

User equipment, comprising:

a processor; and
a memory, the memory storing machine-readable instructions, wherein when executed by the processor, the instructions cause the processor to perform the method according to any one of claims 1 to 6.

[Claim 10]

A base station, comprising:
a processor; and
a memory, the memory storing machine-readable instructions, wherein when executed by the processor, the instructions cause the processor to perform the method according to any one of claims 7 to 8.

Claim 1:

A method for a user equipment (UE) for performing an early data transmission, the method comprising:

transmitting a random access message 1 (Msg1) via a physical random access channel (PRACH);

receiving a random access response message which includes an uplink grant for a random access message 3 (Msg3) physical uplink shared channel (PUSCH), the uplink grant including first information indicating resource allocation for the Msg3 PUSCH and second information indicating a first repetition number corresponding to a maximum transmission block size (TBS);

receiving a broadcast message, the broadcast message including third information indicating the maximum TBS which is pre-associated with a group of candidate TBSs equal to or smaller than the maximum TBS for the UE to perform the early data transmission in the Msg3 PUSCH;

determining a TBS and a second repetition number used for the early data transmission in the Msg3 PUSCH; and

transmitting the early data transmission in the Msg3 PUSCH using the TBS and the second repetition number, wherein:

the TBS is determined from the group of candidate TBSs pre-associated with the maximum TBS, and

the second repetition number is determined based on the first repetition number and a ratio of the TBS to the maximum TBS.

Claim 2:

A method for a base station for performing an early data transmission, the method comprising:
receiving a random access message 1 (Msg1) via a physical random access channel (PRACH);
transmitting a random access response message which includes an uplink grant for a random access message 3 (Msg3) physical uplink shared channel (PUSCH), the uplink grant including first

information indicating resource allocation for the Msg3 PUSCH and second information indicating a first repetition number corresponding to a maximum transmission block size (TBS);

transmitting a broadcast message, the broadcast message including third information indicating the maximum TBS which is pre-associated with a group of candidate TBSs equal to or smaller than the maximum TBS for a user equipment to perform the early data transmission in the Msg3 PUSCH;

determining a TBS and a second repetition number used for the early data transmission in the Msg3 PUSCH; and

receiving the early data transmission in the Msg3 PUSCH using the TBS and the second repetition number, wherein:

the TBS is determined from the group of candidate TBSs pre-associated with the maximum TBS, and

the second repetition number is determined based on the first repetition number and a ratio of the TBS to the maximum TBS.

Claim 3:

A user equipment (UE) for performing an early data transmission, the UE comprising:
one or more non-transitory computer-readable media having computer-executable instructions embodied thereon; and

at least one processor coupled to the one or more non-transitory computer-readable media, the at least one processor is configured to execute the computer-executable instructions to:

transmit a random access message 1 (Msg1) via a physical random access channel (PRACH);

receive a random access response message which includes an uplink grant for a random access message 3 (Msg3) physical uplink shared channel (PUSCH), the uplink grant including first information indicating resource allocation for the Msg3 PUSCH and second information indicating a first repetition number corresponding to a maximum transmission block size (TBS);

receive a broadcast message, the broadcast message including third information indicating the maximum TBS which is pre-associated with a group of candidate TBSs equal to or smaller than the maximum TBS for the UE to perform the early data transmission in the Msg3 PUSCH;

determine a TBS and a second repetition number used for the early data transmission in the Msg3 PUSCH; and

transmit the early data transmission in the Msg3 PUSCH using the TBS and the second repetition number, wherein:

the TBS is determined from the group of candidate TBSs pre-associated with the maximum TBS, and

the second repetition number is determined based on the first repetition number and a

ratio of the TBS to the maximum TBS.

Claim 4:

A base station (BS) for performing an early data transmission, the BS comprising:
one or more non-transitory computer-readable media having computer-executable
instructions embodied thereon; and

at least one processor coupled to the one or more non-transitory computer-readable media, the
at least one processor is configured to execute the computer-executable instructions to:

receive a random access message 1 (Msg1) via a physical random access channel
(PRACH);

transmit a random access response message which includes an uplink grant for a
random access message 3 (Msg3) physical uplink shared channel (PUSCH), the uplink grant
including first information indicating resource allocation for the Msg3 PUSCH and second
information indicating a first repetition number corresponding to a maximum transmission
block size (TBS);

transmit a broadcast message, the broadcast message including third information
indicating the maximum TBS which is pre-associated with a group of candidate TBSs equal
to or smaller than the maximum TBS for a user equipment to perform the early data
transmission in the Msg3 PUSCH;

determine a TBS and a second repetition number used for the early data transmission
in the Msg3 PUSCH; and

receive the early data transmission in the Msg3 PUSCH using the TBS and the second
repetition number, wherein:

the TBS is determined from the group of candidate TBSs pre-associated with the
maximum TBS, and

the second repetition number is determined based on the first repetition number and a
ratio of the TBS to the maximum TBS.