transmission power through cooperation between a plurality of APs installed in a home or a plurality of BSSs. However, it is difficult to reduce mutual interference between APs that are unable to cooperate with each other such as those installed in different homes.

[Citation List]
[Patent Literature]
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[Summary]

[Technical Problem]
[0007]
~~It is an object of the technology disclosed in the present specification to~~Embodiments of the present invention provide a communication apparatus and a communication method that avoid mutual interference between networks.
[Solution to Problem]
[0007a]
According to a first aspect of the present invention, there is provided a communication apparatus configured to operate as a base station in a communication system, the communication apparatus including:a transceiver that wirelessly sends and receives frames; and control circuitry operatively connected to the transceiver, wherein the control circuity: receives a measurement report from a mobile terminal subordinate to the base station, the measurement report including: an interference power of a second mobile terminal measured by the mobile terminal, the second mobile terminal subordinate to a second base station that does not coordinate operations with the base station, and an identification of the second mobile terminal, determines a protection area of the mobile terminal based on the measurement report and a location of the mobile terminal, the protection area characterized by parameters comprising a trigger response transmission power and a second mobile terminal uplink transmission disablement duration, transmits a trigger frame to the mobile terminal, the trigger frame including the parameters and the identification of the second mobile terminal, in response to the trigger frame, receives a trigger response frame transmitted by the mobile terminal to the base station and the second mobile terminal, the trigger response frame including the identification of the second mobile terminal and the

second mobile terminal uplink transmission disablement duration, the trigger response frame transmitted in accordance with the trigger response transmission power specified in the trigger frame, and transmits a downlink signal to the mobile terminal during the second mobile terminal uplink transmission disablement duration.

[0007b]

According to a second aspect of the present invention, there is provided a communication method performed by a communication apparatus configured to operate as a base station in a communication system, the method including: receiving a measurement report from a mobile terminal subordinate to the base station, the measurement report including: an interference power of a second mobile terminal measured by the mobile terminal, the second mobile terminal subordinate to a second base station that does not coordinate operations with the base station, and an identification of the second mobile terminal; determining a protection area of the mobile terminal based on the measurement report and a location of the mobile terminal, the protection area characterized by parameters comprising a trigger response transmission power and a second mobile terminal uplink transmission disablement duration; transmitting a trigger frame to the first mobile terminal, the trigger frame including the parameters and the identification of the second mobile terminal; in response to the trigger frame, receiving a trigger response frame transmitted by the mobile terminal to the base station and the second mobile terminal, the trigger response frame including the identification of the second mobile terminal and the second mobile terminal uplink transmission disablement duration, the trigger response frame transmitted in accordance with the trigger response transmission power specified in the trigger frame; and transmitting a downlink signal to the mobile terminal during the second mobile terminal uplink transmission disablement duration.

[0007c]

According to a third aspect of the present invention, there is provided a communication apparatus configured to operate as a mobile terminal subordinate to a base station in a communication network, the communication apparatus including: a transceiver that wirelessly sends and receives frames; and control circuitry operatively connected to the transceiver, wherein the control circuitry: measures an interference power from a second mobile terminal subordinate to a second base station that does not coordinate operations with the base station and generates a measurement report that includes the interference power and an identification of the second mobile terminal, transmits the measurement report to

the base station, receives a trigger frame from the base station, the trigger frame including parameters determined by the base station based on the measurement report, the parameters comprising the identification of the second mobile terminal, a trigger response transmission power, and a second mobile terminal uplink transmission disablement duration, in response to the trigger frame, transmit a trigger response frame to the base station and the second mobile terminal, the trigger response frame including the identification of the second mobile terminal and the second mobile terminal uplink transmission disablement duration, the trigger response frame transmitted in accordance with the trigger response transmission power specified in the trigger frame, and receive a downlink signal from the base station during the second mobile terminal uplink transmission disablement duration.

[0007d]

According to a fourth aspect of the present invention, there is provided a communication method performed by a communication apparatus configured to operate as a mobile terminal subordinate to a base station in a communication network, the method including: measuring an interference power from a second mobile terminal, subordinate to a second base station that does not coordinate operations with the base station, and generating a measurement report that includes the interference power and an identification of the second mobile terminal; transmitting the measurement report to the base station; receiving a trigger frame from the base station, the trigger frame including parameters determined by the base station based on the measurement report, the parameters comprising the identification of the second mobile terminal, a trigger response transmission power, and a second mobile terminal uplink transmission disablement duration; in response to the trigger frame, transmitting a trigger response frame to the base station and the second mobile terminal, the trigger response frame including the identification of the second mobile terminal and the second mobile terminal uplink transmission disablement duration, the trigger response frame transmitted in accordance with the trigger response transmission power specified in the trigger frame; and receiving a downlink signal from the base station during the interfering terminal uplink transmission disablement duration.

[0008]

~~The technology disclosed in the present specification has been devised in consideration of the above problem, and a first aspect thereof~~Disclosed herein is is a communication apparatus that includes a communication section and a control section. The communication section sends and receives wireless frames. The control section controls transmission and

reception of frames. The control section controls transmission, to one or more target stations and with a transmission parameter specified for each target station, of a trigger frame that induces transmission of a transmission refrainment frame.

[0009]

The control section determines, as a transmission parameter for each target station, transmission power that allows the transmission refrainment frame to reach an interference source. The control section selects a transmission destination of a data frame as a target station and causes the trigger frame to be sent ahead of transmission of the data frame.

[0010]

Also, the communication apparatus functions as a base station. The control section selects one or more subordinate terminals to which a downlink signal is to be sent as target stations and causes the trigger frame to be sent ahead of the transmission of the downlink signal.

[0011]

~~Also, a second aspect of the technology disclosed in the present specification~~Disclosed herein is a communication method that includes a step of selecting a target station to which to request transmission of a transmission refrainment frame, a step of determining a transmission parameter regarding the transmission refrainment frame for each target station, and a step of sending, to the target station, a trigger frame that induces the transmission of a transmission refrainment frame with the determined transmission parameter.

[0012]

~~Also, a third aspect of the technology disclosed in the present specification~~Disclosed herein is a communication apparatus that includes a communication section and a control section. The communication section sends and receives wireless frames. The control section controls transmission and reception of frames. The control section causes, in response to reception of a trigger frame that induces transmission of a transmission refrainment frame, the transmission refrainment frame to be sent with a transmission parameter specified by the trigger frame.

[0013]

The control section causes a transmission refrainment frame to be sent with transmission power specified as a transmission parameter or in such a manner as to achieve a reach range specified as a transmission parameter.

[0014]

Also, the communication apparatus functions as a subordinate terminal of a base station, and the control

section causes a transmission refrainment frame to be sent in response to the trigger frame received from the base station.

[0015]

~~A fourth aspect of the technology disclosed in the present specification~~Disclosed herein is a communication method that includes a step of receiving a trigger frame that induces transmission of a transmission refrainment frame and a step of sending a transmission refrainment frame with a transmission parameter specified by the trigger frame.

[Advantageous Effects of Invention]

[0016]

The technology disclosed in the present specification can provide a communication apparatus and a communication method that streamlines downlink communication by avoiding mutual interference between networks.

[0017]

It should be noted that the effect described in the present specification is merely illustrative and that effects of the present invention are not limited thereto. Also, the present invention may bring about further additional effects in addition to the above effect.

[0018]

Still other ~~objects~~aspects, features, and advantages of the ~~technology~~invention disclosed in the present specification will become apparent from detailed description based on embodiments described later and attached drawings.

[Brief Description of Drawings]

[0019]

[Fig. 1]

Fig. 1 is a diagram illustrating a communication environment to which the technology disclosed in the present specification is applied.

[Fig. 2]

Fig. 2 is a diagram illustrating an example of a communication sequence for carrying out downlink communication in an AP_B network.

[Fig. 3]

Fig. 3 is a diagram illustrating an example of a protection area determined by the AP_B in the network topology illustrated in Fig. 1.

[Fig. 4]

Fig. 4 is a flowchart illustrating an example of a processing procedure for a base station (AP) to send a trigger frame to its subordinate terminal (STA) ahead of

CLAIMS

~~[CLAIMS]~~

~~[Claim 1]~~

1. A communication apparatus configured to operate as a base station in a communication system, the communication apparatus comprising:

a transceiver that wirelessly sends and receives frames; and

control circuitry operatively connected to the transceiver,

wherein the control circuity:

receives a measurement report from a mobile terminal subordinate to the base station, the measurement report including:

an interference power of a second mobile terminal measured by the mobile terminal, the second mobile terminal subordinate to a second base station that does not coordinate operations with the base station, and

an identification of the second mobile terminal,

determines a protection area of the mobile terminal based on the measurement report and a location of the mobile terminal, the protection area characterized by parameters comprising a trigger response transmission

power and a second mobile terminal uplink transmission disablement duration,

transmits a trigger frame to the mobile terminal, the trigger frame including the parameters and the identification of the second mobile terminal,

in response to the trigger frame, receives a trigger response frame transmitted by the mobile terminal to the base station and the second mobile terminal, the trigger response frame including the identification of the second mobile terminal and the second mobile terminal uplink transmission disablement duration, the trigger response frame transmitted in accordance with the trigger response transmission power specified in the trigger frame, and

transmits a downlink signal to the mobile terminal during the second mobile terminal uplink transmission disablement duration

~~a communication section adapted to send and receive wireless frames; and~~

~~a control section adapted to control transmission and reception of frames, wherein~~

~~the control section controls transmission, to one or more target stations and with a transmission parameter specified for each target station, of a trigger frame that induces transmission of a transmission refrainment frame~~.

~~[Claim 2]~~

2. The communication apparatus of claim 1, wherein

wherein the protection area is further determined based on a scheduling announcement received from another base station that does cooperate with the base station, and

wherein the downlink signal is transmitted to the mobile terminal during the second mobile terminal uplink transmission disablement duration and in accordance with the scheduling announcement

~~the control section determines, as a transmission parameter, transmission power of a transmission refrainment frame for each target station~~.

~~[Claim 3]~~

~~The communication apparatus of claim 2, wherein~~

~~the control section determines transmission power of the transmission refrainment frame for each target station on a basis of a status of interference received by the target station.~~

~~[Claim 4]~~

~~The communication apparatus of claim 2, wherein~~

~~the control section determines, for each target station, transmission power that allows the transmission refrainment frame to reach an interference source.~~

~~[Claim 5]~~

~~The communication apparatus of claim 1, wherein the control section selects a transmission destination of a data frame as a target station and causes the trigger frame to be sent ahead of transmission of the data frame.~~

~~[Claim 6]~~

~~The communication apparatus of claim 1, wherein the communication apparatus functions as a base station, and the control section selects, as target stations, one or more subordinate terminals to which a downlink signal is to be sent and controls the transmission of the trigger frame.~~

~~[Claim 7]~~

~~The communication apparatus of claim 6, wherein the control section causes the trigger frame to be sent ahead of transmission of the downlink signal.~~

~~[Claim 8]~~

~~The communication apparatus of claim 6, wherein the control section controls the transmission of the trigger frame on a basis of a status of interference of a terminal to which the downlink signal is to be sent.~~

~~[Claim 9]~~

~~The communication apparatus of claim 6, wherein the control section controls the transmission of~~

~~the trigger frame on a basis of a radio wave utilization status of a base station in a surrounding area of a terminal to which the downlink signal is to be sent.~~

~~[Claim 10]~~

~~The communication apparatus of claim 9, wherein~~

~~the control section does not select, as a target station to which the trigger frame is to be sent, a terminal that receives interference only from an interference source connected to a base station in a surrounding area whose radio wave utilization status can be found out.~~

~~[Claim 11]~~

~~The communication apparatus of claim 6, wherein~~

~~the control section determines, as a transmission parameter for each terminal, a target station, transmission power that allows the transmission refrainment frame to reach an interference source.~~

~~[Claim 12]~~

3. A communication method performed by a communication apparatus configured to operate as a base station in a communication system, the method comprising:

receiving a measurement report from a mobile terminal subordinate to the base station, the measurement report including:

an interference power of a second mobile

terminal measured by the mobile terminal, the second mobile terminal subordinate to a second base station that does not coordinate operations with the base station, and

an identification of the second mobile terminal;

determining a protection area of the mobile terminal based on the measurement report and a location of the mobile terminal, the protection area characterized by parameters comprising a trigger response transmission power and a second mobile terminal uplink transmission disablement duration;

transmitting a trigger frame to the first mobile terminal, the trigger frame including the parameters and the identification of the second mobile terminal;

in response to the trigger frame, receiving a trigger response frame transmitted by the mobile terminal to the base station and the second mobile terminal, the trigger response frame including the identification of the second mobile terminal and the second mobile terminal uplink transmission disablement duration, the trigger response frame transmitted in accordance with the trigger response transmission power specified in the trigger frame; and

transmitting a downlink signal to the mobile

terminal during the second mobile terminal uplink transmission disablement duration

~~a step of selecting a target station to which to request transmission of a transmission refrainment frame;~~

~~a step of determining a transmission parameter regarding the transmission refrainment frame for each target station; and~~

~~a step of sending, to the target station, a trigger frame that induces the transmission of a transmission refrainment frame with the determined transmission parameter~~.

4. The method of claim 3,

wherein the protection area is further determined based on a scheduling announcement received from another base station that does cooperate with the base station, and

wherein the downlink signal is transmitted to the mobile terminal during the second mobile terminal uplink transmission disablement duration and in accordance with the scheduling announcement.

~~[Claim 13]~~

5. A communication apparatus configured to operate as a mobile terminal subordinate to a base station in a

communication network, the communication apparatus comprising:

a transceiver that wirelessly sends and receives frames; and

control circuitry operatively connected to the transceiver, wherein the control circuitry:

measures an interference power from a second mobile terminal subordinate to a second base station that does not coordinate operations with the base station and generates a measurement report that includes the interference power and an identification of the second mobile terminal, transmits the measurement report to the base station, receives a trigger frame from the base station, the trigger frame including parameters determined by the base station based on the measurement report, the parameters comprising the identification of the second mobile terminal, a trigger response transmission power, and a second mobile terminal uplink transmission disablement duration,

in response to the trigger frame, transmit a trigger response frame to the base station and the second mobile terminal, the trigger response frame including the identification of the second mobile terminal and the second mobile terminal uplink

transmission disablement duration, the trigger response frame transmitted in accordance with the trigger response transmission power specified in the trigger frame, and

receive a downlink signal from the base station during the second mobile terminal uplink transmission disablement duration

~~a communication section adapted to send and receive wireless frames; and~~

~~a control section adapted to control transmission and reception of frames, wherein~~

~~the control section causes, in response to reception of a trigger frame that induces transmission of a transmission refrainment frame, the transmission refrainment frame to be sent with a transmission parameter specified by the trigger frame~~.

~~[Claim 14]~~

~~The communication apparatus of claim 13, wherein~~

~~the control section causes a transmission refrainment frame to be sent with transmission power specified as a transmission parameter or in such a manner as to achieve a reach range specified as a transmission parameter.~~

~~[Claim 15]~~

~~The communication apparatus of claim 13, wherein~~

~~the communication apparatus functions as a subordinate terminal of a base station, and~~

~~the control section sends a transmission refrainment frame in response to the trigger frame received from the base station.~~

~~[Claim 16]~~

~~The communication apparatus of claim 15, wherein~~

~~the control section controls notification of an interference status to the base station.~~

~~[Claim 17]~~

~~The communication apparatus of claim 16, wherein~~

~~the control section causes identification information of an interference source and information regarding interference power to be notified to the base station as an interference status.~~

~~[Claim 18]~~

~~The communication apparatus of claim 15, wherein~~

~~the communication apparatus receives the trigger frame sent ahead of a downlink signal from the base station.~~

~~[Claim 19]~~

~~The communication apparatus of claim 15, wherein~~

~~the communication apparatus receives a downlink signal from the base station after having sent a transmission refrainment frame in response to the trigger~~

~~frame.~~

~~[Claim 20]~~

~~The communication apparatus of claim 15, wherein the communication apparatus does not send any transmission refrainment frame in a case where interference is received only from an interference source connected to a base station in a surrounding area whose radio wave utilization status can be found out.~~

~~[Claim 21]~~

6. A communication method performed by a communication apparatus configured to operate as a mobile terminal subordinate to a base station in a communication network, the method comprising:

measuring an interference power from a second mobile terminal, subordinate to a second base station that does not coordinate operations with the base station, and generating a measurement report that includes the interference power and an identification of the second mobile terminal;

transmitting the measurement report to the base station;

receiving a trigger frame from the base station, the trigger frame including parameters determined by the base station based on the measurement report, the parameters comprising the identification of the second mobile

terminal, a trigger response transmission power, and a second mobile terminal uplink transmission disablement duration;

in response to the trigger frame, transmitting a trigger response frame to the base station and the second mobile terminal, the trigger response frame including the identification of the second mobile terminal and the second mobile terminal uplink transmission disablement duration, the trigger response frame transmitted in accordance with the trigger response transmission power specified in the trigger frame; and

receiving a downlink signal from the base station during the interfering terminal uplink transmission disablement duration

~~a step of receiving a trigger frame that induces transmission of a transmission refrainment frame; and~~

~~a step of sending a transmission refrainment frame with a transmission parameter specified by the trigger frame~~.