Grouping subfields for 802.11ax, as defined in table 200 of Fig. 2 (i.e. depicting Table 9-91e of IEEE P802.11-2020), starting with scidx(0) and ending with scidx(Ns – 1), in the order given. This implicitly defines Ns. For full-bandwidth feedback, subcarrier indices scidx(i), i = 0, …, Ns – 1 are the entire superset shown in table 200, in the order given.

[007] 802.11ax and 802.11be (baseline for sub-7GHz 11bf) only supports Ng = 4 and 16, and the indices of the reported subcarrier are fixed by the standard. Assuming 11bf adopts the same Ng values, if a high value is chosen, the CSI feedback will omit many subcarriers, while if a low value is chosen, the CSI feedback overhead will be large.

[008] There is thus a need for communication apparatuses and methods that can solve the above-mentioned issue. Furthermore, other desirable features and characteristics will become apparent from the subsequent detailed description and the appended claims, taken in conjunction with the accompanying drawings and this background of the disclosure.

SUMMARY

[009] Non-limiting and exemplary embodiments facilitate providing communication apparatuses and communication methods for reduced dimension CSI feedback.

[009a] According to a first aspect of the present disclosure, there is provided a first communication apparatus, comprising: a receiver, which in operation, receives a Null Data Physical Protocol Data Unit (NDP) Announcement frame and a NDP from a second communication apparatus; circuitry, which in operation, perform sensing measurement; and a transmitter, which, in operation, transmits a sensing measurement report frame to the second communication apparatus wherein the measurement report

frame includes sending measurement result information according to a subcarrier grouping parameter (Ng) which is set based on bandwidth information.

[009b] According to a second aspect of the present disclosure, there is provided a communication method for a first communication apparatus, the communication method comprising: receiving a Null Data Physical Protocol Data Unit (NDP) Announcement frame and a NDP from a second communication apparatus; performing sensing measurement; and transmitting a sensing measurement report frame to the second communication apparatus wherein the measurement report frame includes sending measurement result information according to a subcarrier grouping parameter (Ng) which is set based on bandwidth information.

[0010] There is disclosed a first communication apparatus comprising: a receiver, which in operation, receives a physical layer protocol data unit (PPDU); circuitry, which in operation, measures channel information of a channel based on the PPDU, wherein the channel to be measured is sub-divided into two or more segments and each of the two or more segments comprises one or more subcarriers, and selects a subset of one or more

subcarriers to be reported for the corresponding segment; and a transmitter, which in operation, transmits a report frame carrying channel information feedback based on the channel information for the selected subcarriers to a second communication apparatus.

[0011] There is disclosed a second communication apparatus, comprising: a transmitter, which in operation, transmits a PPDU that is used to measure channel information of a channel by the first communication apparatus, wherein the channel to be measured is sub-divided into two or more segments and each of the two or more segments comprises one or more subcarriers, and wherein a subset of subcarriers to be reported for the corresponding segment is selected based on a grouping parameter Ng; and a receiver, which in operation, receives a report frame from the first communication apparatus, the report frame carrying channel information feedback based on the channel information for the selected subcarriers.

[0012] There is disclosed a communication method comprising: receiving a physical layer protocol data unit (PPDU); measuring channel information of a channel based on the PPDU, wherein the channel to be measured is sub-divided into two or more segments and each of the two or more segments comprises one or more subcarriers; selecting a subset of one or more subcarriers to be reported for the corresponding segment; and transmitting a report frame carrying channel information feedback based on the channel information for the selected subcarriers.

[0013] It should be noted that general or specific embodiments may be implemented as a system, a method, an integrated circuit, a computer program, a storage medium, or any selective combination thereof. Additional benefits and advantages of the disclosed embodiments will become apparent from the specification and drawings. The benefits

CLAIMS

1. A first communication apparatus, comprising:

a receiver, which in operation, receives a Null Data Physical Protocol Data Unit (NDP) Announcement frame and a NDP from a second communication apparatus;

circuitry, which in operation, perform sensing measurement; and

a transmitter, which, in operation, transmits a sensing measurement report frame to the second communication apparatus wherein the measurement report frame includes sending measurement result information according to a subcarrier grouping parameter (Ng) which is set based on bandwidth information.

2. The first communication apparatus according to claim 1, wherein a range of the Ng is set based on whether the bandwidth information of the NDP is wider than a determined value or not.

3. The first communication apparatus according to claim 1, wherein the circuitry selects subcarriers for the sensing measurement based on combination of the Ng and the bandwidth information notified by the second communication apparatus.

4. The first communication apparatus according to claim 1,

wherein the circuitry selects an empty segment in a frequency domain and the sensing measurement report frame does not contain a result of the sensing measurement corresponding to the selected empty segment.

5. The first communication apparatus according to claim 4,

wherein the circuitry selects the empty segment based on puncturing information notified by the second communication apparatus.

6. The first communication apparatus according to claim 5,

wherein the puncturing information indicated by a bitmap field notified by the second communication apparatus.

7. A communication method for a first communication apparatus, the communication method comprising:

receiving a Null Data Physical Protocol Data Unit (NDP) Announcement frame and a NDP from a second communication apparatus;

performing sensing measurement; and

transmitting a sensing measurement report frame to the second communication apparatus wherein the measurement report frame includes sending measurement result information according to a subcarrier grouping parameter (Ng) which is set based on bandwidth information.

8. The communication method according to claim 7, wherein a range of the Ng is set based on whether the bandwidth information of the NDP is wider than a determined value or not.

9. The communication method according to claim 7, wherein subcarriers for the sensing measurement is set based on combination of the Ng and the bandwidth information notified by the second communication apparatus.

10. The communication method according to claim 7,

wherein the communication method comprising selecting an empty segment in a frequency domain wherein the sensing measurement report frame does not contain a result of the sensing measurement corresponding to the selected empty segment.

11. The communication method according to claim 10,

wherein the empty segment is selected based on puncturing information notified by the second communication apparatus.

12. The communication method according to claim 11,

wherein the puncturing information indicated by a bitmap field notified by the second communication apparatus.