[0006] 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

[0007] Non-limiting and exemplary embodiments facilitate providing communication apparatuses and communication methods for opportunistic WLAN sensing.

[0008] According to an aspect of the present disclosure, there is provided a first communication apparatus comprising: a receiver, which in operation, receives a first PPDU and a second PPDU, the first PPDU indicating PHY parameters for the first PPDU and the second PPDU indicating PHY parameters for the second PPDU; and circuitry configured to receive the first PPDU at a first time period and to receive the second PPDU at a second time period, the second time period being after the first time period, wherein the circuitry is further configured to use the second PPDU for sensing if the first PPDU and the second PPDU have a same PPDU format and a same PHY header.

[0009] According to an example of the present disclosure, there is provided a second communication apparatus, comprising: circuitry, which in

operation, generates a PPDU indicating a change in transmit parameters; and a transmitter, which in operation, transmits the PPDU to a first communication apparatus for performing channel measurement based on the PPDU and the indicated change in transmit parameters.

[0010] According to another aspect of the present disclosure, there is provided a communication method comprising: receiving a first PPDU and a second PPDU, the

first PPDU indicating PHY parameters for the first PPDU and the second PPDU indicating PHY parameters for the second PPDU; receiving the first PPDU at a first time period and to receive the second PPDU at a second time period, the second time period being after the first time period; and using the second PPDU for sensing if the first PPDU and the second PPDU have a same PPDU format and a same PHY header.

[0011] 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 and/or advantages may be individually obtained by the various embodiments and features of the specification and drawings, which need not all be provided in order to obtain one or more of such benefits and/or advantages.

BRIEF DESCRIPTION OF THE DRAWINGS

[0012] The accompanying figures where like reference numerals refer to identical or functionally similar elements throughout the separate views and which together with the detailed description below are incorporated in and form part of the specification, serve to illustrate various embodiments and to explain various principles and advantages in accordance with present embodiments.

[0013] FIG. 1 illustrates an illustration of a WLAN Sensing process using a null data packet (NDP) according to an example.

[0014] FIG. 2 depicts an illustration of a High Efficiency (HE) Physical Protocol Data Unit (PPDU) frame format according to an example.

[0015] FIG. 3 depicts an illustration of various orthogonal frequency-division multiple access (OFDMA) PPDU formats according to an example.

CLAIMS

1. A first communication apparatus comprising:

a receiver configured to receive a first PPDU and a second PPDU, the first PPDU indicating PHY parameters for the first PPDU and the second PPDU indicating PHY parameters for the second PPDU; and

circuitry configured to receive the first PPDU at a first time period and to receive the second PPDU at a second time period, the second time period being after the first time period, wherein

the circuitry is further configured to use the second PPDU for sensing if the first PPDU and the second PPDU have a same PPDU format and a same PHY header.

2. The first communication apparatus according to claim 1, wherein the circuitry is further configured to save the PHY parameters of the first PPDU and extract a CSI of the second PPDU if the second PPDU has the same PHY parameters as that of the first PPDU.

3. The first communication apparatus according to claim 1, wherein the first PPDU further indicates transmit parameters for the first PPDU and the second PPDU further indicates transmit parameters for the second PPDU, wherein the transmit parameters of the PPDUs comprise at least one of a Q-matrix, received transmit (Tx) power, Received Signal Strength Indicator (RSSI), number of long training fields (LTFs), and number of spatial streams.

4. The first communication apparatus according to claim 1, wherein the circuitry is further configured to determine a benchmark PPDU based on PPDU format or the PHY parameters comprising number of LTFs, number of spatial streams and RSSI.

5. The first communication apparatus according to claim 4, wherein the first PPDU is the benchmark PPDU, and wherein the circuitry is further configured to store information relating to the benchmark PPDU, compare a PPDU format of the second PPDU with the stored information, and determine whether to perform channel measurements based on the comparison.

6. The first communication apparatus according to claim 5, wherein the stored information comprises CSI matrix, number of spatial streams, number of transmit antennas, bandwidth and RSSI relating to the benchmark PPDU.

7. The first communication apparatus according to claim 6, wherein the second PPDU further comprises a CSI matrix, wherein the circuitry is further configured to calculate a rank of the stored CSI matrix from the benchmark PPDU, and compares a rank of the CSI matrix of the second PPDU with the calculated rank of the stored CSI matrix.

8. The first communication apparatus according to claim 7, wherein the circuitry is further configured to forward the CSI matrix of the second PPDU to an upper layer if the comparison indicates that the rank of the stored CSI matrix and the rank of the CSI matrix of the second PPDU are the same.

9. The first communication apparatus according to claim 1, further configured to perform channel measurement with a second communication apparatus, wherein the channel measurement is based on a PPDU that is transmitted from the second communication apparatus to a third communication apparatus.

10. The first communication apparatus according to claim 1, further configured to perform channel measurement based on a periodic transmission transmitted from a second communication apparatus.

11. A communication method comprising:

receiving a first PPDU and a second PPDU, the first PPDU indicating PHY parameters for the first PPDU and the second PPDU indicating PHY parameters for the second PPDU; receiving the first PPDU at a first time period and to receive the second PPDU at a second time period, the second time period being after the first time period; and

using the second PPDU for sensing if the first PPDU and the second PPDU have a same PPDU format and a same PHY header.