[0007] One non-limiting and exemplary embodiment facilitates providing multiple communication apparatuses and methods to enable enhanced reliability and improved channel estimation in wireless local area network (WLAN) communications by providing apparatuses and methods for extra long training field (LTF) symbol use in channel estimation in sounding.

[0008] In an embodiment, the techniques disclosed herein feature a communication apparatus operating as an access point in a wireless local area network (WLAN) including a transmitter and circuitry. In operation, the transmitter is configured to transmit signals to at least one peer communication apparatus in the WLAN. In operation, the circuitry generates a first signal to initiate a sounding procedure and a second signal to initiate a transmission procedure of a Null Data PPDU (NDP), wherein the transceiver transmits the NDP with another communication apparatus, after transmitting the first signal and the second signal to the at least one peer communication apparatus.

[0009] In another embodiment, the techniques disclosed herein feature a communication apparatus including a receiver, circuitry and a transmitter. In operation, the circuitry receives a first signal to initiate a sounding procedure and a second signal to initiate s reception procedure of a Null Data PPDU (NDP), wherein the circuitry receives the NDP after receiving the first signal and the second signal.

[0009A] In yet another embodiment, the techniques disclosed herein feature a method in a wireless local area network (WLAN). The method includes generating a first signal to initiate a sounding procedure in the WLAN and a second signal to initiate a transmission procedure of a Null Data PPDU (NDP), and transmitting the NDP with another communication apparatus, after transmitting the first signal and the second signal to at least one peer communication apparatus in the WLAN.

[0009B] In yet another embodiment, the techniques disclosed herein feature a method of a communication apparatus. The method includes receiving a first signal from at least one access point in a wireless local area network (WLAN) to initiate a sounding procedure and a second signal to initiate a reception procedure of a Null Data PPDU (NDP), and receiving the NDP after receiving the first signal and the second signal.

[0010] 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.

CLAIMS

What is claimed is:

1. A communication apparatus operating as an access point in a wireless local area network (WLAN), the communication apparatus comprising:

a transmitter, which in operation, is configured to transmit signals to at least one peer communication apparatus in the WLAN; and

circuitry, which in operation, generates a first signal to initiate a sounding procedure and a second signal to initiate a transmission procedure of a Null Data PPDU (NDP), wherein the transmitter transmits the NDP with another communication apparatus, after transmitting the first signal and the second signal to the at least one peer communication apparatus.

2. The communication apparatus in accordance with Claim 1, wherein the first signal includes information relating to spatial stream.

3. The communication apparatus in accordance with Claim 2, wherein the first signal includes information on spatial stream allocation information for at least one peer communication apparatus.

4. The communication apparatus in accordance with Claim 1, wherein the first signal includes information indicating whether a multi-AP based sounding is to be performed or a single-AP based sounding is to be performed.

5 . The communication apparatus in accordance with Claim 1, wherein the first signal includes number of non-legacy LTF symbols.

6. The communication apparatus in accordance with Claim 1, wherein the transmitter transmits the second signal with the another communication apparatus.

7. The communication apparatus in accordance with Claim 1, wherein the circuitry generates the NDP.

8. A communication apparatus comprising:

a receiver, which in operation, is configured to receive signals from at least one access point in a wireless local area network (WLAN); and

circuitry, which in operation, receives a first signal to initiate a sounding procedure and a second signal to initiate a reception procedure of a Null Data PPDU (NDP), wherein the circuitry receives the NDP after receiving the first signal and the second signal.

9. The communication apparatus in accordance with Claim 8, wherein

the first signal includes first information to indicate to the at least one wireless station spatial stream allocation information, and

the circuity decodes the first signal, obtains the first information, and generates a second signal solicited by the first signal, and

the communication apparatus further comprises,

a transmitter coupled to the circuitry and configured to transmit the second signal to the at least one access point.

10. A method in a wireless local area network (WLAN), the method comprising:

generating a first signal to initiate a sounding procedure in the WLAN and a second signal to initiate a transmission procedure of a Null Data PPDU (NDP); and

transmitting the NDP with another communication apparatus, after transmitting the first signal and the second signal to at least one peer communication apparatus in the WLAN.

11. The method in accordance with Claim 10, wherein the first signal includes information relating to spatial stream.

12. The method in accordance with Claim 11, wherein the first signal includes information on spatial stream allocation information for at least one peer communication apparatus.

13. The method in accordance with Claim 10, wherein the first signal includes information indicating whether a multi-AP based sounding is to be performed or a single-AP based sounding is to be performed.

14 . The method in accordance with Claim 10, wherein the first signal includes number of non-legacy LTF symbols.

15. A method of a communication apparatus comprising:

receiving a first signal from at least one access point in a wireless local area network (WLAN) to initiate a sounding procedure and a second signal to initiate a reception procedure of a Null Data PPDU (NDP); and

receiving the NDP after receiving the first signal and the second signal.