

CLAIMS

What is claimed is:

1. A non-Access Point (non-AP) multi-band ~~communication~~ device comprising:

~~one or more transceiver(s), each of a receiver~~ which, in operation, ~~transmits and receives data on a~~
~~receives a frame transmitted on a first band, the frame including a band bitmap subfield indicating~~
~~existence or non-existence of buffered unit(s) for the non-AP multi-band device on each of a~~
plurality of ~~channels in different frequency bands~~ including the first band and a second band; and

~~circuitry, which, in operation, changes a configuration of any one of the transceivers based on~~
~~configuration information received from a multi-band Access Point (AP), the configuration information~~
~~specifying one of the frequency bands as a Primary band and the other frequency bands as Secondary band(s),~~
~~wherein the transceiver(s) operating on the Primary band is used as a default circuitry for communication with~~
~~the AP.~~

circuitry, which, in operation, retrieves the buffered unit(s) based on the band bitmap
subfield.
2. The non-AP multi-band ~~communication~~ device of claim 1, wherein the configuration information
further specifies whether the plurality of channels in each of the different frequency bands are to be used for
uplink, downlink or bi-directional communication.
- ~~3. The multi-band communication device of claim 1, wherein when the multi-band communication~~
~~device is operating in an Active~~ if a power management mode, ~~the transceiver(s) operating on the Primary~~
~~band is activated and the transceiver circuitry operating on the Secondary band(s) are deactivated.~~
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~~4. The multi-band communication device of claim 1, wherein an indication of a multi-band frame exchange sequence is received from the AP on one of the frequency bands, and wherein the band configuration circuitry is operative to: (i) activate the transceiver(s) operating on at least one of the other frequency bands in time for start of the multi-band frame exchange sequence and (ii) deactivate the at least one of the other frequency bands upon completion of the multi-band frame exchange sequence.~~

~~5. The multi-band communication device of claim 4, wherein the indication of the multi-band frame exchange sequence is received on the Primary band.~~

~~6. The multi-band communication device of claim 4, wherein the indication of the multi-band frame exchange sequence is received on any frequency band that is active.~~

~~7. The multi-band communication device of claim 4, wherein the indication of the multi-band frame exchange sequence further specifies an Active Duration, and wherein the band configuration circuitry is operative to keep the transceiver(s) operating on the at least one of the other frequency bands activated for the specified Active Duration.~~

~~8. The multi-band communication device of claim 1, wherein the band configuration circuitry is further operative to: (i) activate the transceiver(s) operating on the Secondary band(s) and (ii) report activated frequency bands to the AP.~~

~~9. The multi-band communication device of claim 1, wherein when the multi-band communication device is operating in a Power Save (PS) mode, the transceiver(s) operating on the Primary band transitions to an Awake default power state or a Doze of each of the plurality of bands is a doze state independent of, and the Awake circuitry changes a power state or the Doze state of the Secondary band(s).~~

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~~10. The multi-band communication device of claim 9, wherein the multi-band communication device is further operative to receive, from the AP on one of the frequency bands, an indication of Buffered Units (BUs) for at least one of the other frequency bands.~~

~~11. The multi-band communication device of claim 10, wherein the multi-band communication device is further operative to transmit, to the AP on one of the frequency bands, a frame to indicate the Awake state or the Doze state of the at least one of the other frequency bands.~~

~~12. The multi-band communication device of claim 1, wherein the multi-band communication device is further operative to exchange frames with the AP on one of the frequency bands, the frames comprising data to negotiate a Target Wake Time (TWT) Service Period (SP) on at least one of the other frequency bands.~~

~~13. The multi-band communication device of claim 1, wherein the multi-band communication device is further operative to receive, from the AP on one of the frequency bands, a Beacon frame comprising an indication of Target Wake Time (TWT) Service Period (SP) allocated to the multi-band communication device on at least one of the other frequency bands.~~

~~14. The multi-band communication device of claim 1, wherein the band configuration circuitry is further operative to designate the frequency band that is used by the multi-band communication device to associate with the AP as the Primary band.~~

~~15. A multi-band access point (AP) comprising:~~

~~—a transmitter, band on which, in operation, transmits data comprising configuration information to a~~

~~multi-band non-Access Point station (STA), the STA operative to transmit and receive data on a plurality of channels in different frequency bands, wherein the configuration information specifies one of the frequency bands as a Primary band and the other frequency bands as Secondary band(s), wherein the Primary band is used by the STA as a default band for communication with the AP.~~

~~16. _____ the buffered unit(s) exist from the doze mode to an awake mode.~~

~~3. _____ The non-AP multi-band device of claim 1, wherein at least a portion of the band bitmap subfield corresponds to a first station ID of the non-AP multi-band device.~~

~~4. _____ The non-AP multi-band device of claim 3, wherein the frame includes another band bitmap subfield corresponding to a second station ID of another non-AP multi-band device.~~

~~5. _____ The non-AP multi-band device of claim 1, wherein the frame is a beacon frame.~~

~~6. _____ The non-AP multi-band device of claim 1, wherein the frame includes a direction subfield indicating a downlink/uplink direction of the frame.~~

~~7. _____ The non-AP multi-band device of claim 1, wherein frame exchange during association with an AP multi-band device is performed only on the first band.~~

~~8. _____ The multi-band access point (AP) of claim 15, further comprising:~~

~~circuitry operative to:—~~

~~determine which one of the frequency bands is designated as the Primary band or the~~

~~Secondary band;~~

~~generate the configuration information based on the determination; and~~

~~track an activation/de-activation status of each of the frequency bands.~~

~~17. The multi-band access point (AP) of claim 15, further comprising:~~

~~— a receiver, which, in operation, receives frames from the STA, the frames comprising a Multi-band PS Poll frame to indicate an Awake state or a Doze state of one of the frequency bands.~~

~~18. The multi-band access point (AP) of claim 15, wherein the transmitter, which in operation, further transmits a Beacon frame on the Primary band, the Beacon frame comprising an indication of Target Wake Time (TWT) Service Period (SP) allocated to the STA on at least one of the Secondary bands.~~

~~19. The multi-band access point (AP) of claim 15, wherein the configuration information further specifies a Basic Service Set (BSS) on the Primary band as a Primary BSS and BSSs on the Secondary bands as Secondary BSSs.~~

~~20. The non-AP multi-band device of claim 1, wherein Target Wake Time (TWT) agreements across the plurality of bands are negotiated with an AP multi-band device.~~

9. A communication method comprising: for a non-Access Point (non-AP) multi-band device, the communication method comprising:

—receiving configuration information, by a non-Access Point station (STA) from an access point (AP), wherein the STA is operative to transmit and receive data frame transmitted on a first band, the frame including a band bitmap subfield indicating existence or non-existence of buffered unit(s) for the non-AP multi-band device on each of a plurality of channels in different frequency bands using one or more transceiver(s) of the STA;—

~~changing, by circuitry of including the STA, a configuration of any one of the transceiver(s) based on the received configuration information, wherein the configuration information specifies one of the frequency bands as a Primary band and the other frequency bands as Secondary band(s), and wherein the Primary band is used by the STA as a default band for communication with the AP, first band and a second band; and~~
retrieving the buffered unit(s) based on the band bitmap subfield.

10. The communication method of claim 9, wherein if a power management mode of the non-AP multi-band device is a Power Save mode, a default power state of each of the plurality of bands is a doze state, and a power state of a band on which the buffered unit(s) exist is changed from the doze mode to an awake mode.

11. The communication method of claim 9, wherein at least a portion of the band bitmap subfield corresponds to a first station ID of the non-AP multi-band device.

12. The communication method of claim 11, wherein the frame includes another band bitmap subfield corresponding to a second station ID of another non-AP multi-band device.

13. The communication method of claim 9, wherein the frame is a beacon frame.

14. The communication method of claim 9, wherein the frame includes a direction subfield indicating a downlink/uplink direction of the frame.

15. The communication method of claim 9, wherein frame exchange during association with an AP multi-band device is performed only on the first band.

16. The communication method of claim 9, wherein Target Wake Time (TWT) agreements across the plurality of bands are negotiated with an AP multi-band device.