

CLAIMS

1. A method of wireless communication comprising:

(a) determining a Doppler metric associated with a wireless channel and a first device~~user equipment (UE);~~

(b) determining whether the Doppler metric satisfies one of a first threshold and a second threshold;

(c) selecting, from a plurality of reference signal configurations, a first reference signal configuration~~based at least in part on the Doppler metric,~~

(i) wherein the plurality of reference signal configurations~~comprising~~ comprise:

(1) a plurality of reference signal density configurations; and

(2) a plurality of wireless channel estimation techniques;

(ii) wherein the plurality of wireless channel estimation techniques include:~~including~~

(1) an extrapolation wireless channel estimation technique~~comprising a causal wireless channel estimation technique;~~ and

(2) an interpolation wireless channel estimation technique~~comprising a non-causal wireless channel estimation technique; and~~

(iii) wherein, when the Doppler metric satisfies the first threshold, the first reference signal configuration is selected to be the causal wireless channel estimation technique; and

(iv) wherein, when the Doppler metric satisfies the second threshold, the first reference signal configuration is selected to be the non-causal wireless channel estimation technique; and

(d) transmitting, by a base station~~second device~~ to the UE~~first device~~, an indication of the first reference signal configuration, the indication of the first reference signal configuration indicating a first reference signal density configuration and a wireless channel estimation technique having a wireless channel estimation processing timeline for communicating with the UE~~first device~~.

2. The method of claim 1, wherein the first device is a user equipment (UE) and the second device is a base station.

3. The method of claim 1, further comprising: transmitting, by the base station, a downlink data burst including reference signals and data in accordance with the first reference signal density configuration.

34. The method of claim 12, further comprising: receiving, by the base station, an uplink data burst including reference signals and data in accordance with the first reference signal density configuration.

~~4. The method of claim 1, wherein selecting the wireless channel estimation technique comprises: determining that the Doppler metric satisfies a first threshold; and selecting a causal wireless channel estimation technique as the wireless channel estimation technique.~~

~~5. The method of claim 1, wherein selecting the wireless channel estimation technique comprises: determining that the Doppler metric satisfies a second threshold; and selecting a non-causal wireless channel estimation technique as the wireless channel estimation technique.~~

65. The method of claim 12, wherein determining the Doppler metric comprises: measuring Doppler effects associated with uplink data received from the UE; and determining, by the base station, the Doppler metric based at least in part on the Doppler effects associated with the uplink data received from the UE.

76. The method of claim 12, wherein determining the Doppler metric comprises: receiving, by the base station, information related to Doppler effects measured by the UE; and determining, by the base station, the Doppler metric based at least in part on the information related to the Doppler effects measured by the UE.

87. The method of claim 12, wherein determining the Doppler metric comprises: receiving, by the base station, an indication of the Doppler metric from the UE.

98. The method of claim 12, wherein selecting the first reference signal density configuration comprises: identifying a first Doppler classification associated with the Doppler metric; and selecting the first reference signal density configuration from the plurality of reference signal density configurations based at least in part on the first Doppler classification.

109. The method of claim 12, wherein transmitting, by the base station to the UE, the indication of the first reference signal density configuration comprises: transmitting, via a signaling radio bearer channel, the indication of the first reference signal density configuration.

~~11~~10. The method of claim ~~1~~2, wherein transmitting, by the base station to the UE, the indication of the first reference signal density configuration comprises: transmitting, via a resource grant to the UE, the indication of the first reference signal density configuration.

~~12~~11. The method of claim ~~1~~2, further comprising: determining an additional Doppler metric associated with the wireless channel and the UE; determining that the additional Doppler metric indicates a higher Doppler shift value than the Doppler metric; and determining a second reference signal density configuration based at least in part on the additional Doppler metric, the second reference signal density configuration having more reference signals per transmit time interval than the first reference signal density configuration.

~~13. The method of claim 1, wherein the extrapolation wireless channel estimation technique comprises a causal wireless channel estimation technique.~~

~~14. The method of claim 1, wherein the plurality of wireless channel estimation techniques further includes an interpolation wireless channel estimation technique.~~

~~15. The method of claim 14, wherein the interpolation wireless channel estimation technique comprises a non-causal wireless channel estimation technique.~~

~~16. A method of wireless communication comprising: receiving, by a UE, an indication of a first reference signal configuration associated with a Doppler metric, the first reference signal configuration being indicated from a plurality of reference signal configurations comprising a plurality of reference signal density configurations and a plurality of wireless channel estimation techniques including an extrapolation wireless channel estimation technique; determining a first reference signal density configuration and a wireless channel estimation technique indicated by the first reference signal configuration, the wireless channel estimation technique having a wireless channel estimation processing timeline; and communicating with a base station in accordance with the first reference signal density configuration and the wireless channel estimation processing timeline.~~

12. The method of claim 1, wherein the first device is a base station and the second device is a user equipment (UE).

~~17~~13. The method of claim ~~16~~12, further comprising: receiving, by the UE, a first indication to communicate using ~~a~~the causal wireless channel estimation technique associated with the Doppler metric; and determining to switch from the causal wireless channel estimation technique to ~~a~~the non-causal wireless channel estimation technique for communicating with the base station based at least in part on the first indication.

~~18~~14. The method of claim ~~17~~13, wherein determining to switch from the causal wireless channel estimation technique to the non-causal wireless channel estimation technique comprises: receiving, by the UE, a second indication to communicate using the non-causal wireless channel estimation technique associated with a second Doppler condition different from a first Doppler condition associated with the Doppler metric; and switching from the causal wireless channel estimation technique to the non-causal wireless channel estimation technique for communicating with the base station.

~~19~~15. The method of claim ~~16~~12, further comprising: transmitting, by the UE, information related to Doppler effects measured by the UE.

~~20~~16. The method of claim ~~16~~12, further comprising: transmitting, by the UE, an indication of a first Doppler metric for determining whether to change reference signal density configurations.

~~21~~17. The method of claim ~~16~~12, wherein communicating with the base station comprises: transmitting, by the UE, an uplink data burst including reference signals and data in accordance with the first reference signal density configuration.

~~22~~18. The method of claim ~~16~~12, wherein communicating with the base station comprises: receiving, by the UE, a first downlink data burst including reference signals and data in accordance with the first reference signal density configuration; and decoding the first downlink data burst based at least in part on the first reference signal density configuration.

~~23~~19. The method of claim ~~22~~18, further comprising: receiving, by the UE, an indication of a second reference signal density configuration different from the first reference signal density configuration, the second reference signal density configuration having more reference signals per transmit time interval than the first reference signal density configuration; receiving a second downlink data burst including reference signals and data in accordance with the second reference signal density configuration; and decoding the second downlink data burst based at least in part on the second reference signal density configuration.

2420. The method of claim 1612, further comprising: transmitting, by the UE, an indication of a suggested reference signal density configuration.

2521. The method of claim 1612, wherein receiving, by the UE, the indication of the first reference signal density configuration comprises: receiving, via a signaling radio bearer channel, the indication of the first reference signal density configuration.

2622. The method of claim 1612, wherein receiving, by the UE, the indication of the first reference signal density configuration comprises: receiving, via a resource grant from the base station, the indication of the first reference signal density configuration.

2723. An apparatus for wireless communication, comprising:

(a) a processor;

(b) memory coupled with the processor; and

(c) instructions stored in the memory and operable, when executed by the processor, to cause the apparatus to perform the method of any one of claims 1-22;

~~determine a Doppler metric associated with a wireless channel and a user equipment (UE); select, from a plurality of reference signal configurations, a first reference signal configuration based at least in part on the Doppler metric, the plurality of reference signal configurations comprising a plurality of reference signal density configurations and a plurality of wireless channel estimation techniques including an extrapolation wireless channel estimation technique; and transmit an indication of the first reference signal configuration, the indication of the first reference signal configuration indicating a first reference signal density configuration and a wireless channel estimation technique having a wireless channel estimation processing timeline for communicating with the UE.~~

28. The apparatus of claim 27, wherein the instructions are operable to cause the apparatus to: ~~transmit a downlink data burst including reference signals and data in accordance with the first reference signal density configuration.~~

29. The apparatus of claim 27, wherein the instructions are operable to cause the apparatus to: ~~receive an uplink data burst including reference signals and data in accordance with the first reference signal density configuration.~~

30. ~~An apparatus for wireless communication, comprising:~~

~~a processor; memory coupled with the processor; and instructions stored in the memory and operable, when executed by the processor, to cause the apparatus to: receive an indication of a first reference signal configuration associated with a Doppler metric, the first reference signal configuration from a plurality of reference signal configuration comprising a plurality of reference signal density configurations and a plurality of wireless channel estimation techniques including an extrapolation wireless channel estimation technique; determine a first reference signal density configuration and a wireless channel estimation technique indicated by the first reference signal configuration, the wireless channel estimation technique having a wireless channel estimation processing timeline; and communicate with a base station in accordance with the first reference signal density configuration and wireless channel estimation processing timeline.~~

31. ~~The apparatus of claim 30, wherein the instructions are operable to cause the apparatus to: receive a first indication to communicate using a causal wireless channel estimation technique associated with the Doppler metric; and determine to switch from the causal wireless channel estimation technique to a non-causal wireless channel estimation technique for communicating with the base station based at least in part on the first indication.~~

32. ~~A method of wireless communication comprising:~~

~~selecting a reference signal configuration from a plurality of reference signal configurations, the plurality of reference signal configurations indicating a plurality of reference signal density configurations and a plurality of decoding processing timelines; and transmitting, by a base station to a user equipment (UE), an indication of the reference signal configuration indicating a first reference signal density configuration and a decoding processing timeline for communicating with the UE.~~

33. ~~The method of claim 32, wherein the plurality of reference signal density configurations comprise a plurality of reference signal positions and reference signal quantities within a transmit time interval.~~

34. ~~The method of claim 32, further comprising:~~

~~—transmitting, by the base station, a downlink data burst including reference signals and data in accordance with the first reference signal density configuration.~~

35. ~~The method of claim 32, further comprising:~~

~~—receiving, by the base station, an uplink data burst including reference signals and data in accordance with the first reference signal density configuration.~~

36. ~~The method of claim 32, further comprising:~~

determining a Doppler characteristic associated with a wireless channel and the UE; and communicating with the UE in accordance with the first reference signal density configuration and based at least in part on the Doppler characteristic.

37.—The method of claim 32, further comprising:

determining that a Doppler characteristic associated with a wireless channel and the UE satisfies a first threshold, wherein the decoding processing timeline is associated with an extrapolation wireless channel estimation technique; and

communicating with the UE in accordance with the first reference signal density configuration and based at least in part on the Doppler characteristic.

38.—The method of claim 32, further comprising:

determining that a Doppler characteristic associated with a wireless channel and the UE satisfies a second threshold, wherein the decoding processing timeline is associated with an interpolation wireless channel estimation technique; and

communicating with the UE in accordance with the first reference signal density configuration and based at least in part on the Doppler characteristic.

39.—The method of claim 32, further comprising:

—determining a Doppler characteristic associated with a wireless channel and the UE;
—determining that the Doppler characteristic indicates a higher Doppler shift value than a previously determined Doppler characteristic; and

—determining a second reference signal density configuration based at least in part on the Doppler characteristic, the second reference signal density configuration having more reference signals per transmit time interval than the first reference signal density configuration.

40.—The method of claim 32, wherein transmitting, by the base station to the UE, the indication of the reference signal configuration comprises:

transmitting, via a signaling radio bearer channel, the indication of the reference signal configuration.

41.—A method of wireless communication comprising:

receiving, by user equipment (UE), an indication of a reference signal configuration indicating a first reference signal density configuration and a decoding processing timeline; and receiving one or more reference signals and data in accordance with the reference signal configuration; and

decoding the data based at least in part on the decoding processing timeline.

42.—The method of claim 41, further comprising:

determining a Doppler characteristic associated with a wireless channel and a base station, and

wherein receiving one or more reference signals and data comprises receiving the one or more reference signals and the data from the base station in accordance with the reference signal configuration and based at least in part on the Doppler characteristic.

43.—The method of claim 41, wherein the first reference signal density configuration is indicated from a plurality of reference signal density configurations, the plurality of reference signal density configurations indicating a plurality of reference signal positions and reference signal quantities within a transmission time interval.

44.—The method of claim 41, wherein the decoding processing timeline is indicated from a plurality of decoding processing timelines, the plurality of decoding processing timelines associated with extrapolation and interpolation wireless channel estimation techniques.

45.—The method of claim 41, further comprising:
transmitting, by the UE, information related to Doppler effects measured by the UE, and wherein receiving the indication of the reference signal configuration is based at least in part on transmitting the information related to the Doppler effects.

46.—The method of claim 41, wherein communicating with the base station comprises:
transmitting, by the UE, an uplink data burst including reference signals and data in accordance with the first reference signal density configuration.

47.—The method of claim 41, further:
transmitting, by the UE, an indication of a suggested reference signal density configuration.

48.—The method of claim 41, wherein receiving, by the UE, the indication of the reference signal configuration comprises:
receiving, via a signaling radio bearer channel, the indication of the reference signal configuration.

49.—The method of claim 41, wherein receiving, by the UE, the indication of the reference signal configuration comprises:
receiving, via a resource grant from the base station, the indication of the reference signal configuration.

50.—An apparatus for wireless communication, comprising:
a processor;
memory coupled with the processor; and
instructions stored in the memory and operable, when executed by the processor, to cause the apparatus to:
select a reference signal configuration from a plurality of reference signal configurations, the plurality of reference signal configurations indicating a plurality of reference signal density configurations and a plurality of decoding processing timelines; and
transmit, to a user equipment (UE), an indication of the reference signal configuration indicating a first reference signal density configuration and a decoding processing timeline for communicating with the UE.

51.—An apparatus for wireless communication, comprising:
a processor;

memory coupled with the processor; and
instructions stored in the memory and operable, when executed by the processor, to cause the apparatus to:

- receive an indication of a reference signal configuration indicating a first reference signal density configuration and a decoding processing timeline;
- receive one or more reference signals and data in accordance with the reference signal configuration; and
- decode the data based at least in part on the decoding processing timeline.