CLAIMS

1.— A method for wireless communications, comprising:

———determining a slot configuration for a wireless device to use for communication~~;~~,

———wherein the slot configuration comprises at least one of a channel assignment for one or more slots, a reference signal configuration, or a phase tracking reference signal (PT-RS) density within a set of time-frequency resources;

determining, based on the slot configuration, a ~~phase tracking reference signal (~~PT-RS~~)~~ puncturing configuration associated with the wireless device; and

———selecting a PT-RS configuration for the wireless device based, at least in part, on the slot configuration and the PT-RS puncturing configuration~~.~~

~~2. The method of claim 1, further comprising:~~

~~receiving one or more PT-RS based on the selected PT-RS configuration, wherein the wireless device is a user equipment (UE).~~

~~3. The method of claim 1, further comprising:~~

~~receiving one or more PT-RS based on the selected PT-RS configuration, wherein the wireless device is a base station.~~

~~4. The method of claim 1, further comprising:~~

~~transmitting one or more PT-RS based on the selected PT-RS configuration, wherein the wireless device is a base station.~~

~~5. The method of claim 1, further comprising:~~

~~transmitting one or more PT-RS based on the selected PT-RS configuration, wherein the wireless device is a user equipment.~~

~~6. The method of claim 1, wherein the slot configuration comprises at least one of a channel assignment for one or more subframes, a reference signal configuration, or PT-RS density within a set of time-frequency resources.~~

~~7. The method of claim 6, wherein the PT-RS density is based, at least in part on a modulation and coding scheme (MCS) used by the wireless device.~~

~~8. The method of claim 6~~, wherein:

selecting the PT-RS configuration comprises allocating a first symbol with at least one PT-RS if the wireless device was unable to obtain a phase tracking reference in one or more second symbols prior to the first symbol; ~~and~~

and a number of the second symbols is based on the PT-RS density.

~~9.~~ 2. The method of claim ~~6~~1, further comprising:

receiving one or more PT-RS based on the selected PT-RS configuration, wherein~~:~~ the wireless device is a user equipment (UE).

3. The method of claim 1, further comprising:

receiving one or more PT-RS based on the selected PT-RS configuration, wherein the wireless device is a base station.

4. The method of claim 1, further comprising:

transmitting one or more PT-RS based on the selected PT-RS configuration, wherein the wireless device is a base station.

5. The method of claim 1, further comprising:

transmitting one or more PT-RS based on the selected PT-RS configuration, wherein the wireless device is a user equipment.

6. The method of claim 1, wherein the PT-RS density is based, at least in part on a

modulation and coding scheme (MCS) used by the wireless device.

7. The method of claim 1, wherein the phase tracking reference comprises:

a demodulation reference signal in the first symbol;

or a data symbol in which at least one of:

an amount of frequency resources, that collide with other signals or another wireless device, is below a first threshold; or

a number of remaining frequency resources available for allocating PT-RS after puncturing is above a second threshold.

8. A method for wireless communications, comprising:

determining a slot configuration for a wireless device to use for communication, wherein the slot configuration comprises at least one of a channel assignment for one or more slots, a reference signal configuration, or a phase tracking reference signal (PT-RS) density within a set of time-frequency resources;

determining, based on the slot configuration, a PT-RS puncturing configuration associated with the wireless device;

and selecting a PT-RS configuration for the wireless device based, at least in part, on the slot configuration and the PT-RS puncturing configuration, wherein:

selecting the PT-RS configuration comprises allocating a first symbol with at least one PT-RS if the wireless device was unable to obtain a phase tracking reference in one or more second symbols prior to the first symbol and the wireless device determines that it will be unable to obtain the phase tracking reference in one or more third symbols subsequent to the first symbol; and

———a number of the second symbols and a number of the third symbols is based on the PT-RS density.

~~10.~~ 9. The method of claim 8, wherein the phase tracking reference comprises:

a demodulation reference signal in the first symbol; or

a data symbol in which at least one of~~-~~:

an amount of frequency resources, that collide with other signals or another wireless device, is below a first threshold; or

a number of remaining frequency resources available for allocating PT-RS after puncturing is above a second threshold.

10. A method for wireless communications, comprising:

determining a slot configuration for a wireless device to use for communication;

determining, based on the slot configuration, a phase tracking reference signal (PT-RS) puncturing configuration associated with the wireless device, wherein determining the PT-RS puncturing configuration comprises:

determining, from the slot configuration, that the wireless device is assigned non-contiguous symbols in a slot; and

determining that one or more PT-RSs are expected to be punctured or not present in one or more unassigned symbols in the slot; and

selecting a PT-RS configuration for the wireless device based, at least in part, on the slot configuration and the PT-RS puncturing configuration.

11. The method of claim ~~1~~10, wherein:

determining the PT-RS puncturing configuration comprises determining, from the slot configuration, one or more symbols in which a PT-RS is expected to be punctured due to a collision with at least one of time or frequency resources allocated to another signal or to another wireless device.; and

~~12. The method of claim 11, wherein determining the PT-RS puncturing configuration comprises:~~

~~determining, from the slot configuration, that the wireless device is assigned non-contiguous symbols in a slot; and~~

~~determining that one or more PT-RSs are expected to be punctured or not present in one or more unassigned symbols in the slot.~~

~~13. The method of claim 11, wherein~~ the other signal comprises a sounding reference signal (SRS), a physical downlink control channel, a channel state information reference signal (CSI-RS), or a synchronization signal.

~~14.~~ 12. The method of claim 11, wherein selecting the PT-RS configuration comprises~~:~~

~~refraining from~~ allocating ~~a PT-RS to at least a first symbol of the one or more symbols if at least one of:~~

~~an amount of frequency resources in the first symbol that collide with the one of time or frequency resources allocated to the other signal or the other wireless device is above a first threshold; or~~

~~a number of frequency resources in the first symbol available for allocating a PT-RS after puncturing is below a second threshold; and~~

~~allocating a PT-RS to at least a second symbol, wherein at least one of:~~

~~an amount of frequency resources in the second symbol that collide with the one of time or frequency resources allocated to the other signal or the other wireless device is below the first threshold; or.~~

~~a number of frequency resources in the second symbol available for allocating a PT-RS after puncturing that is above the second threshold.~~

~~15. The method of claim 14, wherein the first threshold and the second threshold are identified based on at least one of signaling from another wireless device or one or more predefined thresholds.~~

~~16. The method of claim 15, wherein the one or more predefined thresholds are in a standard.~~

~~17. The method of claim 11, wherein selecting the PT-RS configuration comprises allocating~~ one or more additional PT-RS in each of the one or more symbols in which ~~a~~the PT-RS is expected to be punctured.

~~18.~~ 13. The method of claim 11, wherein selecting the PT-RS configuration is further based on

an amount of frequency resources that do not collide with the frequency resources allocated to the other signal or to the other wireless device.

~~19.~~ 14. The method of claim ~~18~~13, wherein selecting the PT-RS configuration further comprises

selecting a PT-RS frequency domain density of a symbol based on an amount of the frequency resources that do not collide with the frequency resources allocated to the other signal or to the other wireless device in the symbol.

~~20.~~ 15. The method of claim 11, wherein selecting the PT-RS configuration comprises shifting

the frequency resources allocated for the PT-RS in each of the one or more symbols in which the PT-RS is expected to be punctured.

16. A method for wireless communications, comprising:

determining a slot configuration for a wireless device to use for communication;

determining, based on the slot configuration, a phase tracking reference signal (PT-RS) puncturing configuration associated with the wireless device, wherein determining the PT-RS puncturing configuration comprises determining, from the slot configuration, one or more symbols in which a PT-RS is expected to be punctured due to a collision with at least one of time or frequency resources allocated to another signal or to another wireless device; and

selecting a PT-RS configuration for the wireless device based, at least in part, on the slot configuration and the PT-RS puncturing configuration, wherein selecting the PT-RS configuration comprises:

refraining from allocating the PT-RS to at least a first symbol of the one or more symbols if at least one of:

an amount of frequency resources in the first symbol that collide with the one of time or frequency resources allocated to the other signal or the other wireless device is above a first threshold; or

a number of frequency resources in the first symbol available for allocating the PT-RS after puncturing is below a second threshold; and allocating the PT-RS to at least a second symbol, wherein at least one of:

an amount of frequency resources in the second symbol that collide with the one of time or frequency resources allocated to the other signal or the other wireless device is below the first threshold; or

a number of frequency resources in the second symbol available for allocating the PT-RS after puncturing that is above the second threshold.

17. The method of claim 16, wherein the first threshold and the second threshold are identified based on at least one of signaling from another wireless device or one or more predefined thresholds.

18. The method of claim 17, wherein the one or more predefined thresholds are in a standard.