CLAIMS

1. A method (700) for assisting a position determination of a user equipment, UE (120) communicating over a shared communication medium in unlicensed spectrum (344), comprising:

Measuring (704), by the UE (120) at a first positioning reference signal, PRS, measurement time during a first positioning occasion, a first PRS from a first evolved Node B, eNB (110B for a first secondary cell of a plurality of secondary cells, wherein the first eNB transmits the first PRS on the shared communication medium, and wherein the first PRS is configured according to a PRS configuration;

Measuring (706), by the UE (120) at a second PRS measurement time during a second positioning occasion, a second PRS from a second eNB (110C) for a second secondary cell of the plurality of secondary cells, wherein the second eNB transmits the second PRS on the shared communication medium, and wherein the second PRS is configured according to the PRS configuration; and

Reporting (708), by the UE (120), the measurement of the first PRS, the measurement of the second PRS, the first PRS measurement time, and the second PRS measurement time to a location server (170).

2. The method (700) of claim 1, further comprising:

Receiving (702), at the UE (120), positioning assistance data from the location server (170), the positioning assistance data including the PRS configuration, wherein the positioning assistance data preferably indicates that the first eNB and the second eNB transmit PRS using different positioning occasions.

3. The method (700) of claim 1, wherein the measurement of the first PRS and the measurement of the second PRS are measurements of a reference signal time difference, RSTD, for Observed Time Of Arrival, OTDOA, positioning for Long Term Evolution, LTE, wireless access.

4. A method (800) for determining a position of a user equipment, UE (120) communicating over a shared communication medium in unlicensed spectrum (344), comprising:

Receiving (806), at a location server (170) from a first evolved Node B, eNB (110B) for a first secondary cell of a plurality of secondary cells, a first positioning reference signal, PRS, transmission time at which the first eNB transmitted a first PRS, wherein the first eNB (110B) transmits the first PRS on the shared communication medium according to a PRS configuration;

Receiving (807), at the location server (170) from a second eNB (110C) for a second secondary cell of the plurality of secondary cells, a second PRS transmission time at which the second eNB transmitted a second PRS, wherein the second eNB transmits the second PRS on the shared communication medium according to the PRS configuration;

receiving (810), at the location server (170) from the UE (120), a first measurement of the first PRS, a second measurement of the second PRS, a first PRS measurement time at which the first measurement was taken, and a second PRS measurement time at which the second measurement was taken;

determining (812), by the location server (170), that the UE (120) measured the first PRS from the first eNB and the second PRS from the second eNB based on the first PRS measurement time, the second PRS measurement time, the first PRS transmission time, and the second PRS transmission time; and

determining (814), by the location server (170), the position of the UE (120) based at least in part on the first measurement, the second measurement, a location of the first eNB, and a location of the second eNB.

5. The method (800) of claim 4, further comprising:

Receiving (802), by the location server (170), the PRS configuration from the first eNB (110B), the second eNB (110C), or from both eNBs.

6. The method (800) of claim 4, further comprising:

sending, by the location server (170), positioning assistance data to the UE (120), the positioning assistance data including the PRS configuration, wherein preferably the positioning assistance data indicates that the first eNB (110B) and the second eNB (110C) transmit PRS using different positioning occasions.

7. The method (800) of claim 4, wherein the measurement of the first PRS and the measurement of the second PRS are measurements of a reference signal time difference,

RSTD, for Observed Time Of Arrival, OTDOA, positioning for Long Term Evolution, LTE, wireless access.

8. A method (900) for assisting a position determination of a user equipment, UE 120) communicating over a shared communication medium in unlicensed spectrum, comprising:

Transmitting (906), by an evolved Node B, eNB (110B) for a secondary cell, a positioning reference signal, PRS, on the shared communication medium at a positioning occasion according to a PRS configuration; and

Sending (908), by the eNB to a location server (170), a PRS transmission time at which the eNB transmitted the PRS.

9. The method (900) of claim 8, further comprising at least one of the following:

Receiving (902), at the eNB (110B), the PRS configuration from the location server,

Sending (904), by the eNB (110B), the PRS configuration to the location server, or

recording, by the eNB (110B), the PRS transmission time at which the eNB (110B) transmitted the PRS.

10. The method (900) of claim 8, wherein:

the eNB (110B) transmits the PRS on the shared communication medium upon winning access to the shared communication medium,

the eNB (110B) preferably performs a listen before talk procedure to win access to the shared communication medium before transmitting the PRS.

11. The method (900) of claim 8, further comprising:

receiving a request from the location server (170) for the PRS transmission time at which the eNB transmitted the PRS; and

sending the PRS transmission time to the location server (170) in response to the request.

12. A user equipment, UE (120), for assisting a position determination of a UE (120) communicating over a shared communication medium in unlicensed spectrum (344), comprising:

means for measuring, at a first positioning reference signal, PRS, measurement time during a first positioning occasion, a first PRS from a first evolved NodeB, eNB, (110B) for a first secondary cell of a plurality of secondary cells, wherein the first eNB transmits the first PRS on the shared communication medium, and wherein the first PRS is configured according to a PRS configuration;

means for measuring, at a second PRS measurement time during a second positioning occasion, a second PRS from a second eNB (110C) for a second secondary cell of the plurality of secondary cells, wherein the second eNB transmits the second PRS on the shared communication medium, and wherein the second PRS is configured according to the PRS configuration; and

means for reporting the measurement of the first PRS, the measurement of the second PRS, the first PRS measurement time, and the second PRS measurement time to a location server (170).

13. A location server (170) for determining a position of a user equipment, UE (120) communicating over a shared communication medium in unlicensed spectrum (344), comprising:

means for receiving, from a first evolved Node B, eNB, (110B) for a first secondary cell of a plurality of secondary cells, a first positioning reference signal, PRS, transmission time at which the first eNB transmitted a first PRS, wherein the first eNB transmits the first PRS on the shared communication medium according to a PRS configuration;

means for receiving, from a second eNB (110C) for a second secondary cell of the plurality of secondary cells, a second PRS transmission time at which the second eNB transmitted a second PRS, wherein the second eNB transmits the second PRS on the shared communication medium according to the PRS configuration;

means for receiving, from the UE (120), a first measurement of the first PRS, a second measurement of the second PRS, a first PRS measurement time at which the first measurement was taken, and a second PRS measurement time at which the second measurement was taken;

means for determining that the UE (120) measured the first PRS from the first eNB and the second PRS from the second eNB (110B) based on the first PRS transmission time, the PRS transmission second time, the first PRS measurement time, and the second PRS measurement time; and

means for determining the position of the UE (120) based at least in part on the first measurement, the second measurement, a location of the first eNB (110B), and a location of the second eNB (110C).

14. An evolved Node B, eNB, (110B), for a secondary cell for assisting a position determination of a user equipment, UE (120), communicating over a shared communication medium in unlicensed spectrum (344), comprising:

Means for transmitting a positioning reference signal, PRS, on the shared communication medium at a positioning occasion according to a PRS configuration; and

means for sending, to a location server (170), a PRS transmission time at which the eNB (110B) transmitted the PRS.

15. A non-transitory computer-readable medium storing computer-executable instructions for assisting a position determination of a user equipment, UE (120) communicating over a shared communication medium in unlicensed spectrum which, when executed by the UE, cause the UE to carry out a method in accordance with the steps of any of claims 1 to 3, computer-executable instructions for determining a position of said UE (120) which, when executed by a location server, cause the location server to carry out a method in accordance with the steps of any of claims 4 to 7, or computer-executable instructions for assisting a position determination of the UE which, when executed by an eNodeB, cause the eNodeB to carry out a method in accordance with the steps of any of claims 8-11.