

Claims

1. A Shared User Equipment-Side Distributed Antenna Component comprising:

5 a backend transceiver,

a frontend transceiver, and

10 an evaluation signal generator;

wherein the backend transceiver is configured to receive an inbound signal from at least one base station using ultra-high frequencies and to output the inbound signal at intermediate frequencies;

15 wherein the evaluation signal generator is configured to create a frontend control portion comprising a frontend evaluation signal;

20 wherein the frontend transceiver is configured to generate an outbound signal using extremely high frequencies comprising the inbound signal using a relay bandwidth and further comprising the frontend control portion arranged below and another frontend control portion arranged above the relay bandwidth and to transmit the outbound signal comprising the frontend control portions to a user equipment.

- 25 2. A system comprising:

a transceiver of a user equipment, the transceiver comprising:

30 a receiving stage;

a frontend channel estimator;

a frontend channel equalizer;

35 a backend channel estimator; and

a backend channel equalizer;

wherein the receiving stage is configured to receive an inbound signal from a Shared User Equipment-Side Distributed Antenna Component, wherein the Shared User Equipment-Side Distributed Antenna Component enables a relay communication comprising a frontend communication using extremely-high frequencies and a backend communication using ultra-high frequencies, wherein the inbound signal comprises a data portion, a backend control portion and a frontend control portion, the frontend control portion comprising a frontend evaluation signal and a configuration signal;

wherein the frontend channel estimator is configured to perform a channel estimation based on the frontend evaluation signal;

wherein the frontend channel equalizer is configured to equalize distortions, caused by using the extremely-high frequencies, based on the channel estimation of the frontend channel estimator;

wherein the backend channel estimator is configured to perform a channel estimation based on the backend control portion; and

wherein the backend channel equalizer is configured to equalize distortions, caused by using the ultra-high frequencies, based on the channel estimation of the backend channel estimator; and

a Shared User Equipment-Side Distributed Antenna Component according to claim 1;

wherein the Shared User Equipment-Side Distributed Antenna Component and the transceiver establish a communication link using the receiving and transmitting stages of the transceiver and the frontend transceiver of the Shared User Equipment-Side Distributed Antenna Component; and

wherein the Shared User Equipment-Side Distributed Antenna Component and/or the transceiver are configured to perform a time synchronization based on an

external, common time reference or based on a signal sent by the transceiver comprising a current time reference.

3. The system according to claim 2 comprising:

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a plurality of receiving stages,

a common backend channel estimator for the plurality of receiving stages; and

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a common backend channel equalizer for the plurality of receiving stages;

wherein the common backend channel estimator is configured to perform a combined channel estimation based on a plurality of backend control portions; and

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wherein the common backend channel equalizer is configured to perform a combined channel equalization based on the results of the combined channel estimation.

4. The system according to claim 3 comprising a direct receiving stage configured to receive directly a signal from the base station;

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wherein the common backend channel estimator is configured to perform a combined channel estimation based on the plurality of backend control portions and the signal received directly from the base station.

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5. The system according to one of the claims 2-4,

wherein the transceiver comprises a frontend frequency estimator configured to perform a frontend frequency estimation based on the frontend control portion and a frontend frequency compensator configured to perform a frontend frequency offset compensation based on the estimation; and/or

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wherein the transceiver comprises a backend frequency estimator configured to perform a backend frequency estimation based on the backend control portion and a backend frequency compensator configured to perform a backend frequency offset compensation based on the estimation.

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6. The system according to claims 2 - 5 comprising:

a transmitting stage; and

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a frontend channel pre-estimator;

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wherein the frontend channel pre-estimator is configured to calculate frontend channel coefficients in order to perform a channel pre-estimation based on the frontend evaluation signal in order to pre-compensate distortions which will be caused by using the extremely-high frequencies;

7. The system according to claim 6 comprising:

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a backend channel pre-estimator;

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wherein the backend channel pre-estimator is configured to calculate backend channel coefficients in order to perform a channel estimation based on the backend control portion in order to reduce distortions which will be caused by using the ultra-high frequencies.

8. The system according to claim 6 or 7, wherein the transmitting stage is configured to transmit the frontend and/or backend channel characteristics and/or frontend and/or backend channel related parameters and/or frontend and/or backend signal processing related parameters to the Shared User Equipment-Side Distributed Antenna Component in order to remotely control the signal processing in the Shared User Equipment-Side Distributed Antenna Component.

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9. The system according to one of the claims 2-8 comprising a signal processor;

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wherein the signal processor is configured to calculate signal processing parameters in order to transmit the signal processing parameters to the Shared User Equipment-Side Distributed Antenna Component.

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10. The system according to one of the claims 2-9,

wherein the data portion and the frontend control portion of an extremely-high frequency signal to be transmitted differ from each other with regard to a carrier frequency, a code structure and/or a timeslot; and/or

5 wherein the data portion and the backend control portion of an ultra-high frequency signal to be transmitted differ from each other with regard to a carrier frequency, a code structure and/or a timeslot.

10 11. The system according to one of the claims 2-10, wherein the inbound signal comprises an additional frontend control portion having a different carrier frequency when compared to the frontend control portion and/or being shifted in time when compared to the frontend control portion.

15 12. The system according to one of the claims 2-11, wherein the frontend control portion and an additional frontend control portion are aligned in time and have different carrier frequencies in order to improve interpolation robustness or accuracy between further, subsequent frontend evaluation signals due to a joint processing of the frontend control portion and the additional frontend control portion.

20 13. The system according to claim 1, wherein the frontend transceiver is configured to receive an inbound signal from a user equipment using extremely-high frequencies;

25 wherein the backend transceiver is configured to transmit an outbound signal to a base station using ultra-high frequencies.

14. The system according to claim 13, comprising a frontend channel estimator and a frontend channel equalizer;

30 wherein the frontend channel estimator is configured to perform a channel estimation based on the frontend evaluation signal;

35 wherein the frontend channel equalizer is configured to equalize distortions, caused by using the extremely-high frequencies, based on the channel estimation of the frontend channel estimator.

15. The system according to one of the claims 13 to 14, wherein a frontend communication uses a frequency division duplex technique and wherein a backend communication uses a time division duplex technique.

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16. The system according to one of the claims 2 to 15, wherein the system comprises a base station.

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17. The system according to one of the claims 2 to 16, wherein the transceiver and/or the Shared User Equipment-Side Distributed Antenna Component use the backend control portion of the base station as a common time reference.

18. The system according to one of the claims 2 to 17,

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wherein the user equipment extracts a time reference from the backend control portion;

wherein the user equipment transmits the time reference to the Shared User Equipment-Side Distributed Antenna Component in order to obtain a common time reference.

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19. The system according to one of the claims 2 to 18,

wherein the Shared User Equipment-Side Distributed Antenna Component is configured for simultaneously relaying two or more communication links serving one or more receiving and transmitting stages of the transceiver of one or more user equipments.

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20. A method for signal processing in a Shared User Equipment-Side Distributed Antenna Component comprising the steps:

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receiving an inbound signal from at least one base station with a backend transceiver using ultra-high frequencies and to output the inbound signal at intermediate frequencies;

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creating a frontend control portion with an evaluation signal generator comprising a frontend evaluation signal ;

- 5 generating an outbound signal with a frontend transceiver using extremely high frequencies comprising the inbound signal using a relay bandwidth and further comprising the frontend control portion arranged below and another frontend control portion arranged above the relay bandwidth and to transmit the outbound signal comprising the frontend control portions to a user equipment.

- 10 21. Computer readable digital storage medium having stored thereon a computer program having a program code for performing, when running on a computer, a method according to claim 20.