

CLAIMS

1. A multiuser-multiple antenna system ("MU-MAS") comprising:
 - one or a plurality of radio access networks (RANs) comprising of a
 - 5 plurality of distributed transceiver stations and generating a plurality of physical layer wireless protocols;
 - the distributed transceiver stations transmitting or receiving a plurality of waveforms collectively carrying the wireless protocols to or from a plurality of users devices; and
 - 10 the plurality of waveforms interfering with each other in space and exploiting spatial diversity to make the plurality of wireless protocols concurrently available within the same frequency band at locations of the user devices without interference;
 - wherein the user devices maintain continuous data communications
 - 15 without handoffs as they move among the plurality of distributed transceiver stations.
2. The system in Claim 1 wherein each of a plurality of user devices' antennas receiving one of the plurality of wireless protocols receives that
- 20 wireless protocol within a volume of coherent signal.
3. The system in Claim 1 wherein at least one of the plurality of wireless protocols is received by at least one antenna of at least one user device in a volume of coherent signal.
- 25 4. The system in Claim 1 wherein a plurality of data streams from the plurality of wireless protocols is concurrently received by the plurality of user devices.
- 30 5. The system in Claim 1 wherein at least two different wireless protocols are concurrently received by the plurality of user devices.

6. The system in Claim 1 wherein the wireless protocols include one or more of GSM (Global System for Mobile communication), 3G, HSPA+ (High Speed Packet Access +), CDMA (Code-Division Multiple Access), WiMAX
5 (World Interoperability for Microwave Access), LTE (Long Term Evolution), LTE-Advanced, or Wi-Fi (IEEE 802.11 family protocols).

7. The system in Claim 1 wherein the frequency band is subdivided into a plurality of FDMA (Frequency-Division Multiple Access), OFDMA (Orthogonal
10 FDMA) or SC-FDMA (Single-Carrier FDMA) frequency blocks and a subset of the plurality of wireless protocols are concurrently received without interference by a subset of the plurality user devices within each of the plurality of frequency blocks.

15 8. The system in Claim 7 wherein each of the plurality of user devices' antennas receiving one of the plurality of wireless protocols receives that wireless protocol within a volume of coherent signal.

9. The system in Claim 7 wherein the frequency block sizes are allocated in
20 accordance with user device data demand, user priority, service priority, or another resource scheduling paradigm.

10. The system in Claim 1 wherein the frequency band is subdivided into a plurality of TDMA (Time-Division Multiple Access) time blocks and a subset of
25 the plurality of wireless protocols are concurrently received without interference by a subset of the plurality user devices within each of the plurality of time blocks.

11. The system in Claim 10 wherein each of the plurality of user devices'
30 antennas receiving one of the plurality of wireless protocols receives that wireless protocol within a volume of coherent signal.

12. The system in Claim 10 wherein time block sizes are allocated in accordance with user device data demand, user priority, service priority, or another resource scheduling paradigm.

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13. The system in Claim 1 wherein at least one wireless protocol comprises all or a subset of the Long Term Evolution (LTE) user-plane or control-plane protocol layers.

10 14. The system in Claim 1 wherein at least one wireless protocol is at least partially analog.

15. The system in Claim 1 wherein at least one user device receives wireless power.

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16. The system in Claim 1 wherein at least one wireless protocol handles UE (User Equipment) identity, authentication and/or mobility.

17. The system in Claim 1 wherein the one or more RANs comprise a
20 subsystem carrying out baseband processing of one or more wireless protocols.

18. The system in Claim 17 wherein the one or more RANs comprise a scheduler unit, a baseband unit or a MU-MAS baseband processor or a combination of two or three.

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19. The system in Claim 1 wherein the plurality of RANs communicate with each other to jointly create volumes of coherent signals.

20. The system in Claim 19 wherein a first RAN hosts at least one wireless
30 protocol for a jointly-created volume of coherent signal.

21. The system in Claim 19 wherein a first RAN transfers the state of at least one wireless protocol to a second RAN to be hosted by the second RAN.

22. The system in Claim 21 wherein a user device within a volume of coherent signal receives data communications through the transferred state of a wireless protocol with no discontinuity in its wireless protocol reception during the transfer.

23. The system in Claim 1 wherein the one or plurality of RANs also comprise a baseband precoder unit that creates the volumes of coherent signals.

24. The system in Claim 23 wherein the precoder unit dynamically adjusts size, shape and waveform signal strength of the volumes of coherent signals.

25. The system in Claim 23 wherein the baseband precoder unit operates precoding only during certain time intervals and/or within certain frequency ranges.

26. The system in Claim 25 wherein the certain time intervals and/or certain frequency ranges correspond to particular control or data blocks in the wireless protocols.

27. The system in Claim 26 wherein the MU-MAS is LTE-compliant network and the baseband precoder unit operates precoding over all the PDCCH (Physical Downlink Control Channel) or only the part of it containing the DCI (Downlink Control Information) 1A and 0.

28. The system in Claim 1 wherein a plurality of uplink transmissions are transmitted from user devices' antennas located in the volumes of coherent signals to be received by MU-MAS antennas.

29. The system in Claim 28 wherein a plurality of uplink transmissions are concurrently transmitted in the same frequency band.

5 30. The system in Claim 29 wherein post-coding in the MU-MAS system is employed to separate the multiple concurrent uplink transmissions.

31. The system in Claim 29 wherein the frequency band is subdivided into a plurality of FDMA (Frequency-Division Multiple Access), OFDMA (Orthogonal FDMA) or SC-FDMA (Single-Carrier FDMA) frequency blocks and
10 a subset of the plurality of uplink transmissions are concurrently transmitted by a subset of the plurality of user devices' antennas located in each of the plurality of frequency blocks.

15 32. The system in Claim 31 wherein the frequency block sizes are allocated in accordance with user device data demand, user priority, service priority, or another resource scheduling paradigm.

33. The system in Claim 31 wherein post-coding in the MU-MAS system
20 is employed to separate the multiple concurrent uplink transmissions.

34. The system in Claim 29 wherein the frequency band is subdivided into a plurality of TDMA (Time-Division Multiple Access) time blocks and a subset of the plurality of uplink transmissions are concurrently transmitted by
25 a subset of the plurality of user devices within each of the plurality of time blocks.

35. The system in Claim 34 wherein the time block sizes are allocated in accordance with user device data demand, user priority, service priority, or
30 another resource scheduling paradigm.

36. The system in Claim 34 wherein post-coding in the MU-MAS system is employed to separate the multiple concurrent uplink transmissions.

5 37. The system in Claim 2 wherein the waveform in a volume of coherent signal has one specific polarization.

38. The system in Claim 1 wherein at least one of the plurality of waveforms is transmitted to at least one of a plurality of access points (APs) over wired,
10 optical and/or wireless links.

39. The system in Claim 38 wherein at least one of the plurality of waveforms is transmitted to at least one of a plurality of APs as I/Q samples.

15 40. The system in Claim 38 wherein at least one of the plurality of waveforms are transmitted to at least one of a plurality of APs at a lower data rate than I/Q samples.

41. The system in Claim 1 wherein at least two wireless protocols are
20 spectrum- incompatible.

42. The system in Claim 1 wherein the wireless protocols include one or more LTE standard protocols.

25 43. The system in Claim 1 wherein the wireless protocols include one or more Wi- Fi standard protocols.

44. The system in Claim 15 wherein the wireless power is received by a rectifying antenna.
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45. The system in Claim 44 wherein the wireless power is received by a rectifying antenna providing feedback to the MU-MAS.

46. The system in Claim 15 wherein at least one of the plurality of wireless
5 protocols is received by at least one of the plurality of user devices as a waveform that carries both wireless power and data.