CLAIMS

1. A method of learning channels between a transmitter and a plurality of receivers in a wireless power network, the transmitter comprising an array of wireless power transmission antennas, the method comprising:

transmitting a pilot signal from the wireless power transmission antennas of the transmitter;

receiving feedback signals from each receiver of the plurality of receivers, the feedback signals comprising received signal power indications for each respective receiver;

calculating channel matrices for channels between the wireless transmission antennas and wireless power reception antennas of each receiver based on the received signal power indications, by minimizing an objective function of a channel matrix and the received signal power indications for the respective receiver; and

estimating spatial channel signatures of the reception antennas on the array of wireless power transmission antennas from the dominant eigenvalue and corresponding eigenvector of the respective channel matrix.

2. A method according to claim 1, wherein the objective function is the sum squared difference between the estimated power delivered to each respective receiver calculated using the channel matrix and the received signal power indications for each respective receiver.

3. A wireless power transmission method in a wireless power network, the wireless power network comprising a wireless power transmitter and a plurality of wireless power receivers, the wireless power transmitter comprising an array of wireless power transmission antennas and each wireless receiver of the plurality of wireless power receiver comprising a wireless power reception antenna, the method comprising:

estimating spatial channels between the array of wireless power transmission antennas and the wireless power reception antennas of the plurality of wireless power receivers according to the method of claim 1 or 2;

dividing a wireless power transmission time into a plurality of timeslots, wherein each timeslot is allocated to a respective one of the wireless power receivers; and

in each timeslot of the plurality of timeslots, transmitting power from the array of wireless power transmission antennas according to a transmitter signal vector that maximizes the delivered power to the wireless power receiver to which the timeslot is allocated.

4. A method according to claim 3, wherein the amplitude of the power transmitted from the array of wireless power transmission antennas is modified according to a total power transmission constraint.

5. A method according to claim 3 or claim 4, wherein each timeslot has an equal duration.

6. A method according to claim 3 or claim 4, further comprising optimizing the duration of each respective timeslot.

7. A wireless power transmitter comprising an array of wireless power transmission antennas and a controller configured to:

control the transmission antennas to transmit a pilot signal;

receive feedback signals from each receiver of a plurality of receivers, the feedback signals comprising received signal power indications for each respective receiver;

derive channel matrices for channels between the wireless transmission antennas and wireless power reception antennas of each respective receiver based on the received signal power indications, by minimizing an objective function of a channel matrix and the received signal power indications for the respective receiver; and

estimate spatial channel signatures of the reception antennas on the array of wireless power transmission antennas from the dominant eigenvalue and corresponding eigenvector of the respective channel matrix.

8. A wireless power transmitter according to claim 7, wherein the objective function is the sum squared difference between the estimated power delivered to each respective receiver calculated using the channel matrix and the received signal power indications for each respective receiver.

9. A wireless power transmitter according to claim 7 or 8, wherein the controller is further configured to:

divide a wireless power transmission time into a plurality of timeslots, wherein each timeslot is allocated to a respective one of the wireless power receivers; and

in each timeslot of the plurality of timeslots, control the array of wireless power transmission antennas to transmit power according to a transmitter signal vector that maximizes the delivered power to the wireless power receiver to which the timeslot is allocated.

10. A wireless power transmitter according to claim 9, wherein the controller is configured to control the amplitude of the power transmitted from the array of wireless power transmission antennas according to a total power transmission constraint.

11. A wireless power transmitter according to claim 9 or claim 10, wherein each timeslot has an equal duration.

12. A wireless power transmitter according to claim 9 or claim 10, wherein the controller is further configured to optimize the duration of each respective timeslot.