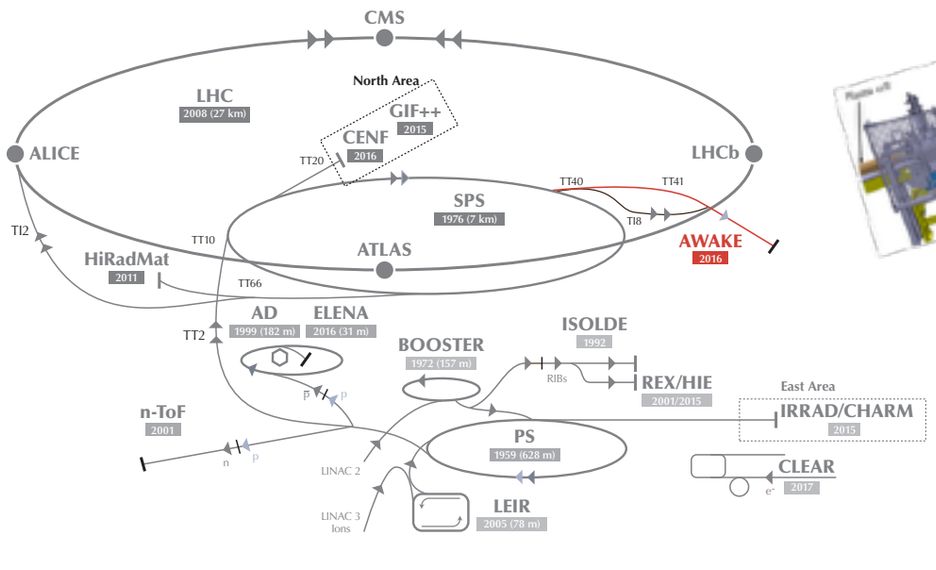
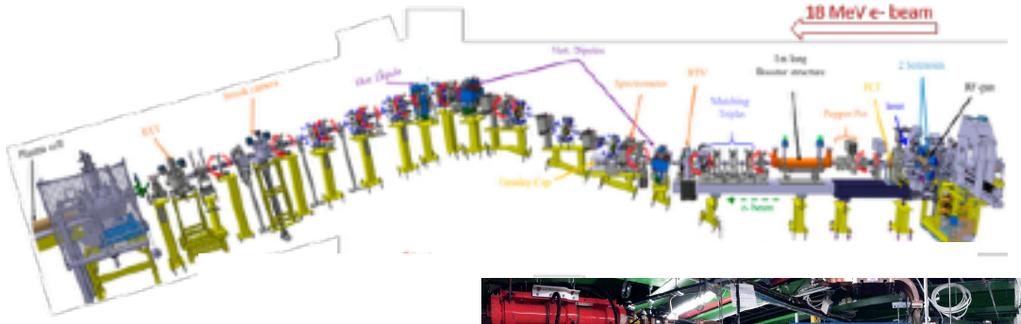
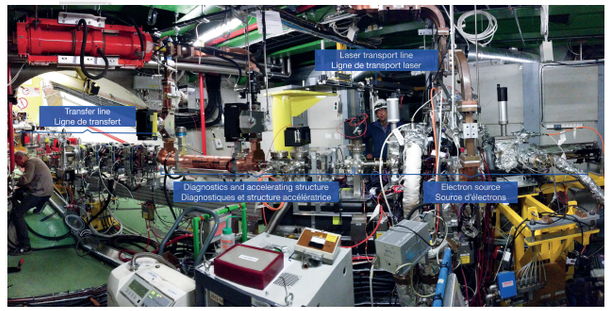
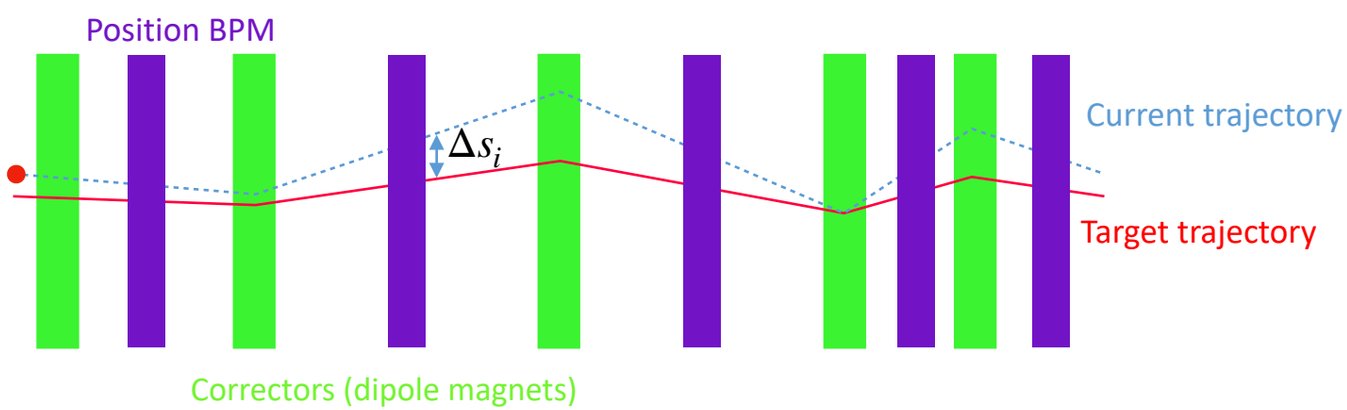
CERN AWAKE steering problem







- AWAKE electrons - start 5 MV (RF gun), accelerated to 18 MeV transported through beam line of 12 m to the AWAKE plasma cell.
- Vertical 1 m step and a 60° bend bring electron beam parallel SPS proton beam shortly plasma cell.
- The trajectory is controlled with 10 horizontal and 10 vertical steering dipoles according to the measurements of 10 beam position monitors (BPMs).



CERN AWAKE steering problem

- Well studied in several papers/thesis
- Linear Dynamics with 10 degrees of freedom in actions and states
- Non-trivial due to action limitations
- Analytical solution for the optimal policy
- Easy to understand, focus on the RL problem not the MDP
- The simulation corresponds exactly to the real system (measured optics)
- All our algorithms were tested on the real machine