Cleaning of first mirrors in ITER by means of radio frequency discharges

First mirrors of optical diagnostics in ITER are subject to charge exchange fluxes of Be, W, and potentially other elements. This may degrade the optical performance significantly via erosion or deposition. In order to restore reflectivity, cleaning by applying radio frequency (RF) power to the mirror itself and thus creating a discharge in front of the mirror will be used. The plasma generated in front of the mirror surface sputters off deposition, restoring its reflectivity. Although the functionality of such a mirror cleaning technique is proven in laboratory experiments, the technical implementation in ITER revealed obstacles which needs to be overcome: Since the discharge as an RF load in general is not very well matched to the power generator and transmission line, power reflections will occur leading to a thermal load of the cable. Its implementation for ITER requires additional R&D. This includes the design of mirrors as RF electrodes, as well as feeders and matching networks inside the vacuum vessel. Mitigation solutions will be evaluated and discussed. Furthermore, technical obstacles (i.e., cooling water pipes for the mirrors) need to be solved. Since cooling water lines are usually on ground potential at the feed through of the vacuum vessel, a solution to decouple the ground potential from the mirror would be a major simplification. Such a solution will be presented.