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Electrode conditioning for prevention of DC arc formation in presence of a cold plasma background.

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In RFX-mod2, an experiment for the magnetic confinement of fusion relevant plasmas presently under construction, the in-vessel conductive plasma facing components are expected to be subjected during transient plasma current phases (start-up and termination) to significant electric fields, in the kV/mm range. While such electric fields are of no concern for components in vacuum, the presence of the scrape-off plasma (electron density ne 1E16 ÷ 1E18 m-3, electron temperature Te of few eV) can create the appropriate conditions for dangerous arc formation. For this reason part of the plasma facing components require a proper conditioning technique capable of maintaining the insulation between conductive components even in presence of the scrape-off plasma.

To this purpose an experimental apparatus has been developed where to test the conditions for the arc formation and prevention between two electrodes immersed in a plasma generated by a hot filament. The results of an extensive experimental campaign will be discussed, aimed at demonstrating the possibility of gaining a good electrical conditioning by applying the standard conditioning technique usually employed for higher voltage ranges. It consists of a repetitive sequence of pulses with voltage applied to the pair of electrodes with current limitation, in the presence of the background plasma. The voltage is then slightly increased when arcing ceases, until the final desired voltage level is achieved (2.5 kV). In order to validate the procedure, different electrode materials have been tested in a variety of plasma conditions in terms of electron density and working gas pressure.

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