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Development of a coating setup for in-situ deployment of an amorphous carbon thin film in the beam screens of the High Luminosity Large Hadron Collider.

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Amorphous carbon(a-C) thin films with low Secondary Electron Yield (SEY) are the baseline solution to mitigate the electron multipacting phenomenon in the beam screens of some critical superconducting magnets of the High Luminosity Large Hadron Collider (HL-LHC). Many of these magnets are already installed in the accelerator ring and the a-C coating has to be done 'in-situ'. We present the development of a coating system consisting of a carriage with two cylindrical magnetron sputtering targets, one of titanium and another of graphite, that is displaced along the 15 meter beam screen by pulling cables. Optimization of the coating parameters is discussed, with emphasis on the double role of the titanium to enhance adhesion and as a getter to reduce the partial pressure of hydrogen during the deposition, in order to achieve SEY < 1.1. The coating is characterized in terms of SEY along the 15 metres, the vacuum outgassing, morphology, adhesion and resistance to ionizing radiation. A strategy for the large-scale coating campaign in the LHC tunnel is proposed (hundreds of meters).

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