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ELM solutions developed in EAST towards ITER steady-state scenario BAONIAN WAN, Institute of plasma physics, Chinese academy of sciences — A stationary grassy ELM regime has been achieved in the EAST tokamak with metal wall and low rotation in the parameter range $q_{95} \geq 5.2$ and $\beta_{\mathrm{p}} \geq 1.1$ with a confinement improvement factor H_{98y2} up to 1.4, β_{N} up to 2 and ELM frequency of 0.5-3 kHz. This regime exhibits good compatibility with high bootstrap current fraction and fully non-inductive operation, accessible in a broad density range, $n_{\mathrm{el}}/n_{\mathrm{GW}} = 0.4\text{-}1.1$, with line-averaged density, n_{el}, up to $6.410^{19}\mathrm{m}^{-3}$. Particle transport carried by the grassy ELMs provides strong impurity exhaust and good density control. High separatrix density makes this regime especially suitable for operation with divertor detachment. A new detachment feedback control scheme has been demonstrated, which combines divertor Langmuir probe and radiation signals to achieve sustained detachment without confinement degradation suitable for long-pulse operation of high-performance grassy ELM plasmas. ELM suppression has been achieved using Boron powder injection and high n RMP in EAST. Sustained ELM suppression in high-performance H-mode plasmas has been achieved with Boron powder injection with nearly constant plasma stored energy and density. The ELM suppression achieved by Boron powder injection appears to be more effective and robust than Lithium powder/granule injection, and has been applied to a broader parameter range. In addition, full ELM suppression without obvious drop of plasma confinement using n=4 RMP has been demonstrated for the first time in EAST.

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