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Joint plasma pressure diagnostic system of Beam Emission Spectroscopy and Ultrafast Charge eXchange Recombination Spectroscopy on EAST tokamak

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In this article we present the development of the joint plasma pressure diagnostic system on EAST tokamak, i.e., the Beam Emission Spectroscopy (BES) and the Ultrafast Charge eXchange Recombination Spectroscopy (UF-CXRS) basing on Neutral Beam Injection which are to diagnose two-dimensional plasma density and ion temperature simultaneously at the same spatial area with a time resolution at the order of 1μs and a spatial resolution of 1-3 centimeters. The main physical goal of this high-resolution joint plasma pressure diagnostic is to understand some underlying physics of turbulence, such as the formation of edge pedestal in L-H transition in which the plasma pressure gradient is the key parameter. These two diagnostics share the same light path. 128 BES channels have been constructed, and can measure plasma density distribution in a 20cm×10cm rectangular area in the cross section which is movable along minor radii (ρ=0˜1) by means of changing the angle of the mirror in the light path. Four of these 128 channels are chosen as test channels of UF-CXRS diagnostic to measure ion temperature. Components in the light path are carefully designed to rise to the great challenge of weak CVI emission light with a wavenumber of 529 nm, thinking of the high time resolution of microseconds. The time resolution raises three orders of magnitude than that of the traditional CXRS diagnostic on EAST tokamak. The whole design and some test results of this joint system are discussed in this article, together with first experimental results of BES part.

Eligible for student paper award?

No

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