

Development of diagnostic systems for first plasma on HL-2M tokamak

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Abstract: HL-2M tokamak ($I_p = 2.5$ MA, $R/a = 1.78\text{m}/0.65\text{m}$, $\kappa = 2$, $\delta > 0.5$), whose parameters is to provide key technical support for future fusion machines (ITER, CFETR) and frontier plasma research areas, is designed and built by Southwestern Institute of Physics (SWIP). It was commissioned on 4 December, 2020 and achieved its first plasma discharge. In support of HL-2M's mission and future work plan, the diagnostic systems which are used to characterize the plasma behaviors over the full range of plasma parameters with appropriate spatial and temporal resolutions are designed. A several-stage development plan has been formulated and ~70 diagnostic systems will be developed in five years. 16 sets of diagnostic systems, including magnetic measurement, wide-angle view imaging system, fast ionization gauge, high speed VUV, solid-state THz interferometer and CO₂ dispersion interferometer have been successfully completed for the first plasma. They provided the necessary information for the first plasma discharge establishment, plasma displacement control, impurities, runaway electrons, plasma instability, safety and environmental protection monitoring. Several diagnostic systems with new technical improvements, such as real time phase extraction, multiplexer-based filter, non-linear crystal and low drift integrator will be discussed.