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A flexible Doppler backscattering system on the HL-3 tokamak

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Recently, a flexible Doppler backscattering system (DBS) has been developed for the HL-3 tokamak to obtain radial profiles of the perpendicular propagation velocity during L-mode and H-mode. [1–4] It operates within the frequency range of 24.4-50.4 GHz, encompassing both the Ka-band and Q-band. In frequency hopping mode, its minimum step frequency is 0.2 GHz. For heterodyne detection, the single side band modulation (SSBM) technique is employed to achieve an intermediate frequency (IF) of 400 MHz. Ray-tracing code BORAY [5] is utilized to estimate the scattering location and wavenumbers of the density fluctuations. [6] The new DBS has been installed and tested in HL-3 2023 experimental campaign. Preliminary results demonstrate its ability to measure radial velocity profiles and turbulence behaviors. In future, this system will be utilized for turbulence analysis and L-H transition investigation.

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[5] H. Xie et al., Computer Physics Communications 276, 108363 (2022).
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