First data and preliminary experimental results from a new Doppler Backscattering system on the MAST-U spherical tokamak

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A new Doppler backscattering (DBS) system, consisting of Q- and V-bands, has been installed and achieved its first data on the MAST-U spherical tokamak. The Q- and V-bands have separate microwave source systems, but share the same optical front-end components. Both the Q- and V-band sources generate eight simultaneous fixed frequency probe beams, which are (34, 36, 38, 40, 42, 44, 46 and 48 GHz) and (52.5, 55, 57.5, 60, 62.5, 65, 67.5 and 70 GHz) respectively. These frequencies provide a large range of radial positions from the low-field-side edge plasma to the core, and possibly to the high-field-side edge, depending on the plasma conditions. The quasi-optical system consists of a remotely-tunable polarizer, a focusing lens and a remotely-steerable mirror. By steering the mirror, the system provides remote control of the probed density wavenumber, and the angle of the launched DBS to match the magnetic field pitch angle. The range of accessible density turbulence wavenumbers (k_θ) is reasonably large with normalized wavenumber $k_\theta\rho_s$ ranging from <0.5 to 15. Additionally, combining with the previously established DBS system by UCLA [1], the toroidal correlation of density turbulence has been studied.

[1] T.L. Rhodes, *et al.,* Rev. Sci. instrum. **93** (2022) 113549.

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