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A ten-channel E-band Doppler backscattering system on EAST

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A muilti-channel E-band (60–90 GHz) Doppler backscattering (DBS) system with X-mode polarization has been installed on the Experimental Advanced Super-conducting Tokamak (EAST)1. In September 2023, this system was upgraded to the ten-channel E-band DBS in order to cover a larger radial range in one shot. The upgraded system can launch 16 fixed microwave frequencies in the range of 60–90 GHz with a 2 GHz interval into the plasma, and ten probing signals are selected by employing a reference signal and multiple filters. During discharge experiments, the frequency of the reference signal is tunable in the E-band, and the selected probing signals can be changed as needed without any other adjustments. Furthermore, the incident angle can be adjusted from −10°to 20°, and the wavenumber range is 4–25 cm−1 with a wavenumber resolution of Δk/k<=0.35. Ray tracing simulations are employed to calculate the scattering locations and the perpendicular wavenumber2.
[1] Liu, S., et al. (2023). “An E-band multi-channel Doppler backscattering system on EAST.” Review of Scientific Instruments 94(12).
[2] Zhou, C., et al. (2015). “Ray Tracing for Doppler Backscattering System in the Experimental Advanced Superconducting Tokamak.” Plasma Science & Technology 17(9): 728-732.

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