

## Fast-Ion $D_\alpha$ (FIDA) Measurements in Various Plasma Conditions\*

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The fast-ion  $D_\alpha$  (FIDA) diagnostic<sup>1</sup> measures the Balmer-alpha light emitted by neutralized fast ions. In MHD quiet plasmas, the FIDA diagnostic confirms the expected parametric dependencies of energetic ions and is corroborated by other fast-ion diagnostics. The measured spectral shape and spectral magnitude agree with a synthetic diagnostic derived from the TRANSP fast-ion distribution function. During ion cyclotron heating (ICH), the FIDA diagnostic observes that fast ions with high perpendicular energy are accelerated, while those with low perpendicular energy are barely affected. The peak gain in the FIDA signal occurs at a larger major radius than the ICH resonance layer. The FIDA profile is consistent with the fast-ion pressure profile inferred from equilibrium reconstruction constrained by internal measurements of the magnetic field pitch angles. In discharges with Alfvén instabilities, both the FIDA profile and spectral shape suggests that fast ions are redistributed, in agreement with the fast-ion pressure profile deduced from equilibrium reconstructions.

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