

## **Compact Full-Function-Integrated Solid State Neutral Particle Analyzer: Recent Results from EAST and Progress on HL-2A Tokamak**

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A package of full function integrated, compact silicon photodiode based solid state neutral particle analyzers (ssNPA) has been successfully developed, implemented and commissioned for energetic particle (EP) relevant studies on the EAST Tokamak. The system consists of 7+9 individual channels on two long vertical up-ports and 16+16 arrays mounted on a retractable feedthrough on a horizontal port.

The system functionality has been systematically proved by the data obtained from the EAST 2014-2016 campaigns. Significant signal enhancements from both neutral beam injection (NBI) and ion cyclotron resonant heating (ICRH) are observed, with no clear direct response to either lower hybrid wave (LHW) or electron cyclotron resonant heating (ECRH) under similar plasma conditions. ssNPA data is consistent with neutron flux detected by traditional counters and a set of new scintillators.

Compared to the complicated EAST engineering and operational realities, the Chengdu tokamak provides ssNPA diagnostics with better accessibility and much simpler in-vacuum environment. Aiming at simultaneous measurements with fast temporal, fine spatial and coarse energy resolutions, details on the HL-2A ssNPA conceptual design, engineering optimization and implementation will be presented. In contrast with the direct-deposited Tungsten foil on EAST system, the ssNPAs on HL-2A will initially use free-standing Tungsten and Aluminum foils for the 1.5MW 50 keV NBI experiments.

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