

Diagnostic	Comments	Resolution
Diagnostic Upgrades Supporting FY11/12 Goals Moved to FY14/15:		
Fusion source profile via charged D-D fusion products	NBCD & fast-ion redistribution by *AE modes	$\Delta r \sim 5\text{-}10\text{ cm}$, $\Delta t \sim 1\text{-}5\text{ ms}$
Fixed sightline NPA	Energetic ion spectrum - localized to intersection with NBI#1	$\Delta L \sim 20\text{ cm}$, $\Delta t \sim 0.1\text{ ms}$
10-40 GHz edge reflectometer for HHFW	Makes reflectometer compatible with 0.5 - 1 T plasmas, supporting RF coupling studies at maximum NSTX-U B_T	
Diagnostic Upgrades Supporting FY14-18 Goals:		
Neutron collimator	NBCD studies, in fully NI and high β where using present FIDA could prove difficult	3-4 chords, $\Delta t = 5\text{-}20\text{ ms}$
Upgraded ssNPA	NBCD & fast-ion redistribution by *AE modes & RF interaction with fast-ions	8-6 channels, $\Delta r = 5\text{-}10\text{ cm}$, $\Delta t \sim 1\text{ }\mu\text{s}$ (current mode), $\sim 10\text{ ms}$ (pulse-height mode)
FIDA & BES Imaging	Vertical & radial profile of co-tangential fast-ions & injected neutrals	$\Delta r \sim 1\text{ cm}$, $\Delta t \sim 5\text{ ms}$, poor energy resolution
FIRETIP-II upgrade with 4 MHz bandwidth	*AE density fluctuations	$\Delta t \sim 0.25\text{ }\mu\text{s}$, $R_T \sim 50, 120 \text{ \& } 145\text{ cm}$
Profile reflectometry with increased Δf	Study effect of EHO on edge density	$\Delta t \sim 5\text{ }\mu\text{s}$, coverage $R \sim 50\text{-}150\text{ cm}$
Improved ERD spatial & temporal resolution	Supports edge RF ion heating studies	$\Delta t \sim 1\text{ ms}$, $\Delta r \sim 1\text{ cm}$, $R \sim 135\text{-}155\text{ cm}$
VB imaging of AE* modes	NBCD & fast-ion redistribution by *AE modes	$\Delta t \sim 20\text{ ms}$, $\Delta r \sim 1\text{ cm}$
Outboard Langmuir probe array	Study RF-related power flow to divertor?	$\Delta r \sim 1\text{ cm}$
BES expansion & increased resolution	Supports EPM, GAE studies	$\Delta r \sim 1.5\text{-}2\text{ cm}$, low-k density fluctuations
BES passive FIDA view	Measure modes that expel fast-ions, uses view that does not intersect neutral beam	
Radial polarimetry	Direct measurement of magnetic field fluctuations	
PCI	Fills k_{per} gap between BES and high-k scattering	$\Delta t \sim 1\text{ }\mu\text{s}$, $k_{\text{perp}} \sim 0.5 - 30\text{ cm}^{-1}$
2-D wavenumber spectra via high-k scattering	Simultaneous measurement of k_θ & k_θ/k_r	$\Delta r \sim 2\text{-}6\text{ cm}$, coverage $R > 110\text{ cm}$
Toroidally-displaced in-vessel multi-energy DXR arrays	Two toroidally displaced, tangentially viewing systems providing fast T_e and n_e profiles	$\Delta t \sim 10 - 100\text{ }\mu\text{s}$, $\Delta r \sim 3\text{-}5\text{ cm}$
Dual-energy, ultra-fast SXR arrays	Measure high frequency *AE modes, distinguish CAE/GAE. *AE effects on RF heated plasmas	$\Delta t \sim 0.25\text{ }\mu\text{s}$, $\Delta r \sim 2\text{-}3\text{ cm}$
NOTE: *Existing* diagnostics which are not affected by the upgrade are not included in this list		