



#### The Present Status of the High-k Scattering System

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# The High-k Scattering System has been Taking Data Routinely

- An improved in-vessel calibration of High-k scattering system optics has been carried out in Dec. 2009 and the calibration and alignment have been well maintained.
  - Routine alignment was and will be carried out for very run day.
- All five channels are operational and the power responses have been determined with a calibrated microwave source.
- A solid-state microwave source was successfully tested and has replaced the carcinotron as the probe beam source.
  - Reliable and adjustment-free operation.
- Several upgrades have been implemented to enhance the control capability of high-k system:
  - Full remote control capability of high-k system mirrors: between-shot adjustments according to realized plasma equilibrium without controlled access.
  - Integrated user interface implemented for efficiently setting mirrors angles.
  - Remote control of electrical attenuations installed and working well.

# **Scattering Configuration Improved**

- Previous experiments were only able to simultaneously utilize at most three out of the five receiving channels.
  - The probe beam hits the Y( spherical mirror and some of the channels have to be fully attenuated to protected detectors.
  - Adjacent channels can be overwhelmed by the stray radiation.
- To Launch the probe beam upward to prevent it from directly hitting the mirror.
  - No channel has to be fully attenuated.
  - The stray radiation on all channels are reduced.







## **Scattering Signals Obtained at All Five Channels**



# The Measured $k_{\perp}$ Spectrum Shows Transition from Power law

- The  $k_{\perp}$  spectrum is obtained for almost a decade of  $k_{\perp}$ .
  - The k<sub>⊥</sub> spectrum exhibits a power law from  $k_{\perp}\rho_s \approx 6$  to 11 with a spectral index of -6.2.
  - The k<sub> $\perp$ </sub> spectrum flattens at smaller k<sub> $\perp$ </sub> $\rho_s$ , i.e. k<sub> $\perp$ </sub> $\rho_s$  <6.



 We are planning to compare the measured k<sub>⊥</sub> spectrum with non-linear gyro-kinetic simulations.

### Summary and Future Work on the High-k System

- The high-k scattering system is in good working condition now and will be routinely taking data throughout the run campaign.
  - Improved calibration, enhanced remote-control capability and reliable microwave source.
- We have improved the scattering configuration and are able to obtain scattered signals from more channels simultaneously than before.
  - This capability allows us to cover a wider range of wavenumbers and to make more detailed comparisons with gyro-kinetic simulations.
- Future work
  - To implement voltage surge protector to prevent amplifier damage due to NSTX events.
  - To implement remote control of optical attenuation.