

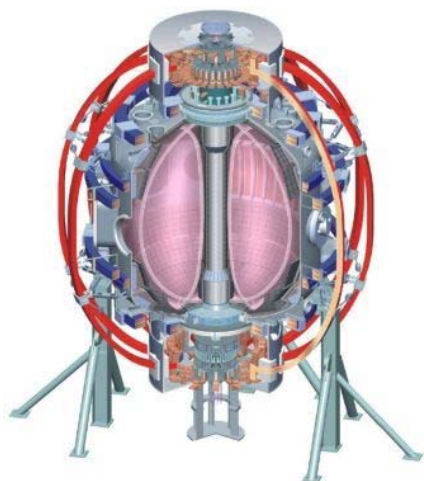
High-k Scattering System: Present Status and Future Plan

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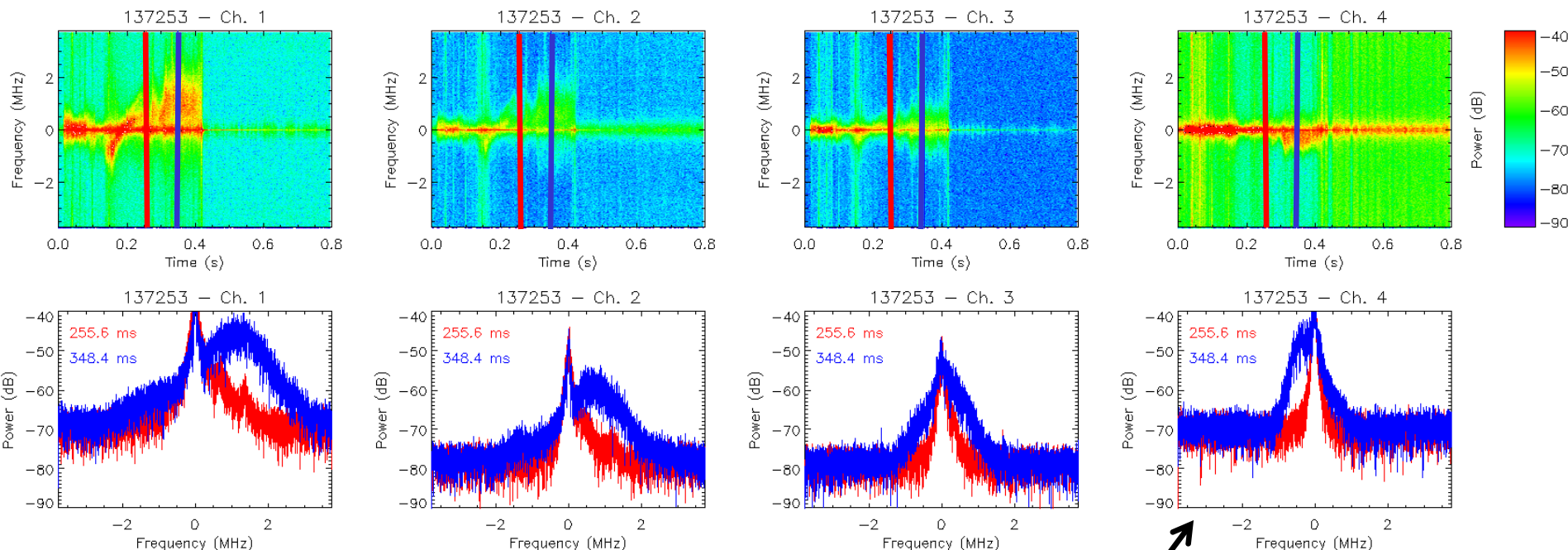
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High-k Scattering System: Present Status

- 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.
- The microwave source was conditioned and has been working reliably since the beginning of this run campaign.
- Several upgrades have been implemented to enhance the control capability of high-k system:
 - Full remote control capability of high-k system mirrors in place now (finished yesterday): 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 Signal Obtained at Multiple Channels



$k_r \approx -20 \text{ cm}^{-1}$
 $k_\theta \approx 3 \text{ cm}^{-1}$
 $k_\phi \approx 1.7 \text{ cm}^{-1}$

$k_r \approx -16 \text{ cm}^{-1}$
 $k_\theta \approx 2 \text{ cm}^{-1}$
 $k_\phi \approx 1.3 \text{ cm}^{-1}$

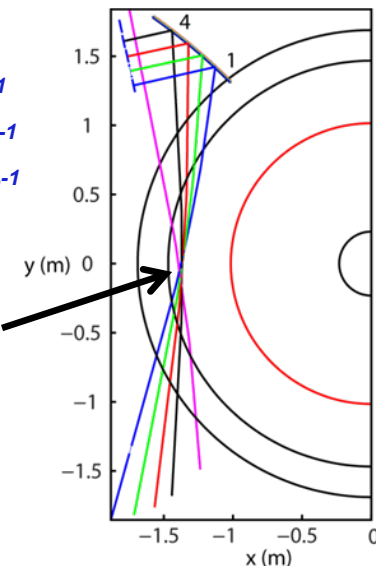
$k_r \approx -12 \text{ cm}^{-1}$
 $k_\theta \approx 1.4 \text{ cm}^{-1}$
 $k_\phi \approx 0.8 \text{ cm}^{-1}$

$k_r \approx -8 \text{ cm}^{-1}$
 $k_\theta \approx 0.7 \text{ cm}^{-1}$
 $k_\phi \approx 0.4 \text{ cm}^{-1}$

- **A power calibration for each channel is still needed to obtain absolute density fluctuation**

- A recent optimization of mixer coupling efficiency
- A recent amplifier failure and replacement

$r/a \approx 0.73$, $R \approx 139 \text{ cm}$



Near-term Upgrade Plan for High-k Scattering System

- Utilizing a 30 mW solid-state microwave source
 - Frequency more stable than the carcinotron
 - Preliminary testing showing that a finer-tune synthesizer may be needed to obtain frequency locking and further testing will be conducted during present shutdown.
- Implementing remote control of optical attenuation
 - Scanning the probe beam across plasma minor radius still requiring controlled access to manually change optical attenuators
 - Shutter mechanisms to move individual attenuators into/out-of optical path
 - Integrated quasi-optical attenuators utilizing wire-grid polarizer

Future Plan for High-k Scattering System

- Implementing k_θ scattering system
 - Present high-k scattering system measures mostly k_r
 - k_θ spectrum is more representative of ETG, *i.e.* a spectral peak in k_θ spectrum.
 - Fully utilizing solid-state microwave sources.

