Edge impurity transport dynamics using high resolution ME-SXR

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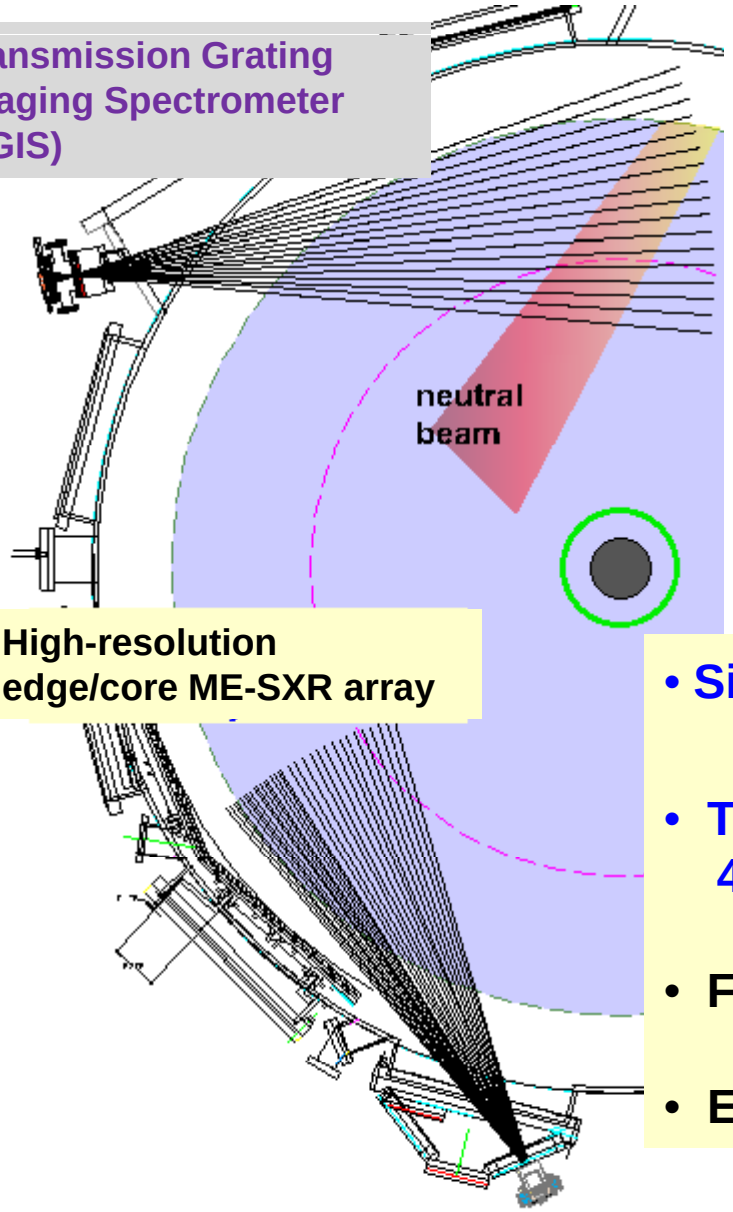
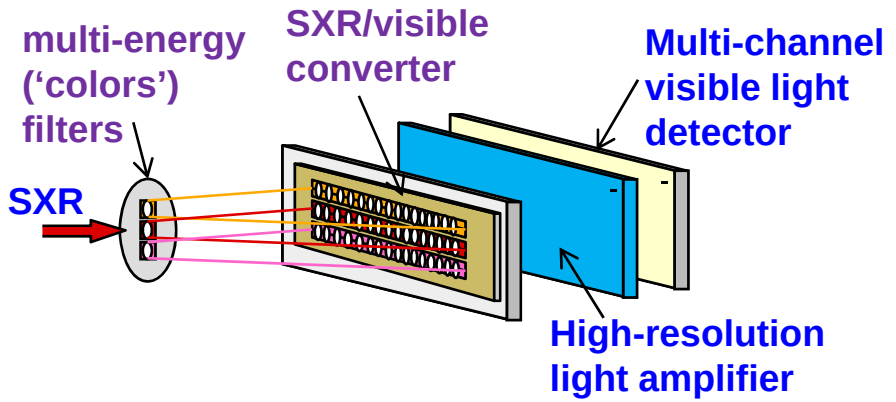
High resolution ME-SXR edge/core array planned for this run

Transmission Grating Imaging Spectrometer (TGIS)

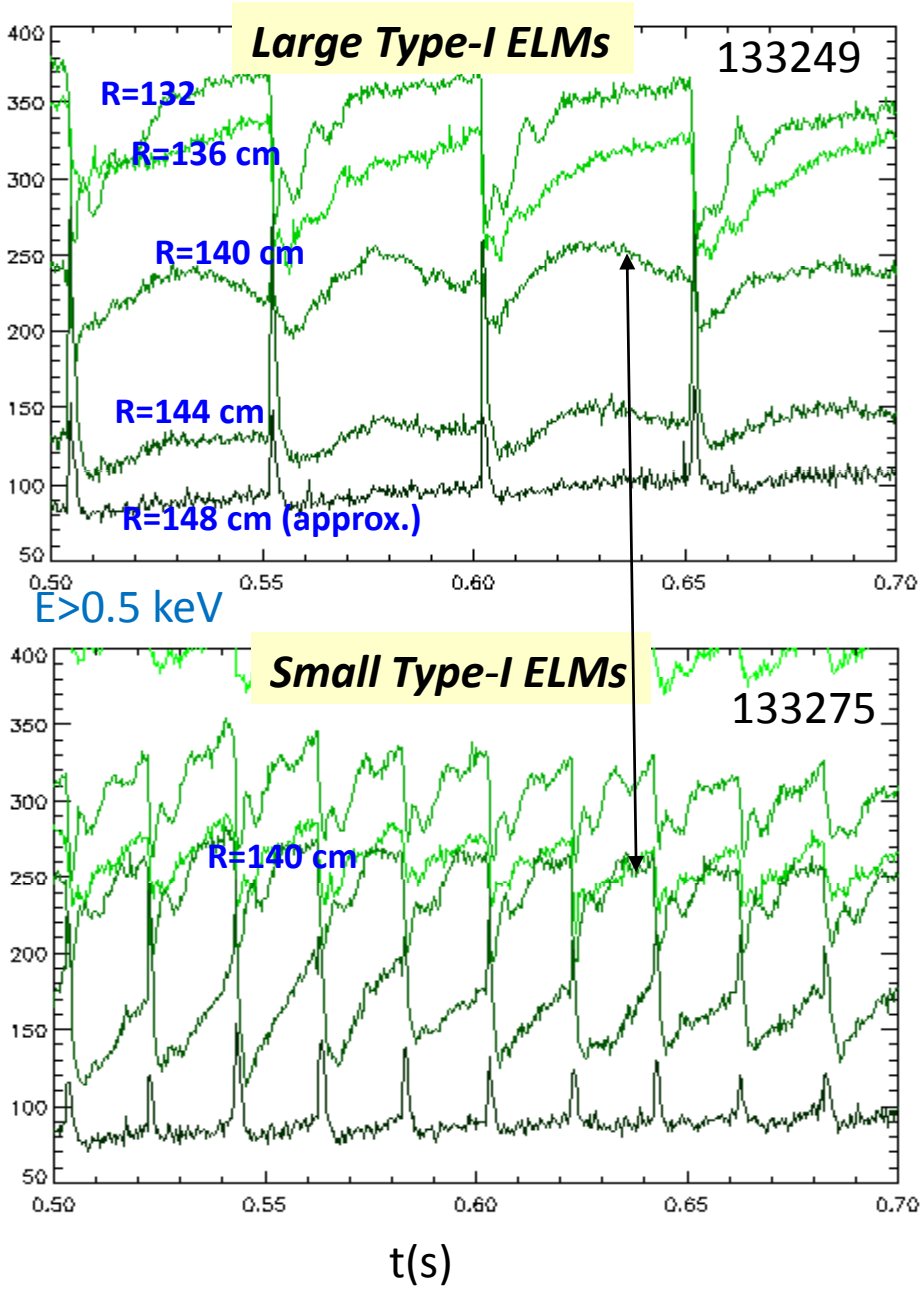


High-resolution edge/core ME-SXR array



- Six 'color' ME-SXR: 1 cm /1ms / 0.02-10 keV
- TGIS spectrometer for impurity fractions: 4 cm / 350 ms /30-500 Å
- Fast $T_{e,}$ edge/core impurity transport dynamics
- Expected availability: second half of the run

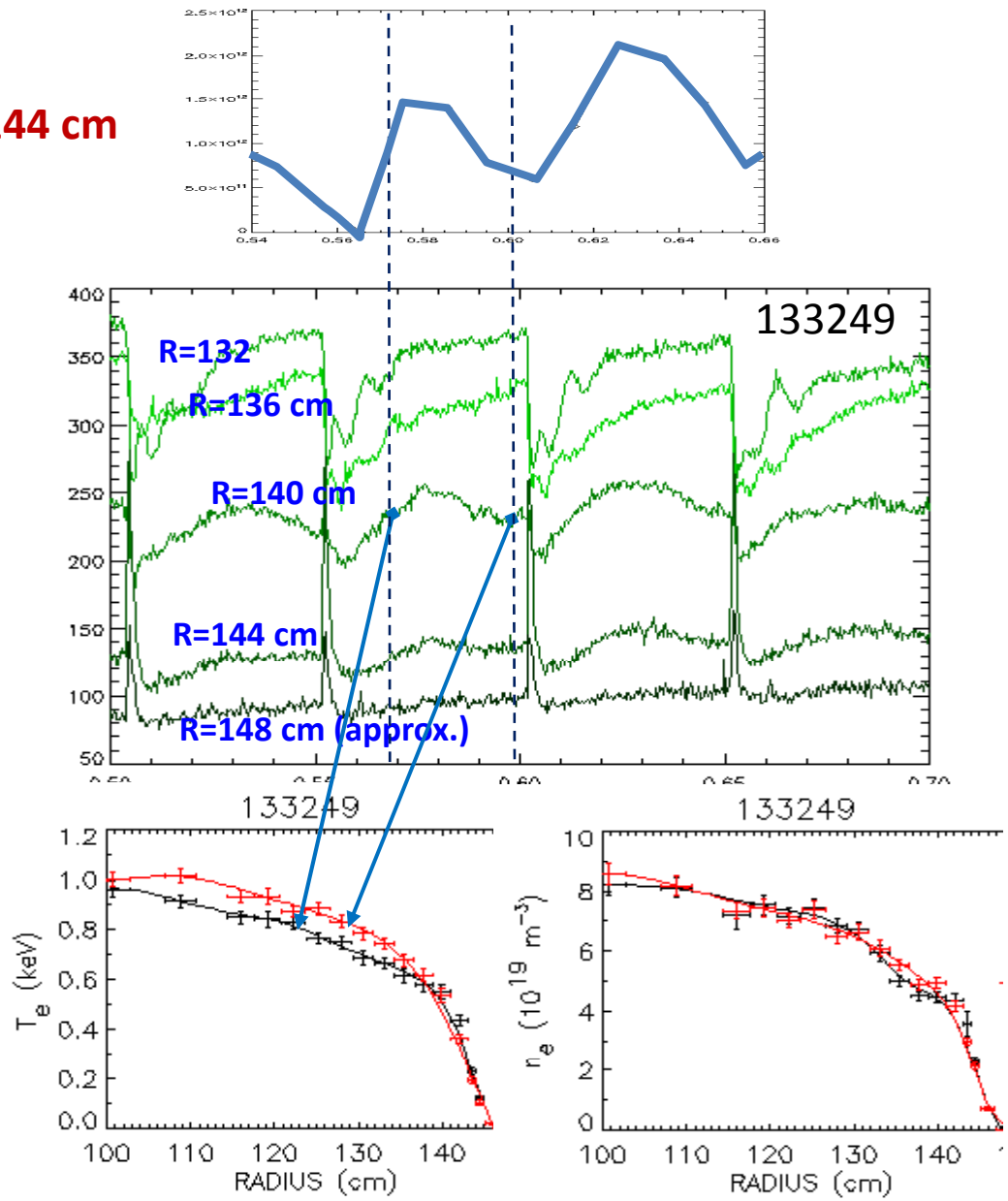
ME-SXR data suggests edge transport degrades *before* ELM



- **Transport (particle apparently) degrades near pedestal top (R~140 cm), few tens of ms before a large Type-I ELM**
- **Seen with USXR also in 2006 shots (not Li effect)**
- **Possible breakthrough in ELM research (physics, active feedback control?)**
- **High-res ME-SXR could follow fast impurity injection, T_e, Z_{eff} evolution**
- **Although new diagnostic, topic critical for ITER**

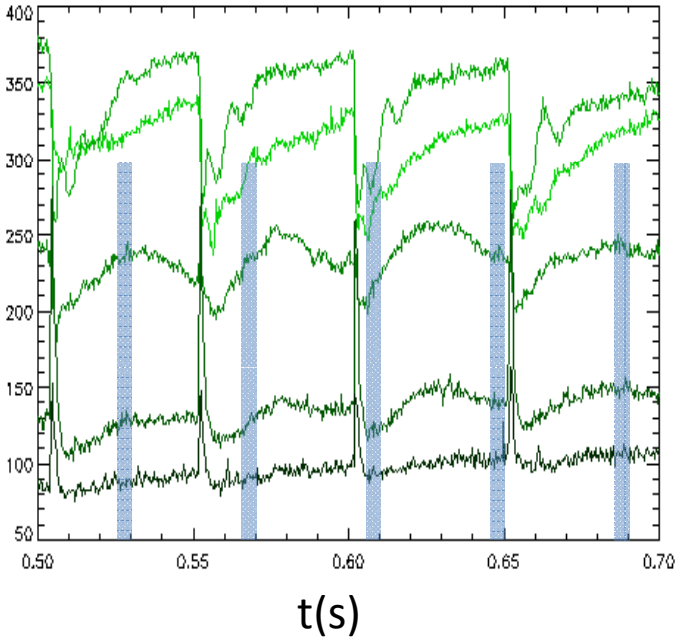
CHERS indicates edge carbon loss prior to large ELM

CHERS carbon density at R=144 cm

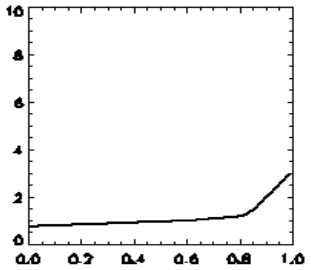


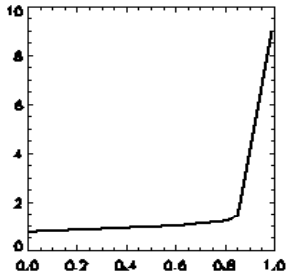
XP: Fast, periodic impurity injection for transport dynamics

40 ms period, 5 ms long Ne puffs



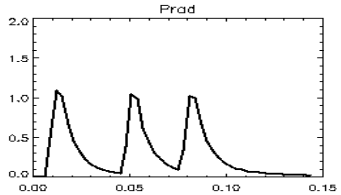
D (m^2/s)

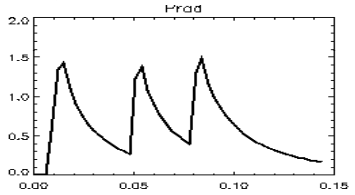




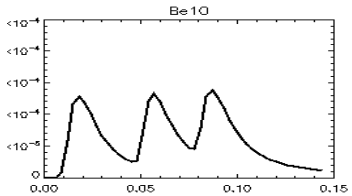
R=140 cm ME-SXR emissivity (W/cm^3) (MIST)

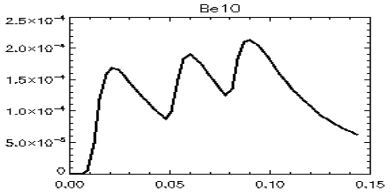
E>0.02 keV



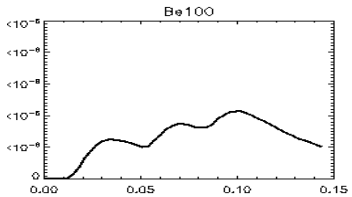


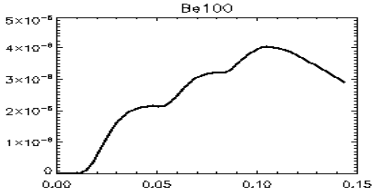
E>0.5 keV





E>1 keV





- **Periodic impurity gas puffs ($\mathcal{T}=T_{ELM}$) to probe transport in between ELMs**

Possible run plan

- **Test edge ME-SXR diagnostic with single, short Ne puffs (piggy back)**
- **Develop fast periodic Ne injection (off-line + XMP)**
- **Study edge transport dynamics in different ELM, wall conditioning regimes**
- **Compare with edge code predictions**