



U.S. DEPARTMENT OF  
**ENERGY**

Office of  
Science



# US/Japan Collaboration Opportunities for Radiation Imaging Diagnostics

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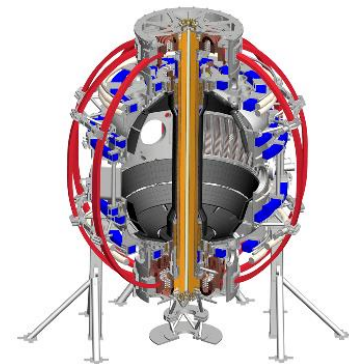
US/Japan Collaboration Discussion

ISTW – Princeton, NJ

11/6/2015

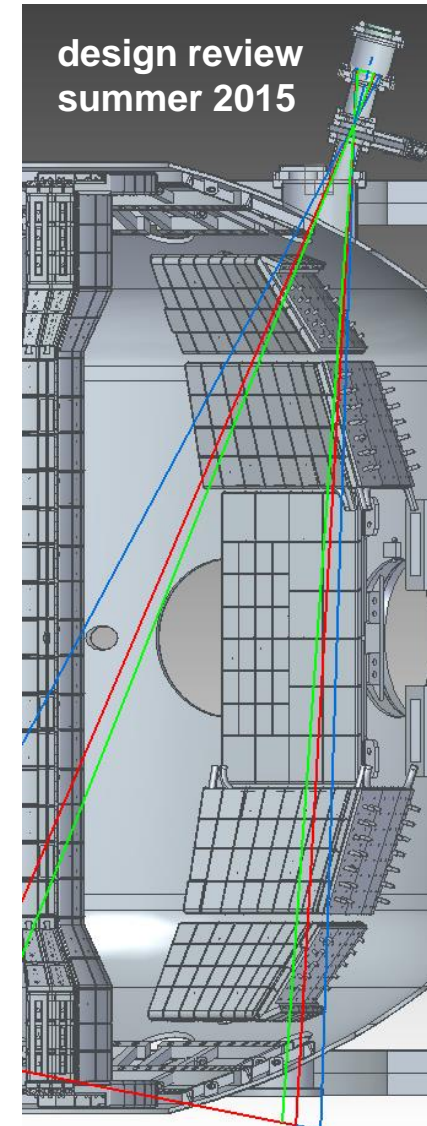
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National Laboratory

 PPPL



# We've Already Begun!

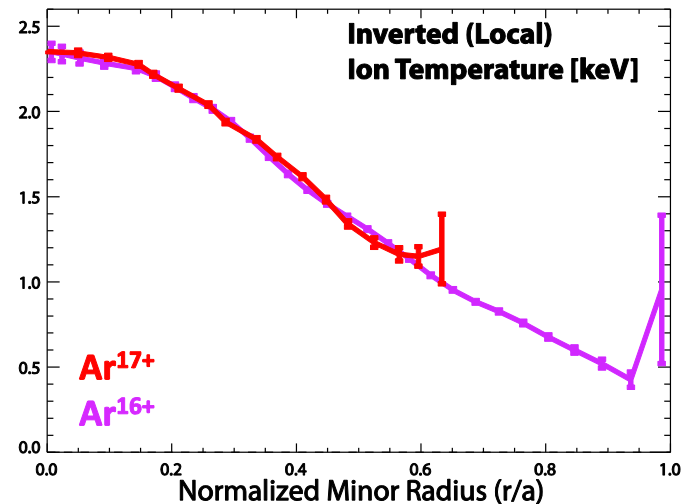
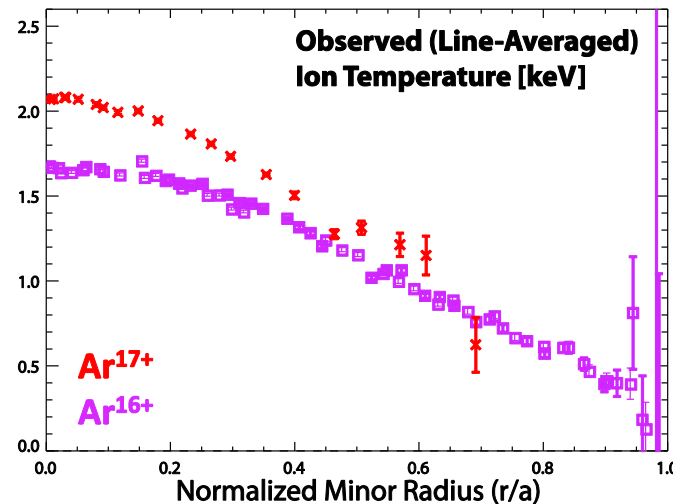
- NSTX-U working with Prof. B. Peterson (NIFS) on deploying an infrared video bolometer (IRVB)
  - system uses IR cameras to image 2-D temperature rise of thin foil heated by radiation viewed thru pinhole
  - <https://www.dropbox.com/s/usrq1drkialmvwz/2014-10-25%2008.52.39.mov?dl=0>
  - looks to complement/replace resistive bolometer technology for radiated power
- first time applied to STs which can leverage excellent field of view to get ‘wide-angle’ views
  - advance technology & applications on NSTX-U and communicate this to wider ST community
- this also puts me in ‘debt’ via the US/Japan collaboration, understanding that contributions need not be reciprocal – where can I help?



# Possible Areas of Contribution

- background from Alcator C-Mod, JET, AUG on high-Z impurity transport, high-Z tokamak operations, low-Z impurity seeding and boundary plasma physics
- broad diagnostic experience: resistive bolometers, AXUV diodes, VIS/VUV/SXR survey spectroscopy, x-ray Doppler spectroscopy
  - contribute/advise on diagnostic design & optimization
- analysis/visualization tools for impurity spectroscopy, including comprehensive tools for solving Doppler tomography problems

results from  
Alcator C-Mod  
x-ray imaging  
crystal  
spectrometer



# Brief Thoughts from ISTW Talks

- consideration of Dectris solutions for SXR imaging
  - expensive technology, but transformative!
  - $<100$  keV using CdTe,  $>1.8$  keV using Si
  - PPPL/MIT collaboration demonstrating imaging PHA solutions for  $T_e$  profiles – important application for ST's that can't use ECE
- expansions of Doppler tomography for flow and temperature profiles
  - both QUEST and ST-2 seem to be using visible emission, techniques transfer from x-ray imaging crystal spectroscopy (are you doing inversions?)
  - overlap between 'core' ST-2 use and 'divertor' NSTX-U for C III emission
  - possible mutual interest in coherence imaging systems (MAST-U demon.)
- we need more demonstrations of ST-based RF technology
  - adoption of high-Z PFCs in ST's may require wave heating techniques for high-Z impurity control, similar to larger-A devices; do we have the tools?
  - present technology is focused on current-drive, start-up but does it have a wider application? does it create new problems (see ICRF headache)?