Public Input

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I would like to suggest that FESAC consider including in your response to the charge on international collaboration specific mention of research on active control in reversed field pinch devices. One important aspect of such collaborations is the relevance to tokamaks and specifically to ITER.

I have in mind one area that seems ripe for collaborations. That area is MHD instability control by magnetic field coils. The RFX-Mod device at Padua has a coil set that provides what is arguably the world's most advanced plasma mode-control system with very good sensing and control for a wide spectrum of kink modes, and the group there has successfully stabilized multiple resistive wall modes. Also, a new RFP experiment called KTX has been funded for construction at the University of Science and Technology of China, in Hefei. This device is similar in scale to RFX-Mod and MST at UW-Madison. The USTC group is collaborating closely with the EAST group on the design and construction of this new device. The KTX research mission includes eventual mode control capability much like on RFX-Mod, and the close collaboration with EAST could be a useful avenue to impact long-pulse, high-beta tokamak research well within the 10-20 year timeframe defined by the FESAC charge.

One of the dimensions of international collaboration that I would like to emphasize is theory and modeling. For mode control physics, the modeling for RFPs is sometimes simpler than for tokamaks, and allows for comparison between theoretical modeling and the experimental results without the complications inherent in modeling the control of resistive wall modes in tokamaks. These complications include the fact that the mode in tokamaks (essentially the external kink) has a broad spectrum of poloidal mode numbers, and therefore the mode may be strongly affected by the different plasma rotation on the various mode rational surfaces. In RFPs each mode may be considered separately.

The major point of any such international collaboration in RFPs, as I see it, is that much can be learned about toroidal MHD control for RFPs, and this background can guide the research in MHD mode control in tokamaks. If you would like a more detailed writeup, just let me know. I have talked about these issues at length with John Sarff.

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