Input to the FESAC Advisory Committee to Assess Opportunities in International Collaboration on Plasma Science and Control and Materials Science and Technology

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Following on from discussions at the recent APS DPP meeting in Salt Lake City, I would like to draw the attention of the FESAC panel to three specific points:

1) Providing US designed and built diagnostic systems to international facilities is a natural vehicle for establishing long-term, mutually-beneficial collaborations, suitable for university participation.
2) There needs to be an open, accessible DOE funding mechanism for international collaboration, that is flexible and can encompass the full spectrum of potential international collaborations.
3) While international collaboration offers many opportunities, there are also specific challenges for MFE which need to be addressed or ameliorated. Specific examples include challenging environments for long-term student/staff relocation, export control regulations, etc.

Below, I expand on each of these points in turn.

1. Diagnostic Collaboration Opportunities

I am concerned that in the documentation and discussion I have seen to-date, opportunities for collaboration on diagnostic systems was not explicitly mentioned. While this omission may be driven by the language of the original Charge Letter from the DOE Office of Science, or by the belief that diagnostics are implicitly included, *I believe that opportunities for collaboration on diagnostic systems should be explicitly considered by the panel,* for the following reasons: i) Historically, diagnostic systems have provided a natural mechanism for multi-institutional collaboration, both nationally and internationally. ii) Providing diagnostic hardware and expertise provides a visible and lasting "quid pro quo," i.e. reciprocity within the collaboration is built-in. iii) Diagnostic systems are within the capabilities of university based research groups. In fact, diagnostic systems are a primary method for such groups to participate on the present major US domestic MFE experiments. iv) As has been said, "diagnostics are the window to the knowledge," and as such measurements from diagnostic systems can often transform our understanding of many different scientific areas and issues, forming a much broader basis for collaboration and participation within a device research program than might be obvious at first sight.

2. Accessible DOE Funding Mechanisms

At present, there is no clear mechanism by which to obtain specific funding for international collaborations by university based research groups (funding mechanisms do exist for National Laboratories and Facilities). In the context of calls for increased international collaboration by university researchers this is a major omission or contradiction, which clearly needs to be addressed. This need became clear from

discussions with DOE last year, when trying to find a way to obtain support for a new UCLA collaboration on EAST. UCLA is currently funded to design and build a Doppler backscattering system for EAST, using EAST funding. Beyond construction of the actual diagnostic, EAST has also offered UCLA the opportunity to fully participate in the EAST scientific program and experiments. However, any such long-term scientific participation would need to be U.S. funded, and as already mentioned, *it appears no mechanism to obtain such funding exists at present.* More particularly, I believe that the DOE is looking to the report from this group for guidance as to what the scope of future funding calls should encompass: specifically, whether funding calls are focused or broad-based, and whether they will include direct funding routes for university based researchers, or not, will depend to a large extent on the recommendations of your forthcoming report. Consequently, I hope the report specifically addresses this need.

3. Challenges for international collaboration within MFE

While the perceived success of international collaboration within the high energy physics (HEP) community is often held up as an example for MFE, there are some significant differences and specific issues that need to be borne in mind. Examples include:

a. I would suggest that sending staff, and particularly students, to participate long-term in experiments at Heifei, China (EAST), or Daejon, Korea (KSTAR), will be much more challenging than sending students, to, say CERN in Geneva. In order to live locally and participate effectively on EAST or KSTAR, would students be expected to learn Mandarin or Korean? How will the prospect of having to work in China or Korea for several years affect student and post-doc recruitment? Also, bear in mind that not all students are suitable for such "remote" work, and issues with regard to supervision arise even with university participation in US domestic facilities.

b. US export control issues will arise frequently. OFES needs to have a contact person who is familiar with US export control regulations and procedures, and can help researchers navigate this complex area. OFES does not have such a person at present (to my knowledge), and even large research universities such as UCLA are unfamiliar with exactly what to do with regard to specific technologies.

c. The nature of experiments and data analysis is very different as between MFE and HEP, e.g. HEP is much more conducive to remote long-term data mining. Such structural differences are important!