

## Remarks on the CRP meeting on Dense Magnetized Plasma Applications

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The community gathered here made the proposal for this meeting because of its global concern in the area of plasma fusion, which I share. I will make a few basic remarks on where we share a common philosophy, and also comment on what I believe is the right direction for us at ICTP to go. Please understand that I come at this issue from my own perspective.

As we all know, there is a complex and expensive activity in nuclear fusion at ITER. It is supposed to tell us whether fusion can be the future for the world's energy problems. We are all aware that, even if ITER were to succeed, an intermediary device will be needed before fusion can be rendered a commercial success. So we are thus talking about the situation some 50 years away.

But let's be optimistic and assume that fusion will indeed be a major answer to the world's energy problems. And then look at how things are progressing. Outside of European Union and the US, only five countries are involved in the ITER enterprise: China, India, Japan, Russia and South Korea. This leaves out a very large part of the world. How can that part of the world suddenly wake up to the ITER technology one day, and adapt it to their needs if they have no inkling of what is happening now, and if they do not educate a cadre of scientists who understand the issues involved and take advantage of the advancing knowledge? As we know, there are critical scientific issues of plasma instabilities and confinement, as well as technological issues such as the thermal insulation between the hot plasma at something like 100 million K and superconducting magnets working at something like 1 K. The technology and its backbone science are very sophisticated, and it requires special efforts to create knowledgeable communities across the world. However difficult this may seem, one has to attempt to do it. Otherwise, fusion will become the prerogative of a few nations and the rest of the world will not benefit from its possible impact.

This awareness is at the bottom of ICTP's own interest in Plasma fusion. Given our mandate, we would like to be the place that educates a cadre of plasma scientists in developing countries with broad awareness of the science

and technology of fusion. We are not interested in tying ourselves down entirely to ITER but wish to address issues of broad nature relating to plasma fusion. From our point of view, the applications of dense plasma devices, the subject of this meeting, should be seen in that light.

As everyone knows, dense plasma devices may be used in principle in a wide range of applications, such as material science, radiation biology and nuclear medicine. Scientifically, they pose challenges in nonlinear phenomena, which are not yet well understood. Compared to ITER or any small-scale tokamak, they are relatively simple and cheap, and can be created in many labs throughout the world, thus giving an opportunity to provide experiments with fusion plasma. These devices have existed for quite some time in different places but, as I understand, their operation still falls short of expectations. It is our hope that our own enterprise with the dense plasma source here at ICTP will work well, and provide opportunities for scientists from developing countries to work with plasma physics.

Now, let me say how I would like the ICTP involvement to go. I am aware that IAEA and ITER have signed (or will be signing) an MoU that gives IAEA the responsibility for training and science dissemination in fusion science. I have already mentioned it a number of times to people at IAEA about ICTP's willingness to act as the mechanism for promoting this goal. I hope that IAEA and ICTP can work together on this aspect. I hope that our own plasma device being built will play some useful role. I am not certain that it would be useful merely to prepare reports for specialists without building the capacity to absorb them, disseminate them, and act on them. Both capacity building and specialist meetings are essential.

I hope that this meeting will consider the issues I have mentioned. Please give your considered advice to us and also to IAEA. I hope you can transmit to the IAEA management our interest and concerns. I hope that your next meeting will be more representative of the world and also go some ways in addressing the issues I have raised.