<u>Questions and comments that require extended answers beyond the available time during the class L2-20150919:</u>

1. **遇到问题的时候给大家思考的时间，集思广益。**

   I will open up a question or two near the end of L3 for all answer individually, and see if we can arrive at good answers.

2. **Why does the tokamak plasma have such a good heat-insulation capability?**

   The question of "why" is different from the question of "how." The practice of scientific investigations has commonly focused on the question of "how," while leaving the question of "why" to the philosophers and religionists.

   This is a good question for L3 open discussion, as indicated above.

3. **Are there any data support the left figure in slide 14? Are there any effective ways to measure the core plasma? And what are they?**

   These questions cover the entire scope of tokamak fusion plasma physics. Maybe I should develop a 2-hour introduction class on this.

4. **If we use the fusion cycle of p－11B (in slide 4), how could we change the fusion power to electricity?**

   "Direct conversion" of the kinetic energy of the ions and electrons in a magnetized has been a subject of R&D for some time, though not with the intensity enjoyed by tokamak fusion energy. I think it is appropriate to say that this situation naturally results from the present focus of D-T fusion cycle.

   This subject is likely less complex in its scientific content, and also offers great opportunities for challenge and creativity similarly to the D-T based fusion energy research. Increased interest in this topic would follow automatically an increased interest in the p – 11B fusion cycle.

5. **What diagnostics will ITER use? And what are the locations?**

   These topics deserve to be covered in an entire semester. Let's think about this possibility.

6. **What's the meaning of long pulse?**

   Excellent question. That is, how long relative to what time scale? One way to look at this is to determine the time scales of interest to a tokamak fusion plasma, the frontline, the 2nd line, and the 3rd line of the entire fusion facility.

   ITER design has been assigned 400s for phase I Q=10 "ignition" operation, and 3000s for phase II Q=5 "hybrid" operation. Roughly, the former time scale would encompass the time from the start of plasma burn (at Q=10) to a time when D, T fuel and the fusion ash He would arrive at a nearly stationary condition.

   The latter time scale would encompass the time for the plasma current profile,

via the mechanisms of magnetic flux diffusion, to arrive at a nearly stationary condition.