

*On some problems of large tokamak type fusion reactors*

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Although most fusion research physicist now believe that a selfsustainment of fusion reaction will be achieved by 1985., it is also realised that there is long way to go to the construction of technically and economically acceptable fusion power plant. After this first stage ten or so years will be needed for the construction of demonstration plants and another ten for construction of commercial plant. This seemingly long periods can be partly understood from physical considerations which require that fusion installations, at least those dominating today, be of rather large size. As the fusion conditions in density temperature and confinement time of plasma are steadily approached by both magnetic and inertial confinement systems, it is becoming increasingly clear that the problems of greatest importance for the final goal of thermonuclear power are going to be of technical and technological nature. They could be so decisive, as to rule out fusion approaches which look very attractive and are successful in attaining the first stage of selfsustainment of fusion reaction. Expert bodies thus recommend that as early as possible the technological problems presented by specific fusion approaches and geometries should be looked into, in order to assess to what extent they can serve as a base for development into thermonuclear power plant. Being scientifically relatively highly developed, tokamak approach can serve as a base for reactor project studies without too extensive extrapolations. These project studies serve to identify and evaluate the technical and technological problems of the next stage. Those posed by tokamak reactor appear to be very serious. It is intended here to point out that some of them fall in the field of experimental nuclear physicist:

a) First wall of the plasma chamber is exposed to a very high flux of the 14 MeV neutrons and to a bombardment of plasma ions. Development of the materials capable of withstanding irradiation and thermal strains might be essential for success of tokamak reactors. However, new intense neutron generators will be required in order to simulate reactor conditions and to help to investigate the first wall materials.

b) Magnets

Construction of very large superconductive magnets is essential for tokamak reactors. The main problems is the extension of present experience on the magnets which should be larger by two orders of magnitude. However, their size is dependent partly on their ability to withstand damage by fast neutrons.

References:

*Thermonuclear fusion; present status and perspective*

I Tokamak instalations

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