

Fusion results 'confirm the scientific case for ITER'

SOURCE: JET

[LONDON] Plans for a next-generation experimental fusion reactor have been boosted by the latest research with mixed deuterium-tritium (D-T) fuel on the Joint European Torus (JET), based near Oxford, England.

The experiments, carried out over the past few weeks, have as anticipated set new world records for fusion power, fusion energy, and the critical 'fusion amplification factor' or Q — the ratio of fusion power produced to net power input.

Equally significantly, the experimental results have been broadly in line with predictions — a crucial requirement given that the design of JET is close to that of the proposed International Thermonuclear Experimental Reactor (ITER), which its supporters hope will be built early in the next century.

"There have not been any breakthroughs in the sense of something unexpected being obtained, but the physics models have met expectations, giving us confidence that the predictions for ITER are sound," JET's director, Martin Keilhacker, said last week.

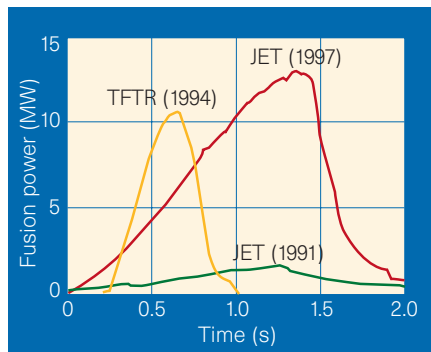
But Keilhacker and others are increasingly nervous about the funding prospects for ITER, particularly in the light of reports that the United States, one of the four planned supporters of the project — the others being the European Commission, Japan and Russia — is becoming lukewarm. "The political climate at present is not very favourable to megabillion projects," says Keilhacker.

The previous record for fusion power, 10.7 MW, was set by the Tokamak Fusion Test Reactor (TFTR) at Princeton, New Jersey, in 1994. The latest experiments with JET, which is financed largely through the European Commission, achieved a peak power of 13 MW with the power remaining at more than 10 MW for half a second (see figure).

One particularly reassuring result has been the demonstration that, as predicted, a significant contribution is made to the plasma power balance by the α particles produced in the D-T reaction, in that the temperature and energy content of the plasma were consistently higher with higher levels of α -particle heating.

"We had some doubts until we had these results whether 300 MW [the planned heating power to the plasma of ITER] would be sufficient to contain the plasma. Our results with the D-T experiments have confirmed our predictions that the α particles are trapped and heat the plasma," says Keilhacker. "Thus the process by which ignition and thermonuclear burn will occur in ITER has been experimentally confirmed."

Another source of satisfaction for the JET



Pushing the envelope: JET's output has overtaken the previous record set by Princeton's TFTR.

engineers has been the fact that, compared with previous experiments using pure deuterium, the heating power needed to access the so-called high confinement or 'H' mode, which considerably improves the thermal insulation, was significantly lower using both D-T mixture and pure tritium.

"This is a very significant result, since it predicts a 50 per cent reduction in the power needed to access conditions with high thermal insulation in a pure tritium plasma, and a 25 per cent reduction in the power needed to maintain such conditions during high fusion power operation of ITER," says Keilhacker.

But if the physics prospects for ITER look good, optimism about the outcome of political negotiations is in shorter supply. The team drawing up the detailed design for ITER, which reports earlier next year, is expected to confirm the \$6-billion cost that was planned. But a firm decision on whether to proceed — and if so on what site — has now been put off for three years (see *Nature* 388, 119; 1997).

JET officials say there appear to be no technical obstacles to construction, and — in apparent contrast to those responsible for the US fusion programme in Washington — are keen to move quickly to the construction phase with a minimum loss of momentum.

In this context, they are reacting cautiously to proposals from some senior US fusion physicists that the United States should divert some of the money that might otherwise be dedicated to ITER to support experimental work at JET (see *Nature* 369, 769; 1997).

"There is certainly scope for more US involvement [in JET] and we already have very good collaboration with US laboratories," says Keilhacker. "But there is the political problem that we in Europe are convinced that the fusion community is ready to build ITER, while the United States — partly for budgetary reasons — is not." **David Dickson**

Monsanto links up with Millenium on genome research

[BOSTON] The agricultural and pharmaceutical company Monsanto last week signed a research agreement with the genomics company Millennium Pharmaceuticals that is being hailed as one of the largest deals in the field of genomics.

Millennium will transfer its proprietary technologies in genomics, gene sequencing and bioinformatics to a new subsidiary formed by Monsanto for developing plant and agricultural products.

The subsidiary, which is expected to recruit at least 100 scientists during 1998, will be located near Millennium's headquarters in Cambridge, Massachusetts. Monsanto, which produces agricultural products, food ingredients and pharmaceuticals, is based in St Louis, Missouri.

The agreement will also provide Monsanto with non-exclusive rights to Millennium's genetics process technology for research in other areas of life sciences, including pharmaceuticals and nutrition.

Millennium, in turn, will receive \$118 million in advance and an additional \$100 million over the next five years if mutually agreed research objectives are realized. The company's vice-president of business development, Alan Crane, calls the deal "the biggest partnership we've entered into and our first relationship outside human health care". Millennium has already entered into collaborations with nine other corporate partners including Bristol-Myers Squibb, Eli Lilly, Hoffmann-La Roche and Pfizer.

Monsanto is interested in pursuing several agricultural applications through the deal, including the introduction of new herbicides and pesticides, the development of genetically engineered plants and seeds, and the application of genomics tools to the process of "directed breeding".

Monsanto's president, Hendrik Verfaillie, says Millennium's "broad, integrated technology platform" will "greatly increase the speed and precision with which we can analyze new product leads".

The partnership fits in well with Millennium's strategic mission. According to Crane, the companies "share a similar vision of the potential of technologies like genomics to revolutionize the life sciences". **Steve Nadis** ● Sequana Therapeutics, the gene discovery company based in San Diego, California, announced on Monday that its stock has been acquired by Arris Pharmaceutical Corporation in a deal said to be worth approximately \$166 million. The new company, which will bridge the range from genomics to clinical application, will operate under the name of AxyS Pharmaceuticals.