

One Step Closer to the Sun: JET and a Record Breaking Run

Toby Chapman

It's a hollow metal ring. It weighs 3000 tonnes. Its fuel weighs one tenth of a gram.

Its magnets confine a plasma. When the plasma is hot enough two heavy isotopes of hydrogen, deuterium and tritium, fuse together. That's at 100 million Kelvin.

It's JET (Joint European Torus). It is the only experiment with the fuel mixture (50/50 D/T mix) of a potential fusion power station. And it's the most powerful fusion reactor on the surface of the Earth.

Its record breaking run recently produced 13 mega-watts of fusion power. And managed more than 10 mega-watts for a half second. And that's a long time when you're trying to hold onto the power of the sun, and you can only manage the high temperature of the sun and not its high pressure and density.

It's a tokamak one tenth, by volume, of the core of a fusion power station of the future. It's an industrial-scale prototype, located at Abingdon – which being in England is a place that doesn't get nearly enough sun normally.

The first record at the site was set in 1991 with the world's first controlled fusion energy reaction. But the 1991 tokamak had no mechanism for getting rid of waste. And it couldn't handle impurities that get into the fuel from the walls of the machine.

This limited its power – impurities get in the way of fusion, radiate heat away

from the plasma, and the fire goes out.

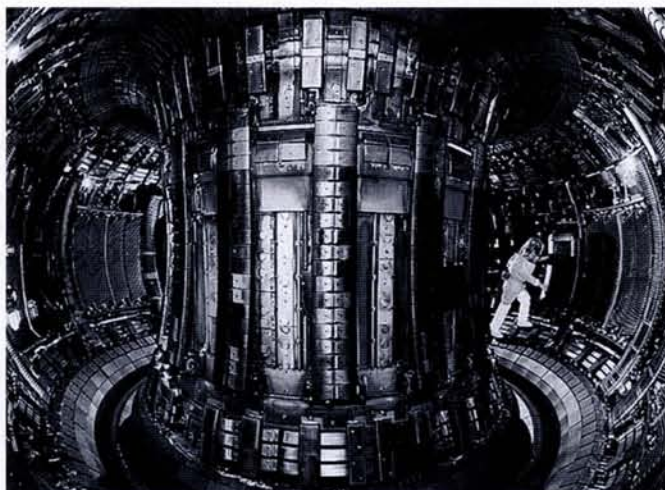
Now they've built an exhaust into the tokamak: powerful magnets in the base. They change the shape of the magnetic bottle. Impurities are drawn into the base of the torus. And are then pumped away.

Installing the magnets took two years, 1992 and 1993. The next two years were spent learning how to use it. And they are now on a second version of the exhaust.

The tokamak is a small part of a large fusion programme which currently reaches across Europe. Its latest design will be submitted to the council of ITER (International Thermonuclear Experimental Reactor) in the middle of next year, and ITER reaches from Europe to Russia, Japan and the USA.

The next generation magnetic fusion reactor will cost ITER \$10 billion. The EU has not yet decided how to pay its share. And JET is suffering from its own money troubles – its funding is paid in Ecus but spent on staff in pounds sterling. And the pound is stronger against the Ecu than it use to be. So the team may be 100 people smaller next year.

Which might seem like an odd way to develop the reactor that may replace fossil-fuel power stations in 20 to 30 years time. But, according to JET second in command, Alan Gibson, you only need to put in enough to sustain the research (like sustaining a reaction). And that's about what the project receives.



Inside the new JET. Magnets under the base now draw impurities away from the reaction

Brief Notes

THE OWNERS and editors of the new European physics journal have had trouble deciding on a name for their new baby. The journal was described in the last issue of *Europhysics News* by two of its editors who were calling it *The European Physics Review*. But this name seems to imply that it is an attempt to rival *The Physical Review*, published by our American colleagues. An alternative could be *Europhysics Journal*—which *Europhysics Notes* considers an excellent title. But unfortunately, it will be named *European Physical Journal*, or *EPJ*. Which—librarians and indexers beware—could easily be mis-keyed as *EJP*, otherwise known as *The European Journal of Physics*, published by our British cousins at the Institute of Physics Publishing.

THE BULLETIN of the French Physical Society has had its publishing troubles recently, too. The July issue, no. 110, carried this announcement with an article: "It is not without problems that the publishing of the *Bulletin* has been computerized. This article published in no. 109 suffered to the point of becoming almost incomprehensible. We thought that the best way to present our excuses to the authors was to edit and republish it – the Editors." But they can take heart, *Europhysics News* has a worse admission (see below).

THE ORGANISERS of the condensed matter conference in Leuven had publishing troubles as well. A disagreement with the printer meant that the proceedings of the conference weren't printed. The organisers of the high-energy physics conference a week earlier in Jerusalem have a solution to this kind of problem: publish on the Web instead. After a request by this office for the programme, the following reply came: "The Jerusalem conference has been the first conference ever where all the contributed papers as well as all talks were put immediately on the WWW (so everybody in the world could see the talks in almost real time)." And Web conferencing was born. Take a look at www.cern.ch/hep97.

EUROPHYSICS NOTES is sorry to announce that there will only be five issues of *Europhysics News* this year, due to publishing delays. It will return on schedule in January. In addition, you will notice that *EN* now speaks for itself and carries a disclaimer (page 147) declaring that it is the voice of the editor and not the European Physical Society. This is just so that it is free to congratulate, and to criticise. And above all is free to be the voice of the members of the Society.