exceeding 90 per cent — occurring at the frequencies of both lower and upper polariton modes — in good agreement with those predicted by theory.

In the future, the figures of merit of this polariton-absorption interferometer, such as the maximum absorption and the interference visibility, might be improved by using specially designed gate biases. It should be possible, for example, to tune the losses of the cavity spacer without changing the properties of the quantum-well electronic medium. This would provide an *in situ* control to precisely fulfil the strong critical-coupling condition for coherent perfect energy-feeding.

The time-reversal relationship between coherent perfect absorption and lasing has been studied in detail only recently — a few decades after the invention of lasers. For polaritons, however, a coherent perfect absorber in the mid-infrared has been demonstrated, whereas a mid-infrared polariton laser is yet to come. In the near-infrared and visible spectral ranges, inversionless polariton lasers[4] have been successfully obtained by using several types of materials and recently ultra-low thresholds have been achieved even at room temperature[5,6]. The crucial development of inversionless, low-threshold polariton lasers in the coveted spectral regions of the mid- and far-infrared might be further stimulated by the present work.

A coherent perfect feeding of polaritons may also have significant applications in optoelectronics devices, where an efficient injection of polaritons is required. For example, the creation of efficient and tunable terahertz emitters and lasers originating from the nonlinear frequency difference between the upper and lower branches of mid-infrared polaritons might become a reality. ❒

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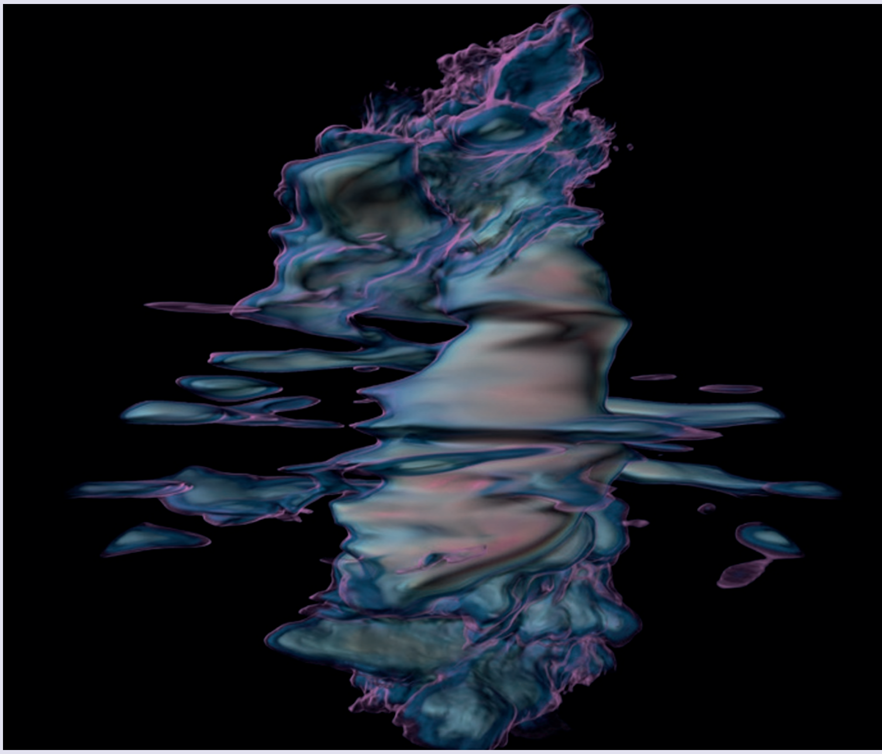
NUCLEAR PHYSICS

The long way

Fusion remains a distant goal, but the good news is that we have not lost pace and with the help of computer simulations we may even speed up a bit. Modelling magnetically confined plasmas on supercomputers is certainly not new, but Greg Foss and Anne Bowen at the Texas Advanced Computing Center at the University of Texas in the USA have used data from such supercomputer simulations to create stunning three-dimensional dynamic visualizations (pictured). The visualizations — featured this month at the SC14 conference — reveal the complexity of the structures present in the ionosphere and tokamak plasmas. These insights could complement traditional diagnostic methods and help improve current ITER tokamak design.



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At Sandia National Laboratories in the USA researchers take an alternative approach to fusion (M. R. Gomez *et al., Phys. Rev. Lett.* **113,** 155003; 2014). Their so-called *Z* machine uses the concept of magnetized liner inertial fusion. An extremely strong magnetic field generated by Helmholtz coils squashes deuterium fuel inside a thin, long tube — the liner. As the confinement is tightened, and just before implosion, a laser beam heats the fuel. In these conditions neutrons are created at a slower pace allowing more time for the fusion reaction to take place. The slower compression also prevents other materials from mixing with fuel and creating instabilities that could ultimately compromise fusion.

The team measured the deuterium-deuterium neutron yield and surprisingly, they also observed a secondary signal from deuterium-tritium neutrons — one hundred times larger than expected. This hinted at the existence of extreme magnetic fields that slow down the tritium nuclei giving them time to react with the deuterium fuel. Computer simulations (P. F. Schmit *et al., Phys. Rev. Lett.* **113,** 155004; 2014) confirmed this scenario, suggesting that the probability of fusion would increase thanks to the additional confinement created by these magnetic fields. The results seem promising, but as far as fusion is concerned, we're just not there yet.

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