Researchers generate fusion at 100 million Kelvin for 20 seconds
8 September 2022, by Bob Yirka

A team of researchers affiliated with multiple institutions in South Korea working with two colleagues from Princeton University and one from Columbia University has achieved a new milestone in the development of fusion as an energy source—they generated a reaction that produced temperatures of 100 million Kelvin and lasted for 20 seconds. In their paper published in journal *Nature*, the group describes their work and where they plan to take it in the next few years.

For the past several years, scientists have been trying to create sustainable fusion reactions inside power plants as a means of generating heat for conversion to electricity. Despite significant progress, the main goal has still not been met. Scientists working on the problem have found it difficult to control fusion reactions—the slightest deviations lead to instabilities that prevent the reaction from continuing. The biggest problem is dealing with the heat that is generated, which is in the millions of degrees. Materials could not hold plasma that hot, of course, so it is levitated with magnets.

Two approaches have been devised: One is called an edge-transport barrier—it shapes the plasma in a way that prevents it from escaping. The other approach is called an internal transport barrier, and it is the kind used by the researchers working at Korea’s Superconducting Tokamak Advanced Research Center, the site of the new research. It works by creating an area of high pressure near the center of the plasma to keep it under control.

The researchers note that use of the internal transport barrier results in much denser plasma than the other approach, and that is why they chose to use it. A higher density, they note, makes it easier to generate higher temperatures near the core. It also leads to lower temperatures near the edges of the plasma, which is easier on the equipment used for containment.

In this latest test at the facility, the team was able to generate heat up to 100 million Kelvin and to keep the reaction going for 20 seconds. Other teams have either generated similar temperatures or have kept their reactions going for a similar amount of time, but this is the first time both have been achieved in one reaction.
The researchers next plan to retrofit their facility to make use of what they learned over the past several years of research, replacing some components, such as carbon elements on the chamber walls with new ones made of tungsten, for example.


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