

Bring a 50,000-degree plasma into your living room

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Remote users can operate a plasma experiment with a set of controls, shown on the left side of the screen, and watch the effect on the apparatus at PPPL using the web stream video, Credit: A. Dominguez and A. Zwicker

With the rise of online open course platforms such as Khan Academy, MIT OpenCourseWare and iTunes U, it has never been easier to teach yourself everything from American history to semiconductor manufacturing. These courses enable students to advance at their own pace while accessing the limitless resources available on the internet for supplemental material.

But there's a glaring exception to this cornucopia of courseware: Online physics classes that enable students to interact with a real physical experiment. While excellent online sites like Phet Interactive Simulations have developed virtual labs that simulate laboratory environments, there is no substitute for actual live experiments.

At the U.S. Department of Energy's Princeton Plasma Physics Laboratory (PPPL), we've developed software for an experiment that can be observed and controlled from anywhere in the world.

The user can operate the experiment with a set of controls, shown on the left side of the screen, and watch the effect on the apparatus at PPPL using the web stream video, shown on the right. This "Remote Glow Discharge Experiment (RGDX)" consists of three main components:

- A live-streaming video that constantly observes an experimental apparatus housed at PPPL.
- A set of online controls.
- Information that explains what the user observes and controls, plus more in-depth resources that explore [plasma](#) and its uses.

The RGDX consists of a hollow glass tube with air held under vacuum. Supplying a voltage of up to 2000V generates a glow discharge within. The user has control of the pressure inside the tube, the voltage supplied to the plasma and of the strength of an electromagnet surrounding the tube. Users are guided through steps that gradually increase their level of engagement and introduce them to new physical concepts and topics. If the user is interested in the physics behind the voltages, pressures and magnets, further explanations are given for each topic.

Audiences for the RGDX can range from someone simply interested in controlling a physical apparatus from afar, to an undergraduate or graduate student who wants to study phenomena such as instabilities in

plasma or the physics behind plasma breakdown voltages. The RGDX can be used as a novel experimental component of either an online or in-class [physics](#) course, and the software can be adapted to a wide array of experiments.

Provided by American Physical Society

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