

Fusion science in the teaching lab — from €46,000

The gap it fills

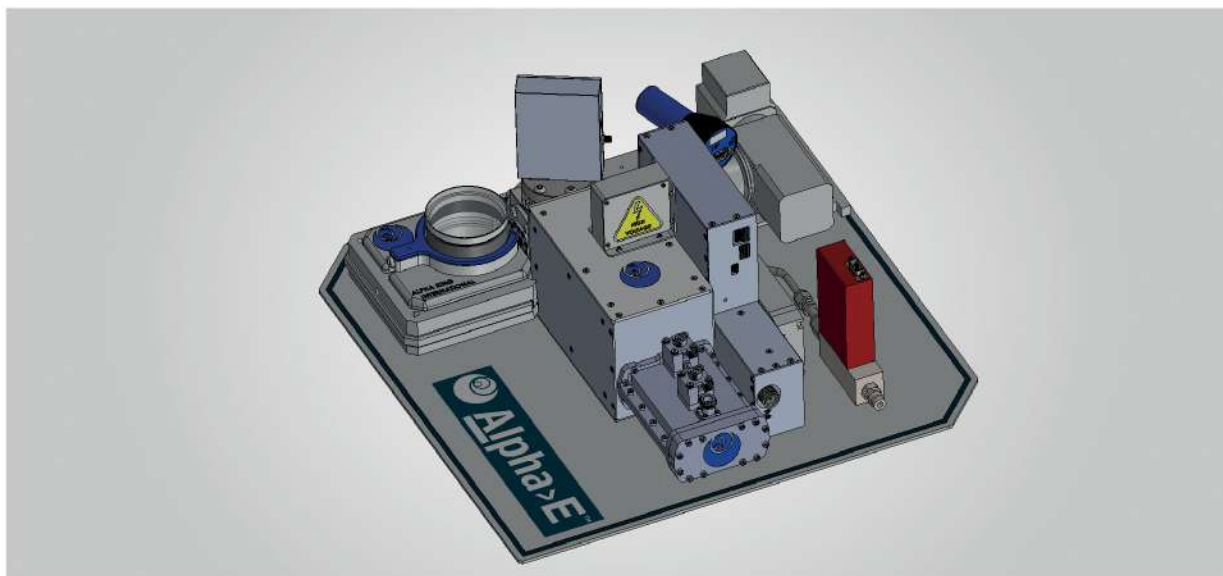
Most university physics and nuclear engineering programmes can teach students the theory of fusion reactions. Very few can give students a working fusion experiment they operate themselves. The instruments that could do this have historically cost hundreds of thousands of euros and served research groups, not teaching labs.

Alpha-E Prime is built for the teaching context. It produces real D-D fusion reactions at a price point that fits departmental equipment budgets.

What students do with it

Students initiate deuterium-deuterium fusion reactions, detect the products directly using calibrated charged particle and neutron detectors, and observe charged particle tracks in the cloud chamber in real time. They control beam parameters, change targets, and compare measured energy spectra against theoretical predictions.

The result is students doing fusion science: generating their own datasets, fitting data to models, interrogating where the model holds and where it fails, comparing results across experimental conditions, and drawing conclusions from evidence rather than from textbook assertions.



Key specifications

Ion beam energy	$\leq 30\text{keV}$
Fusion reaction	D-D (2.45 MeV neutrons + charged particles)
Detectors	Si-PIN charged particle; fast neutron scintillator
Visualisation	Cloud chamber — simultaneous charged particle tracking
Architecture	Modular, open; CF-standard flanges; swappable targets
DAQ	Web-based control and data interface
Safety	Operates below EU exempt radiation thresholds; standard laboratory safety protocols apply

How it fits into your curriculum

Alpha-E is designed to integrate at multiple points within an existing physics or nuclear engineering curriculum rather than requiring a dedicated standalone course. Faculty at Sofia University have integrated it across bachelor's and master's level courses, and a student has already used the device to complete an undergraduate dissertation. Faculty at Purdue University's Nuclear Engineering Department use it for undergraduate laboratory instruction. The curriculum included with the device covers fusion science theory, plasma physics, beam-target interactions, detector systems, radiation measurement, and data analysis — a scope that maps directly to standard nuclear engineering and advanced physics syllabi.

"The Alpha-E system provides an opportunity for bachelor's and master's theses, for doctoral students to conduct relevant research, and for the scientific community in the faculty to expand its range of interests."

Assoc. Prof. Stiliyan Lishev, Sofia University

In use at:



Nuclear Engineering
Department - West Lafayette, USA



Faculty of Physics
Sofia, Bulgaria



Department of Physics
Hsinchu, Taiwan



To request a demonstration or discuss
your programme's requirements,
Contact us: alpha-e@alpharing.com