



**Proxima
Fusion**



THALES

Proxima is Partnering with Thales, KIT, and Diamond Materials to Build the Microwave Heating Systems for Tomorrow's Fusion Power Plants

April 16, 2026 – Fusion power plants will need to heat plasma to temperatures exceeding 100 million degrees Celsius, far above those at the center of the Sun.

The solution is powerful microwave beams that deliver energy deep into magnetically confined plasma, heating it to the extreme conditions where fusion reactions can sustain themselves. The microwave sources that generate these beams are called gyrotrons, and building the next generation of them is one of the most important engineering challenges on the path to commercial fusion.

That's why we're collaborating with Thales, one of the world's leading manufacturers of high-power microwave sources and a company with more than four decades of experience in gyrotron development.

Why gyrotrons matter for stellarators

Proxima's quasi-isodynamic stellarator design calls for stronger magnetic fields than those used in today's fusion experiments. Stronger fields mean higher plasma densities and better confinement – but they also mean the microwave heating systems must operate at significantly higher frequencies. While ITER's gyrotrons work at 170 GHz, our planned power plants will require systems operating at around 240 GHz, each delivering over 1 MW of power. The higher frequency heats effectively in higher magnetic fields, enabled by our high temperature superconducting magnets.

The frequency jump requires a substantial technical leap, and it demands partners with deep expertise in the underlying physics and precision manufacturing.

A natural partnership

Thales has been developing gyrotrons since the 1980s, working closely together with the Karlsruhe Institute of Technology (KIT) and contributing to the Electron Cyclotron Resonance Heating (ECRH) system on Wendelstein 7-X – the world's most advanced stellarator, operating at the IPP Greifswald Branch of the Max Planck Institute for Plasma Physics, Garching. Using Thales gyrotrons, the ECRH system of Wendelstein 7-X is the most powerful microwave plasma heating system in operation anywhere in the world.

For Proxima, a spin-out from IPP Garching, partnering with Thales and KIT was a natural choice. Their track record of developing and manufacturing of gyrotrons to

tokamaks and stellarators across Europe and beyond gives us confidence that together we can bridge the gap to the higher frequencies our machines will require.

From lab to power plant

As part of the German BMFTR project HeatQIS (an initiative led by KIT), Proxima, KIT and Thales are working alongside Diamond Materials to develop the core microwave heating technologies needed for Alpha, our net-energy-gain demonstration stellarator planned for construction in Garching, Germany. Proxima defines the system-level requirements and coordinates with KIT and Thales on translating the project's R&D results into a gyrotron design that can be industrially manufactured, quality-controlled, and operated reliably in a power-plant environment.

This means maturing the coaxial-cavity gyrotron technology, including key subsystems such as the electron gun, cavity, quasi-optical system, collector, and cooling structures – all of which must meet the demands of continuous, long-duration operation.

Building an ecosystem

Fusion is not a challenge any single company can solve alone. Our approach is to build an ecosystem of partners, each contributing world-class capabilities to a supply chain that is 100% European. Thales brings the best of gyrotron technology. KIT brings decades of research leadership. Diamond Materials brings industrial expertise in the synthetic diamond components that gyrotron windows and reactor interfaces depend on.

"In close collaboration with Thales as the European gyrotron manufacturer, KIT has been at the forefront of gyrotron design for decades," says Professor John Jelonnek, a Professor for High Power Microwave Technology at KIT. "We have delivered designs to Thales for different world-leading tokamaks and stellarators. We're now seeing an exciting acceleration with Proxima, targeting 240 GHz systems. We are clearly entering a new phase of growth for Europe's fusion ecosystem."

Together, we're working to ensure that when the first stellarator fusion power plants come online, the heating systems they rely on will be proven, manufacturable, and ready.