

FemtoFab™

Automated Femtosecond Laser Fabrication of Nano-Structured Superconductors

“Precision Nanofabrication for Next-Generation Quantum Devices”

Technology

FemtoFab™ introduces an automated femtosecond laser-based process for the fabrication of micro- and nano-constriction structures on high-temperature superconducting (HTS) thin films such as $\text{YBa}_2\text{Cu}_3\text{O}_{7-x}$. The technique enables the precise and reproducible formation of superconducting nano- and micro-patterns used in quantum interference devices (SQUIDs) and other high-performance electronic systems.

This method represents a significant advancement in superconductor manufacturing, overcoming the cost, complexity, and scalability barriers associated with traditional lithographic techniques. By employing programmable, automated laser control, FemtoFab™ allows the rapid, low-cost, and high-fidelity fabrication of arrays of superconducting nano-structures suitable for research and commercial applications.

Market need

Today, reliable and stable thin-film Josephson circuits can be manufactured in large quantities. However, the production process of good-quality SQUIDs is not that simple. The main challenge lies in the technically demanding fabrication process of reliable high-temperature superconductors. Most well-established fabrication technologies fail, particularly at the nanoscale. Even extremely sensitive SQUIDs present challenges when it comes to manufacturing.



Features

- Automated manufacturing process of high-temperature superconductors
- Produces perfect interfaces and uniform barriers, which ensures good reproducibility
- Improved signal-to-noise ratio and increased strength and performance of the SQUID



Benefits

- Automated femtosecond laser system for precision nanofabrication
- High reproducibility and scalability for industrial use
- Reduced cost and complexity compared to conventional lithography
- Compatible with multiple superconducting materials
- Enables customisable, programmable pattern design for nano-arrays



Industry

Manufacturing

Possible Applications

- Quantum sensors and SQUID devices
- High-temperature superconductor (HTS) fabrication
- Advanced electronic and photonic device manufacturing
- Research in quantum materials and cryogenic systems

Creators

Vijaya VS Vallabhapurapu

Patrice Umeme

Stage of Development

Prototype

Intellectual Property

Patent Protection

Desired Relationship

Co-development; investor