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Hybrid Echelle: The Enabling Technology for the Next Generation of THz Particle Accelerators

A patented hybrid pulse-front-tilting technology enabling the generation of multi-millijoule terahertz pulses with unprecedented beam quality for future accelerator and advanced THz applications.

The Challenge

Current LiNbO₃-based THz sources suffer from imaging errors that limit energy scaling. Conventional pulse-front-tilting systems generate asymmetric THz beams with poor beam quality. Existing approaches constrain the development of compact THz-driven particle accelerators. The scientific and industrial communities need higher-energy THz pulses with superior beam characteristics.

The Solution

The invention introduces a novel hybrid pulse-front-tilting architecture utilizing:
A high-order stepped LiNbO₃ contact grating.
Multi-mJ THz pulse generation capability.
Significantly reduced imaging aberrations.
Plane-parallel crystal geometry delivering near-ideal beam quality.
Manufacturability through ultraprecision technology.

INVESTMENT HOOK

Future compact particle accelerators depend on the availability of high-energy terahertz sources. The Hybrid Echelle technology addresses one of the most critical bottlenecks in THz generation and targets a market expected to exceed USD 1.5 billion.

WHAT ARE WE LOOKING FOR?

Licensing Partners

For industrial deployment and commercialization.

Strategic Development Partner

For companies and research centers specializing in THz technology.

The TEAM

University of Pécs High Energy Thz researchgroup

Core Expertise: Terahertz science, ultrafast laser physics, accelerator technologies, nonlinear optics, precision engineering

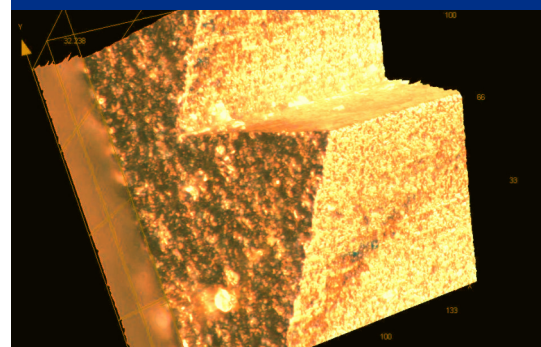


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Generating THz Waves in the Lab

Echelon under microscope



TRL 4
TECHNOLOGY
READINESS

1.5 Billion USD
Projected market
of Thz particle
acceleration

Granted Patent Portfolio

United States, Japan, Canada,
Austria, Denmark, France,
Germany, Hungary, Italy,
Netherlands, Switzerland, United
Kingdom

KEY VALUE PROPOSITIONS Breakthrough Performance

Enables higher THz pulse energies while maintaining exceptional beam quality.

Enabling Technology

A critical component for next-generation compact accelerators.

Manufacturing Ecosystem

Supported by ultraprecision crystal manufacturing capabilities.