

NASA Glenn Technology Fact Sheet

Laser Pulse Stretcher

Innovators at NASA's Glenn Research Center have devised a passive, robust optical laser pulse stretcher that transforms a short, intense laser pulse into a long, less-intense pulse while maintaining the laser's peak power. The laser pulse stretcher has enabled the first-ever turbulence-chemistry measurements in ultra low-emission combustors with an unprecedented level of accuracy. This critical new capability in combustion diagnostics enables the design and development of ultra-efficient combustors with lower emissions than ever before. This patented technology also virtually eliminates plasma sparking and protects sensitive optical components in the beam path. The laser pulse stretcher provides a deeper scientific understanding of combustion, generates significant cost savings, increases safety for scientists and engineers working in combustion diagnostics, and supports the goals of U.S. government and industry to lower greenhouse gas emissions.

Benefits

- **Green aviation:** The laser pulse stretcher is the key enabler of precision diagnostic experiments on next-generation, safer, cleaner combustors.
- **More accurate data:** Laser diagnostics require a powerful pulse to "freeze" and magnify molecules to obtain precise, accurate combustion data.
- **Cost savings:** The laser pulse stretcher can be used to validate computational combustor codes in order to shorten the design, development, test, and evaluation cycles for combustors of all kinds, resulting in tens of millions of dollars in cost savings.
- **Improved safety:** The laser pulse stretcher increases laser radiation safety by tenfold.

Applications

- Combustion diagnostics
- Combustor dynamics simulations
- Combustor design
- Stationary turbine power
- Automobile engine diagnostics
- Fuel spray diagnostics
- Supercritical anti-solvent research
- Carbon nanotube decomposition
- Supersonic wedge flows

Patent

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