

Instrumentation

Line Tunable Visible and Ultraviolet Laser

Nd:YAG laser used with nonlinear optics that can be made line-tunable to 172 different wavelengths

NASA Langley Research Center has developed a line tunable visible and ultraviolet laser. Originally developed to sense ozone, this technology is a means of generating a large number of additional wavelengths from an Nd:YAG laser, well beyond what is normally achieved. Using this technology, the laser can be made line-tunable to 172 different wavelengths, from the infrared (IR) through the visible to the ultraviolet (UV).

BENEFITS

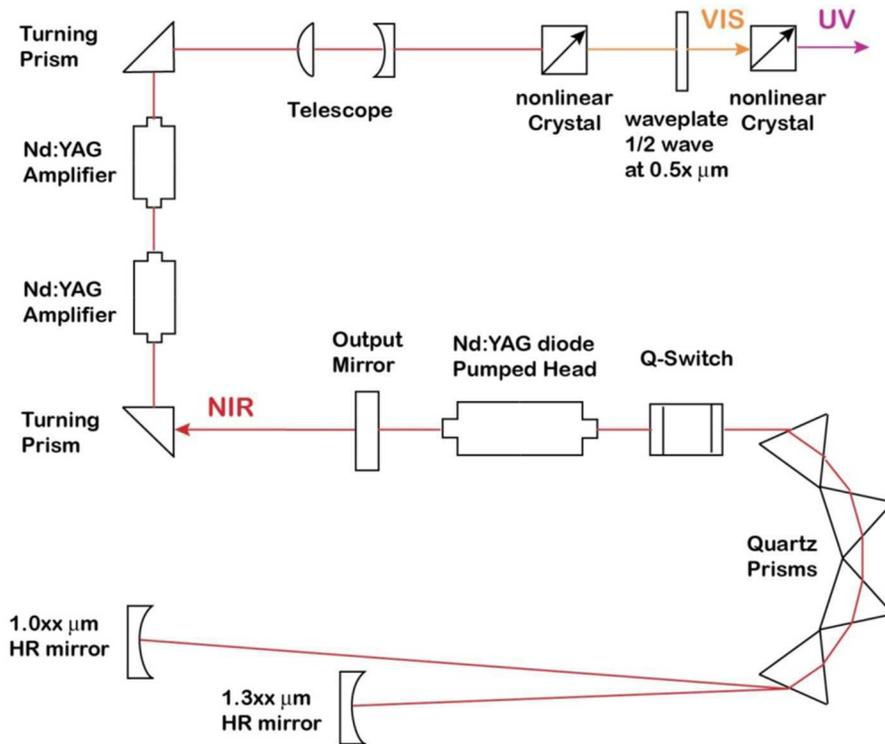
- Produces synchronous and collinear pulses at widely different wavelengths in the IR, which makes sum frequency generation (SFG) as easy as second harmonic generation (SHG), allowing generation of multiple wavelengths in the visible and UV
- Eliminates the need for dye lasers and rare gas halogen excimer lasers for certain wavelengths, both of which use unstable, hazardous, and corrosive materials
- Enables new applications by allowing wavelengths to be tuned to match the absorption characteristics of materials in processes, such as in cutting and welding

technology solution



THE TECHNOLOGY

The invention stems from the availability of other, generally unused lines in Nd, and the ability to generate two wavelengths simultaneously in a Q-switched laser. Since the two beams are synchronous and collinear, nonlinear optical mixing is as simple as second harmonic generation. Nonlinear mixing does not require mirrors as does parametric oscillation. Thus, the possibility of laser-induced damage is minimized.



Nd:YAG laser Synchronous Tunable Optical Pulses (STOP) with nonlinear optics

APPLICATIONS

The technology has several potential applications:

- Materials Processing: cutting and welding
- Medical: photodynamic therapy for cancer treatment
- Medical: tattoo and wrinkle removal
- Sensing

PUBLICATIONS

Patent No: 7,848,381

B.M. Walsh, Dual Wavelength Lasers, Laser Physics, DOI: 10.1134/S1054660X1005021X, 2010, Vol. 20, No. 3, pp. 622-634.

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