

Optical Analysis of Air induced breakdown plasma generated by high power Nd: YAG lasers

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Abstract:

High energy resource is mandatory to generate the air breakdown-based plasma. There are many ways to produce the air breakdown-based plasma, an external energy can be provided in the many forms like electrical energy, nuclear energy, thermal energy, photon energy, etc. In the present project work, high power laser has been utilised to generate air plasma. Quanta-Ray Pro-Series Nd: YAG laser with 10 nsec pulse width and up to 550 mJ/pulse energy is used in the experiment. The project work involves the study of basic properties related to optical component used in the experiment. Basic parameters like spherical aberration, chromatic aberration, laser output characterization has been studied experimentally. The laser induced plasma generated in air by focusing a 532 nm nanosecond pulse from Q-switched Nd: YAG laser. The data has been analysed by optical spectrum analyser (Ocean Optics, USB 4000). Result provided the information about the emission spectrum associated with air breakdown in UV, VIS and IR range. The experimental outcomes confirms that amplitude of output emission spectra has been increasing along with laser power and exposure time. It has been observed that laser induced plasma in air is mainly constitutes of Oxygen and Nitrogen molecules. Investigation of the temperature associated to sub particles involved in plasma is going on.

Keywords: Laser induced plasma, Nd: YAG laser, Optical spectroscopy.