Abstract Submitted
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Advanced laser diagnostics for gases and weakly ionized plasma
ARTHUR DOGARIU, Princeton University — Recent advancements in laser-based gas and plasma diagnostics will be presented, ranging from resonant multiphoton ionization to femtosecond filamentation. Spectroscopy and remote trace gas detection down to parts-per-billion are demonstrated using a combination of resonant laser ionization through multiphoton excitation, and microwave scattering off the weakly ionized plasma. The Radar-REMPI (Resonantly Enhanced Multi-Photon Ionization) technique also allows for studying the dynamics of the weak plasma, and first direct measurements of the electron attachment rates in atmospheric air are demonstrated. The plasma dynamics not only reveals the electron loss mechanisms such as attachment and recombination, but can also be a good measure of the electron density. Laser based techniques such as Rayleigh scattering are used for gas temperature measurements, and in particular Filtered Rayleigh Scattering shows great promise in environments where background scattering is significant. Femtosecond Laser Electronic Excitation Tagging (FLEET) is a new non-invasive laser technique for flow velocity mapping, and it is based on imaging nitrogen emission in femtosecond filaments. FLEET has been recently proven to be adequate for measuring and mapping the gas temperature as well.

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