Abstract Submitted
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Time-resolved conductivity measurements of air plasmas created by nonlinearly propagating ultrashort laser pulses[1] HOWARD DAO, Northeastern University, ALEXANDER ENGLESBE, EDWARD RUDEN, JAMES WYMER, JENNIFER ELLE, ANDREAS SCHMITT-SODY, Air Force Research Laboratory — The properties of the short-lived plasma generated by a high peak power, ultrashort laser pulse propagating in the atmosphere depend sensitively on the evolution of the laser pulse intensity profile. The intensity is determined by nonlinear optical effects arising from the bound electrons in the air molecules, in addition to natural diffraction and plasma-induced defocusing. The simultaneous contribution of these effects to the laser intensity means that the plasma properties are difficult to predict. However, it is possible to experimentally measure the plasma conductivity by probing the plasma with weak external electric fields. We measure the time history of the conductivity by propagating the laser through a hole in a waveguide that contains a CW microwave field oscillating at a frequency of 40 GHz. The 25 picosecond period of the microwave field enables small temporal resolution of the conductivity relative to the plasma lifetime, which is on the order of a nanosecond. We present comparisons of the conductivity due to laser pulses with a wavelength of 800 nm for varying laser conditions, such as the pulse energy and polarization state.

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