Resonant Excitation in the Double-Ionization of O$_2$ Molecule by Intense Short Laser Pulses$^1$ ALI ALNASEER, M. ZAMKOV, C.M. MAHARJAN, P. RANITOVIC, B. SHAN, Z. CHANG, I. V. LITVINYUK, C.L. COCKE, J. R. MACDONALD LABORATORY, PHYSICS DEPARTMENT, KANSAS STATE UNIV., MANHATTAN, KS, 66506 TEAM — The purpose of this experiment is to identify mechanisms whereby doubly charged molecules are produced by short intense laser pulses on neutral targets. We have used the COLTRIMS technique to measure in coincidence O$^+$ ion pairs produced in the double ionization of O$_2$ molecules by intense short laser pulses. High-resolution kinetic energy spectra and the angular distributions of the fragment ions were obtained. By using laser pulses of different durations (8-40 fs), intensities (1-10 X10$^{14}$W/cm$^2$) and wavelengths (500-2000nm), we found that double ionization of O$_2$ may occur from a combination of three different processes: Field ionization, rescattering and resonant multiphoton excitation. The production of the B$^3\Pi_g$ state in the O$^+_2\Sigma_g^+$ dictation shows a strong dependence on the laser wavelength. The data presented provide clear evidence of resonant multiphoton excitation in the production of the B$^3\Pi_g$ state at 800 nm wavelength.

$^1$This work was supported by Chemical Sciences, Geosciences and Biosciences Division, Office of Basic Energy Sciences, Office of Science, U. S. Department of Energy