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Measurement and Analysis of Carbon Swan Emissions using Laser Induced Breakdown Spectroscopy MICHAEL WITTE, CHRISTIAN PARIGGER, University of Tennessee Space Institute — Carbon Swan emissions are frequently noticeable in the recorded spectra of laser-generated plasma, for example, at or near biological materials, hydrocarbons and/or during laser ablation of carbon-containing substances. Therefore, it is desirable to accurately model C_2 diatomic molecular spectra. Temporally-resolved spectroscopy allows us to explore highly excited carbon Swan spectra, and in turn, we can utilize rotational and vibrational molecular spectra to characterize the laser plasma. In this work, C_2 is examined for nanosecond to microsecond time delays from optical breakdown, and for the $\Delta v = +2, +1, 0$, and -1 transitions. In previous experiments, line-strengths were used to determine vibrational and rotational temperature when assuming local thermodynamic equilibrium. We report new experimental results by exploring the temporal and spatial evolution and decay of laser-plasma generated by focusing 13 nanosecond, 190 mJ energy/pulse Nd:YAG laser radiation onto a carbon containing material, and subsequently dispersing and recording the emitted radiation using a spectrometer and a 2-dimensional gated, array detector. The computed line-strengths for the C_2 Swan system are employed as well in our analysis and fitting of the new experimental results.

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