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**Diagnostics of Expansion Tube Flows by Multi-pass Laser Absorption Spectroscopy** RYUJI KOBAYASHI, MAKOTO MATSUI, Department of Engineering, Shizuoka University, KAZUHIKO YAMADA, JAXA, Japan — Although expansion tubes have been used to simulate an ultrafast re-entry environment, the flow characteristics have not been completely understood. Our group has applied diode laser absorption spectroscopy (DLAS) to expansion tube flows. In our previous study, we diagnosed an expansion tubes flows in Institute of Space and Astronautical Science in JAXA using molecular oxygen line of 763.43 nm. The maximum fractional absorption was 0.6 %, which is comparable with that of the atmosphere outside the chamber. Then, Herriott type multi-pass system was developed to enhance the sensitivity of DLAS by increase the absorption length. In this study, the sensitivity was increased using a Herriott type multi-pass cell. As a result, in ISAS expansion tube, the sensitivity is 43 times and temperature of test flow is 4400~6000 K, but no sensitivity until the degree of dissociation is identified.

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