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Effects of the shear layer growth rate on the supersonic jet noise[1] YUTA OZAWA, Tohoku University, TAKU NONOMURA, Tohoku University, Presto, JST, AKIRA OYAMA, Japan Aerospace Exploration Agency, HIROYA MAMORI, NAOYA FUKUSHIMA, MAKOTO YAMAMOTO, Tokyo University of Science — Strong acoustic waves emitted from rocket plume might damage to rocket payloads because their payloads consist of fragile structure. Therefore, understanding and prediction of acoustic wave generation are of importance not only in science, but also in engineering. The present study makes experiments of a supersonic jet flow at the Mach number of 2.0 and investigates a relationship between growth rate of a shear layer and noise generation of the supersonic jet. We conducted particle image velocimetry (PIV) and acoustic measurements for three different shaped nozzles. These nozzles were employed to control the condition of a shear layer of the supersonic jet flow. We applied single-pixel ensemble correlation method (Westerweel et al., 2004) for the PIV images to obtain high-resolution averaged velocity profiles. This correlation method enabled us to obtain detailed data of the shear layer. For all cases, acoustic measurements clearly shows the noise source position at the end of a potential core of the jet. In the case where laminar to turbulent transition occurred in the shear layer, the sound pressure level increased by 4 dB at the maximum.

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