

Numerical Simulation of the Acoustic Characteristics of Hartmann Generator

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● Responsible Representative

Tatsuya Ishii, Aeronautical Technology Directorate, Aviation Environmental Sustainability Innovation Hub

● Contact Information

Noise and Vibration Reduction Technology team, Aviation Environmental Sustainability Innovation Hub, Aeronautical Technology Directorate(enomoto.shunji@jaxa.jp)

● Members

Taichi Fujimoto, Shunji Enomoto, Tatsuya Ishii

● Abstract

Numerical analysis of a fluid interference generator, which generates high sound pressure that can affect the structure of the flow field, for the purpose of reducing the noise generated by the exhaust jet of an aero engine.

● Reasons and benefits of using JAXA Supercomputer System

The computational performance of the JAXA supercomputer was necessary to perform the calculations on a large number of Hartmann generator geometries.

● Achievements of the Year

The objective of this year's study was to understand the basic acoustic characteristics of the Hartmann generator. The pressure fluctuations produced by the Hartmann generator were reproduced numerically, and acoustic analysis of the far field was conducted to study the directivity of the sound pressure level and the difference in sound power. Figure is an example of a visualization movie of the calculation results. By performing a series of calculations, we were able to obtain fundamental knowledge such as at what position the resonance tube of the Hartmann generator should be placed to increase the sound power.

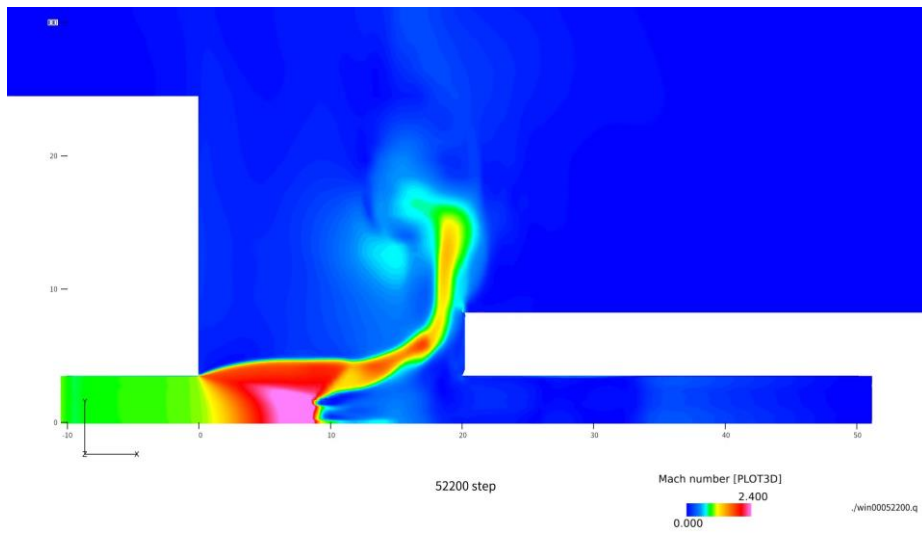


Fig. 1: Example of numerical analysis of Hartmann generator (Mach number)
 (Video. Video is available on the web.)

- **Publications**

N/A

- **Usage of JSS**

- **Computational Information**

Process Parallelization Methods	MPI
Thread Parallelization Methods	OpenMP
Number of Processes	32
Elapsed Time per Case	22 Hour(s)

● **JSS3 Resources Used**

Fraction of Usage in Total Resources*1(%): 0.07

Details

Computational Resources		
System Name	CPU Resources Used (core x hours)	Fraction of Usage*2(%)
TOKI-SORA	1,615,299.67	0.07
TOKI-ST	19,905.42	0.02
TOKI-GP	0.00	0.00
TOKI-XM	0.00	0.00
TOKI-LM	0.00	0.00
TOKI-TST	0.00	0.00
TOKI-TGP	0.00	0.00
TOKI-TLM	0.00	0.00

File System Resources		
File System Name	Storage Assigned (GiB)	Fraction of Usage*2 (%)
/home	17.69	0.02
/data and /data2	104,863.08	0.81
/ssd	493.85	0.07

Archiver Resources		
Archiver Name	Storage Used (TiB)	Fraction of Usage*2 (%)
J-SPACE	20.86	0.09

*1: Fraction of Usage in Total Resources: Weighted average of three resource types (Computing, File System, and Archiver).

*2: Fraction of Usage : Percentage of usage relative to each resource used in one year.

- **ISV Software Licenses Used**

ISV Software Licenses Resources		
	ISV Software Licenses Used (Hours)	Fraction of Usage ^{*2} (%)
ISV Software Licenses (Total)	1,632.37	1.14

*2: Fraction of Usage : Percentage of usage relative to each resource used in one year.