

## Investigation of internal flow of aircraft combustor for En-Core Project.

Report Number: R22EA0714

Subject Category: Aeronautical Technology

URL: <https://www.jss.jaxa.jp/en/ar/e2022/20733/>

### ● Responsible Representative

Mitsumasa Makida(JAXA, Aeronautical Technology Directorate)

### ● Contact Information

Mitsumasa Makida(Aeronautical Technology Directorate)(makida.mitsumasa@jaxa.jp)

### ● Members

Mitsumasa Makida, Naoki Nakamura, Takashi Ishiyama

### ● Abstract

In the development process of aircraft combustors, air mass flow distribution between fuel nozzles and cooling air holes on the liner effects performances of combustors. In this research, we conduct combustion simulations of internal flow inside the combustor which faithfully simulates the configuration of practical combustor. Then their results are applied as initial conditions for the acoustic calculation which are conducted to predict combustion oscillation.

### ● Reasons and benefits of using JAXA Supercomputer System

It is important to do parametric case study with slightly different geometry, and each case needs large scale simulation. To conduct such simulation effectively, we need the super computer with high parallelization efficiency.

### ● Achievements of the Year

In this fiscal year, we made numerical grids which faithfully simulates the configuration of practical annular combustor, then conducted internal simulations by a commercial code. These results were applied as initial conditions for the acoustic calculation by a commercial code. Then we investigated the oscillation mode.

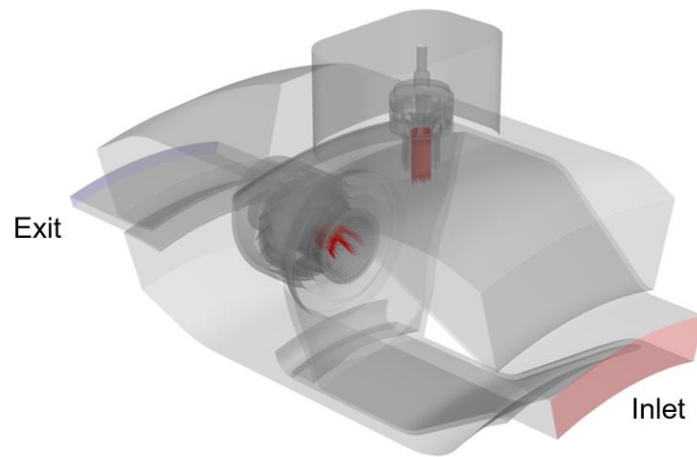


Fig. 1: Numerical region for combustion calculation

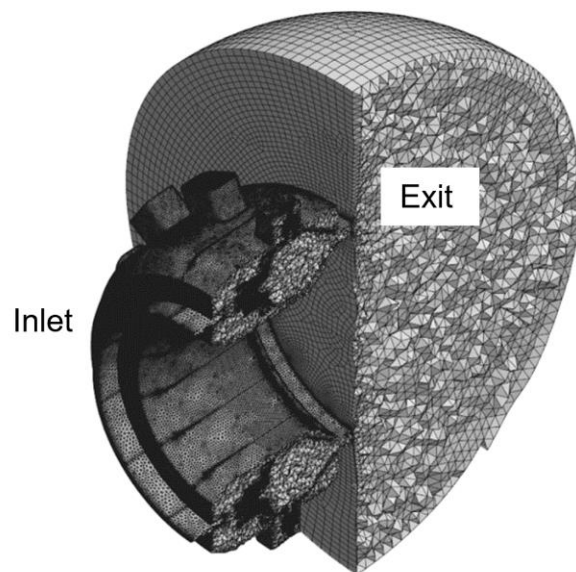


Fig. 2: Numerical grid for acoustic calculation

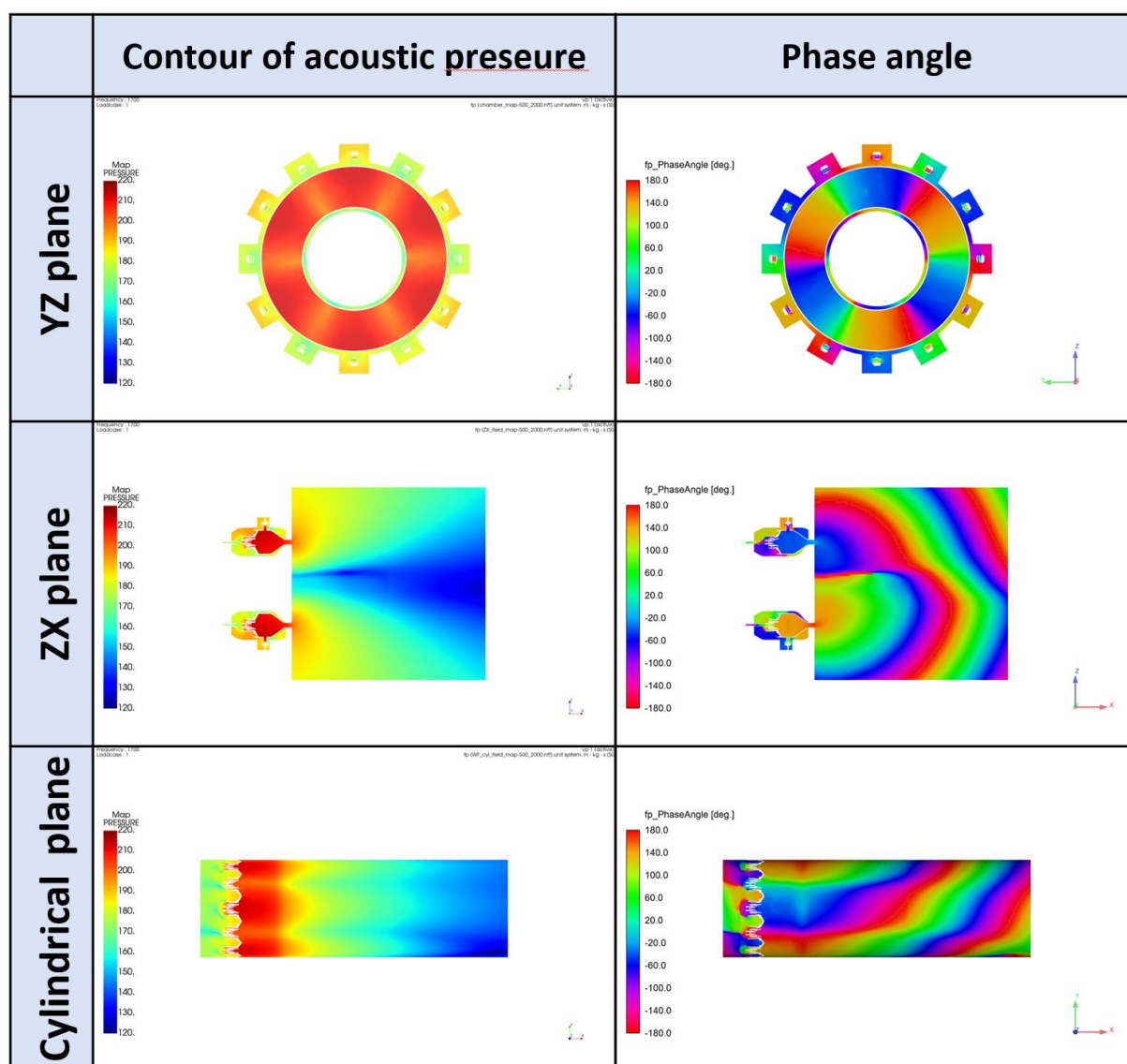


Fig. 3: Contour of acoustic pressure and phase angle on each plane

### Publications

N/A

### Usage of JSS

#### Computational Information

Process Parallelization Methods	MPI
Thread Parallelization Methods	Automatic Parallelization
Number of Processes	36
Elapsed Time per Case	192 Hour(s)

- **JSS3 Resources Used**

Fraction of Usage in Total Resources\*1(%): 0.29

Details

Computational Resources		
System Name	CPU Resources Used (core x hours)	Fraction of Usage*2(%)
TOKI-SORA	7,625,984.93	0.33
TOKI-ST	36,244.27	0.04
TOKI-GP	0.00	0.00
TOKI-XM	0.00	0.00
TOKI-LM	10,008.56	0.67
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	72.90	0.07
/data and /data2	7,375.05	0.06
/ssd	37.50	0.01

Archiver Resources		
Archiver Name	Storage Used (TiB)	Fraction of Usage*2 (%)
J-SPACE	3.49	0.02

\*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 <sup>*2</sup> (%)
ISV Software Licenses (Total)	859.12	0.60

<sup>\*2</sup>: Fraction of Usage : Percentage of usage relative to each resource used in one year.