

# The Quantitative Density Measurement of Unsteady Flow around the Projectile\*

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## Abstract

Three-dimensional density measurement of unsteady flow field around a sphere is carried out in the ballistic range at Institute of Fluid Science, Tohoku University. Simultaneous multi-angle measurement system using twelve digital cameras is installed in the test chamber of the ballistic range to achieve the three-dimensional density measurement. The Colored-Grid Background Oriented Schlieren (CGBOS) technique using colored-grid background is utilized for the reconstruction of density. The Mach number of the sphere is set to 1.5. The short pulse LEDs to illuminate the backgrounds are also installed in the chamber to capture the unsteady flow field around a flying sphere. Three-dimensional density distribution around a sphere is successfully reconstructed.

## Keywords

Background Oriented Schlieren, Flow Visualization, High Speed Flows, Unsteady Flow, Simultaneous Measurement

## 1. Introduction

The supersonic aircrafts and rockets are developed actively all over the world. In the development process, the density measurement around the model of aircraft and rockets under the supersonic speed is important in order to obtain aerodynamic properties [1] [2] [3].

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## **Table of Contents Symposium On Measurement In Unsteady Flow**

1. Understanding the eBook Symposium On Measurement In Unsteady Flow
  - The Rise of Digital Reading Symposium On Measurement In Unsteady Flow
  - Advantages of eBooks Over Traditional Books
2. Identifying Symposium On Measurement In Unsteady Flow
  - Exploring Different Genres
  - Considering Fiction vs. Non-Fiction
  - Determining Your Reading Goals
3. Choosing the Right eBook Platform
  - Popular eBook Platforms
  - Features to Look for in an Symposium On Measurement In Unsteady Flow
  - User-Friendly Interface
4. Exploring eBook Recommendations from Symposium On Measurement In Unsteady Flow
  - Personalized Recommendations
  - Symposium On Measurement In Unsteady Flow User Reviews and Ratings

- Symposium On Measurement In Unsteady Flow and Bestseller Lists
- 5. Accessing Symposium On Measurement In Unsteady Flow Free and Paid eBooks
  - Symposium On Measurement In Unsteady Flow Public Domain eBooks
  - Symposium On Measurement In Unsteady Flow eBook Subscription Services
  - Symposium On Measurement In Unsteady Flow Budget-Friendly Options
- 6. Navigating Symposium On Measurement In Unsteady Flow eBook Formats
  - ePub, PDF, MOBI, and More
  - Symposium On Measurement In Unsteady Flow Compatibility with Devices
  - Symposium On Measurement In Unsteady Flow Enhanced eBook Features
- 7. Enhancing Your Reading Experience
  - Adjustable Fonts and Text Sizes of Symposium On Measurement In Unsteady Flow
  - Highlighting and Note-Taking Symposium On Measurement In Unsteady Flow
  - Interactive Elements Symposium On Measurement In Unsteady Flow
- 8. Staying Engaged with Symposium On Measurement In Unsteady Flow
  - Joining Online Reading Communities
  - Participating in Virtual Book Clubs
  - Following Authors and Publishers Symposium On Measurement In Unsteady Flow
- 9. Balancing eBooks and Physical Books Symposium On Measurement In Unsteady Flow
  - Benefits of a Digital Library
  - Creating a Diverse Reading Collection Symposium On Measurement In Unsteady Flow
- 10. Overcoming Reading Challenges
  - Dealing with Digital Eye Strain
  - Minimizing Distractions
  - Managing Screen Time
- 11. Cultivating a Reading Routine Symposium On Measurement In Unsteady Flow
  - Setting Reading Goals Symposium On Measurement In Unsteady Flow
  - Carving Out Dedicated Reading Time
- 12. Sourcing Reliable Information of Symposium On Measurement In Unsteady Flow
  - Fact-Checking eBook Content of Symposium On Measurement In Unsteady Flow
  - Distinguishing Credible Sources

13. Promoting Lifelong Learning
  - Utilizing eBooks for Skill Development
  - Exploring Educational eBooks
14. Embracing eBook Trends
  - Integration of Multimedia Elements
  - Interactive and Gamified eBooks

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