

1. Record Nr.	UNINA9910139118203321
Autore	Valiere Jean-Christophe
Titolo	Acoustic particle velocity measurements using laser : principles, signal processing and applications // Jean-Christophe Valiere
Pubbl/distr/stampa	London, England ; ; Hoboken, New Jersey : , : ISTE Ltd : , : John Wiley & Sons, , 2014 ©2014
ISBN	1-118-64933-8 1-118-64934-6
Descrizione fisica	1 online resource (157 p.)
Collana	Focus Series, , 2051-249X
Disciplina	534.42
Soggetti	Sound - Measurement Electro-acoustics
Lingua di pubblicazione	Inglese
Formato	Materiale a stampa
Livello bibliografico	Monografia
Note generali	Description based upon print version of record.
Nota di bibliografia	Includes bibliographical references and index.
Nota di contenuto	Cover; Title Page; Contents; Preface; Chapter 1. Summary Of Acoustic Equations; 1.1. Basic equations; 1.1.1. Fluid- and thermodynamics; 1.1.2. Hypothesis of linear acoustics without losses; 1.2. Acoustic equations; 1.2.1. Linear acoustic equations with sources; 1.2.2. Some remarks on acoustic sources; 1.2.3. Without sources; 1.2.4. Acoustic intensity and source power; 1.2.5. Acoustic impedance and border conditions; 1.3. Constants, units and magnitude orders of linear acoustics; 1.4. Acoustic velocity measurement and applications; 1.4.1. Velocity estimation from pressure gradient 1.4.2. Intensity estimation 1.4.3. Application to impedance estimation; 1.5. Beyond linear equations; 1.5.1. Acoustic equations with mean flow; 1.5.2. High acoustic displacement; 1.5.3. Acoustic streaming; 1.6. Bibliography; Chapter 2. Some Topics On Signal Processing; 2.1. Measurement signal; 2.1.1. Random signals; 2.1.2. Statistical averages; 2.1.3. Time averages; 2.1.4. Acoustic signal model; 2.2. Reminder of Fourier analysis tools; 2.2.1. Fourier transform; 2.2.2. Uniform sampling and recovery of signals; 2.2.3. Fourier transform of discrete signals; 2.2.4. Discrete Fourier transform 2.3. Correlations and spectra 2.3.1. Definitions; 2.3.2. Stationary and ergodic process; 2.3.3. Properties of correlation functions and

examples; 2.3.4. PSD and cross-spectral density properties; 2.4. Basis of estimation theory; 2.4.1. Definition and properties of an estimation method; 2.4.2. Mean estimator; 2.4.3. Correlation estimators; 2.4.4. Spectrum estimators; 2.4.5. Spectrum estimator by synchronous detection approach; 2.5. Non-uniform sampling; 2.5.1. Poisson processes; 2.5.2. Empirical estimators; 2.5.3. Comparison of spectrum estimation of random sampling sequences; 2.6. Bibliography; 2.7. Appendix 2.7.1. Properties of the Fourier transform; 2.7.2. Fourier transforms of typical functions; 2.7.3. Properties of the discrete Fourier transform (DFT); Chapter 3. Ldv For Acoustics; 3.1. Bases of LDV; 3.1.1. Optical principles; 3.1.2. Signal processing of burst analyses in the context of fluid mechanics; 3.2. Models for acoustics; 3.2.1. Model of the Doppler signal; 3.2.2. Model of the sampling in the context of acoustics; 3.2.3. Case of low acoustic displacement with few mean flows; 3.2.4. Case of high acoustic displacement with few mean flows; 3.2.5. Other cases; 3.3. Estimation method for low acoustic displacement 3.3.1. Theoretical limitations; 3.3.2. Estimation methods based on IF detection; 3.3.3. Estimation based on parametrical models; 3.3.4. Simultaneous detection of flow velocity and small acoustic velocity; 3.3.5. Comparison between methods for low-level acoustics; 3.4. Estimation method for high displacement; 3.4.1. Experimental condition; 3.4.2. Theoretical limitations; 3.4.3. Estimation for SPP; 3.4.4. Estimation for highly NSPP; 3.5. Bibliography; Chapter 4. Piv For Acoustics; 4.1. Principle of PIV; 4.1.1. Setting up; 4.1.2. Model of the 2D signal and image processing

---

## Sommario/riassunto

This book concerns the presentation of particle velocity measurement for acoustics using lasers, including Laser Doppler Velocimetry (LDV or Anemometry (LDA)) and Particle Imagery Velocimetry (PIV). The objective is first to present the importance of measuring the acoustic velocity, especially when the acoustic equations are nonlinear as well as characterizing the near fields. However, these applications need to use non-invasive sensors. Some optical techniques, initially developed for fluid mechanics, have been adapted to the field of acoustics in recent years. This book summarizes 15

---