



Due to the rapid development of the sound intensity techniques over the last few years there is a lack of comprehensive, up-to-date texts on the subject. This list of references covers a broad range of subjects and includes both basic and advanced methods.

REVIEW ARTICLES

T.J. SCHULTZ, P.W. SMITH, and C.I. MALME.
"Measurement of Acoustic Intensity in a Reactive Sound Field."
J. Acoust. Soc. Am. 57, 1263-1268 (1973).

H.F. OLSON.
"Field-Type Acoustic Wattmeter."
J. Audio Eng. Soc. 22, 321-328 (1974).

S. GADE.
"Sound Intensity (Part I. Theory)." *Brüel & Kjær Technical Review* 3-1982, 3-39 (1982).

S. GADE.
"Sound Intensity (Part II. Instrumentation and Application)." *Brüel & Kjær Technical Review* 4-1982, 3-32 (1982).

S. GADE.
"Validity of intensity measurements." *Brüel & Kjær Technical Review* 4-1985, 3-31 (1985).

HISTORICAL BACKGROUND

H.F. OLSON.
"System Responsive to the Energy Flow of Sound Waves." U.S. Patent No. 1,892,644 (1932).

C.F. CLAPP and F.A. FIRESTONE.
"The Acoustic Wattmeter — An Instrument for Measuring Sound Energy Flow." *J. Acoust. Soc. Am.* 13, 124-136 (1941).

S. BAKER.
"An Acoustic Intensity Meter." *J. Acoust. Soc. Am.* 27, 269-273 (1955).
T.J. Schultz, "Acoustic Intensity Meter." *J. Acoust. Soc. Am.* 27, 269-273 (1955).

T.J. SCHULTZ.
"Acoustic Wattmeter." *J. Acoust. Soc. Am.* 28, 693-699 (1956).

T.J. SCHULTZ.
"Outlook for In-Situ Measurement of Noise from Machines." *J. Acoust. Soc. Am.* 54, 982-984 (1973).

W. STAHEL and H.P. LAMBRICH.

"Development of an Instrument for the Measurement of Sound Intensity and its Application in Car Acoustics." External Publication, Interkeller A.G., Zürich, Switzerland (1977).

MODERN FORMULATION

J.Y. CHUNG.
"Cross-Spectral Method of Measuring Acoustic Intensity Without Error Caused by Instrument Phase Mismatch." *J. Acoust. Soc. Am.* 64, 1613-1616 (1978). Also: Report GMR-2617, General Motors Research Laboratories, Warren, MI., USA (1977).

F.J. FAHY.
"Measurement of Acoustic Intensity Using the Cross-Spectral Density of Two Microphone Signals." *J. Acoust. Soc. Am.* 62, 1057-1059 (L) (1977).

O. ROTH.
"A Sound Intensity Real-Time Analyzer." *Proc. International Congress on Recent Developments in Acoustic Intensity Measurement, CETIM, Senlis, France, 69-74 (1981).*

G.P. MATHUR.
"A General Theoretical Formulation for Acoustic Intensity Method using Two Microphones." *Proc. NOISE-CON 83 (1983).*

ALSO OF INTEREST

J.D. BRITO.
"Sound Intensity Patterns for Vibrating Surfaces." Ph.D. Thesis, Massachusetts Institute of Technology, Cambridge, MA., USA (1976).

R.J. ALFREDSON.
"A New Technique for Noise Source Identification on a Multi-Cylinder Automotive Engine." *Proc. of NOISE-CON 77, 307-319 (1977).*

F.J. FAHY.
"A Technique for Measuring Sound Intensity with a Sound Level Meter." *Noise Control Engineering* 9, 155-162 (1977).

T.H. HODGSON.

"Investigation of the Surface Acoustical Intensity Method for Determining the Noise Sound Power of a Large Machine In-Situ." *J. Acoust. Soc. Am* 61, 487-493 (1977).

G. PAVIC.

"Measurement of Sound Intensity." *J. Sound Vib.* 51, 533-545 (1977).

J.Y. CHUNG and J. POPE.

"Practical Measurement of Acoustic Intensity - The Two Microphone Cross-Spectral Method." *Proc. INTER-NOISE 78*, 893-900 (1978).

C.H. HANSEN and D.A. BIES.

"Near Field Determination of the Complex Radiation Efficiency and Acoustic Intensity Distribution for a Resonantly Vibrating Surface." *J. Sound Vib.* 62, 93-110 (1979).

O.K.O. PETTERSEN.

"A Procedure for Determining the Sound Intensity Distribution Close to a Vibrating Surface." *J. Sound Vib.* 66, 626-629 (1979).

R.J. ALFREDSON.

"The Direct Measurement of Acoustic Energy in Transient Sound Fields." *J. Sound Vib.* 70, 181-186 (1980).

F. JACOBSEN.

Measurement of Sound Intensity. Report No.28, 1980 Acoustics Laboratory of the Danish Technical University (1980).

P. SAS.

"Digital Sound Intensity Measurements." Research Report, Afdeling Werkplaatstechniek en Industrieel Beleid, Katholieke Universiteit Leuven, Heverlee, Belgium (1980).

ANON., ED.

"Recent Developments in Acoustic Intensity Measurement." CETIM, Senlis, France (1981). (A conference proceedings containing 36 papers on all aspects of sound intensity.)

J.Y. CHUNG and D.A. BLASER.

"Recent Developments in the Measurement of Acoustic Intensity Using the Cross-Spectral Method." SAE Paper 810396 (1981).

F.J. FAHY and S.J. ELLIOTT.

"Acoustic Intensity Measurements of Transient Noise Sources." *Noise Control Engineering* 17, 120-125 (1981).

G. KRISHNAPPA.

"Cross Spectral Method of Measuring Acoustic Intensity by Correcting Phase and Gain Mismatch Errors by Microphone Calibration." *J. Acoust. Soc. Am.* 69, 307-310 (L) (1981).

NOISE SOURCE IDENTIFICATION

F. FRIUNDI.

"The Utilization of the Intensity Meter for the Investigation of the Sound Radiation of Surfaces." External Publication, Interkeller AG, Zürich, Switzerland (1977).

J.Y. CHUNG, J. POPE and D.A. FELDMAIER.

"Application of Acoustic Intensity Measurement to Engine Noise Evaluation." *Proc. of SAE Diesel Engine Noise Conference*, SAE Publication P-80, Paper 790502 (1979).

P.R. DONOVAN and L.J. OSWALD.

"The Identification and Quantification of Truck Tire Noise Sources Under On-road Operating Conditions." *Proc. INTER-NOISE 80* (1980).

T. REINHART and M.J. CROCKER.

"A Comparison of Noise Source Identification Technique on a Diesel Engine." *Proc. INTER-NOISE 80*, 1129-1132 (1980).

A.F. SEYBERT.

"Source Characterization Using Acoustic Intensity Measurements." *Proc. INTER-NOISE 80*, 1067-1070 (1980).

ANON., ED.

"Recent Developments in Acoustic Intensity Measurements." CETIM, Senlis, France (1981). (A conference proceedings containing 36 pages on all aspects of sound intensity.)

K.B. GINN and M. BROCK.

"Noise Control Investigation using Sound Intensity Measurements." *Brüel & Kjær Application Note BO-0023* (1981).

M.C. MCGARY.

"Interior Noise Source/Path Identification on Propeller-Driven Aircraft Acoustic Intensity Methods." *Proc. NOISE-CON 81*, 261-264 (1981).

M.C. MCGARY and M.J. CROCKER.

"Surface Intensity Measurements on a Diesel Engine." *Noise Control Engineering* 16, 26-36 (1981).

O.K.O. PETTERSEN.

"Sound Intensity Measurements for Describing Acoustic Power Flow." *Applied Acoustics* 14, 387-397 (1981).

J. POPE, R. HICKLING, D.A. FELDMAIER and D.A. BLASER.

"The Use of Acoustic-Intensity Scans for Sound Power Measurement and for Noise Source Identification in Surface Transportation Vehicles." SAE Paper 810401, SAE Transactions, 1530-1538 (1981).

SOUND POWER DETERMINATION

J.F. BURGER, C.J.J. VAN DER MERWE, B.G. VAN ZYL, and L. JOFFE.

"Measurement of Sound Intensity Applied to the Determination of Radiated Sound Power." *J. Acoust. Soc. Am.* 53, 1167-1168 (L) (1973).

B.G. VAN ZYL and F. ANDERSON.

"Evaluation of the Intensity Method of Sound Power Determination." *J. Acoust. Soc. Am.* 57, 682-686 (1974).

F.J. FAHY.

"Measurements with an Intensity Meter of the Acoustic Power of a Small Machine in a Room." *J. Sound and Vibration* 57, 311-322 (1978).

J.M. LAMBERT.

"The Application of a Modern Intensity Meter to Industrial Problems: Example of In-Situ Sound Power Determination." *Proc. INTER-NOISE 79*, 227-231 (1979).

F. LAVILLE, G. SALVAN and J.C. PASCAL.

"Sound Power Determination Using Intensity Measurements Under Field Conditions." *Proc. INTER-NOISE 80*, 1083-1086 (1980).

- ANON., ED.
"Recent Developments in Acoustic Intensity Measurement." CETIM, Senlis, France (1981). (containing 36 papers on all aspects of sound intensity.)
- O. ROTH, K.B. GINN and S. GADE.
"Sound Power Determinations from Sound Intensity Measurements in a Semi-Anechoic Room." Brüel & Kjær Application Note BO-0062 (1982).
- S. GADE, H. WULFF and K.B. GINN.
"Sound Power Determination using Sound Intensity Measurements (Part I)." Brüel & Kjær Application Note BO-0055 (1982).
- S. GADE, N. THRANE and K.B. GINN.
"Sound Power Determination using Sound Intensity Measurements (Part II)." Brüel & Kjær Application Note BO-0054 (1982).
- S. GADE, K.B. GINN, O. ROTH and M. BROCH.
"Sound Power Determination in Highly Reactive Environments using Sound Intensity Measurements." Proc. INTER-NOISE 83 (1983).
- H.A. WOLF.
"An Acoustic Intensity Spatial Sampling Technique for Measuring the Sound Power of Industrial Equipment In-Situ." Proc. NOISE-CON 83, 343-348 (1983).

OTHER TOPICS

- D.A. BLASER and J.Y. CHUNG.
"A Transfer Function Technique for Determining the Acoustic Characteristics of Duct Systems with Flow." Proc. INTER-NOISE 78, 901-908 (1978).
- D.H. MUNRO and K.U. INGARD.
"On Acoustic Intensity Measurements in the Presence of Mean Flow." J. Acoust. Soc. Am. 65, 1402-1406 (1979).
- J.Y. CHUNG and D.A. BLASER.
"Transfer Function Method of Measuring Acoustic Intensity in a Duct System with Flow." J. Acoust. Soc. Am. 68, 1570-1577 (1980).
- J.Y. CHUNG and D.A. BLASER.
"Transfer Function Method of Measuring In-Duct Acoustic Properties, I. Theory and II. Experiment." J. Acoust. Soc. Am. 68, 907-921 (1980).
- L.J. OSWALD and P.R. DONAVAN.
"Acoustic Intensity Measurements in Low Mach Number Flows of Moderate Turbulence Levels." Report GMR-3269, General Motors Research Laboratories, Warren, MI., USA (1980).
- ANON., ED.
"Recent Developments in Acoustic Intensity Measurement". CETIM, Senlis, France (1981). (A conference proceedings containing 36 papers on all aspects of sound intensity.)
- M.J. CROKER, P.K. RAJU and B. FORSSEN.
"Measurement of Transmission Loss of Panels by the Direct Determination of Transmitted Acoustic Intensity." Noise Control Engineering 17, 6-11 (1981).
- A.F. SEYBERT.
"Statistical Errors in Acoustic Intensity Measurements." J. Sound Vib. 75, 519-526 (1981).

- J.K. THOMPSON and D.R. TREE.
"Finite Difference Approximation Errors in Acoustic Intensity Measurements." J. Sound Vib. 75, 229-238 (1981).
- Comment by S.J. ELLIOT.
"Errors in Acoustic Intensity Measurements." with Author's reply. J. Sound Vib. 78, 439-445 (1981).
- Comment by J. POPE and J.Y. CHUNG.
"Comments on Finite Difference Approximation Errors in Acoustic Intensity Measurements", with Author's reply. J. Sound Vib. 83, 459-464 (1982).
- J.C. PASCAL and C. CARLES.
"Systematic Measurement Errors with Two Microphone Sound Intensity Meters." J. Sound Vib. 83, 53-65 (1982).
- Y.S. WANG and M.J. CROCKER.
"Direct Measurement of Transmission Loss of Aircraft Structures using the Acoustic Intensity Approach." Noise Control Engineering 19, 80-85 (1982).
- B. FORSSEN and M.J. CROCKER.
"Estimation of Acoustic Velocity, Surface Velocity and Radiation Efficiency by use of the Two-Microphone Technique." J. Acoust. Soc. Am. 73, 1047-1053 (1983).
- P. RASMUSSEN.
"Measurement of Vibration Intensity." Brüel & Kjær, Nærum, Denmark (1983).
- O. DYRLUND.
"A note on statistical errors in acoustic intensity measurements", J. Sound Vib, 90, 585-589, (1983).
- S. GADE.
"Validity of intensity measurements". Proc. INTER-NOISE 84, 1077-1082 (1984).
- K. B. GINN.
"Instrumentation for real-time surface intensity measurements" Proc. INTER-NOISE 84, 1083-1086 (1984).
- GEORGE C. MALING, Editor.
"Internoise" Proc. INTER-NOISE Vol. II 1984 (containing 37 papers on all aspects of sound intensity).
- ANON., Editor.
"Internoise" Proc. INTER-NOISE Vol. I & II 1985 (containing papers on all aspects of sound intensity).
- ANON., ED., Editor.
"2nd International Congress on Acoustic Intensity", CETIM, Senlis, France (1985) (containing 80 papers on all aspects of sound intensity).

SPATIAL TRANSFORMATION OF SOUND FIELDS

- C.W. HORTON & G.S. INNIS.
"The Computation of far-field radiation patterns from measurements made near the source" J. Acoust. Soc. Am. 33 (7) 877-880 (1961).
- H.G. FERRIS.
"Computation of farfield radiation patterns by use of a general integral solution to the time-dependent scalar wave equation" J. Acoust. Soc. Am. 41 (2) 394-400 (1967).

- E.G. WILLIAMS & J.D. MAYNARD.
"Holographic imaging without the wavelength resolution limit" *Physical Review Letters*, Vol., 45, nr.7, 554-557 (1980)
- E.G. WILLIAMS, J.D. MAYNARD and E. SKUDRZYK.
"Sound Source Reconstructions Using a Microphone Array." *J. Acoust. Soc. Am.* 68, 340-344 (1980).
- J.D. MAYNARD and E.G. WILLIAMS.
"Nearfield Holography, A New Technique for Noise Radiation Measurement." *Proc. NOISE-CON 81*, 19-24 (1981).
- J. HALD and O. ROTH.
"Spatial Transformation of Sound Fields." *J. Acoust. Soc. Am. Suppl. 1* 74, S62 (1983).
- E.G. WILLIAMS & H.D. DARDY.
"Nearfield acoustical holography using an underwater automated scanner" *J. Acoust. Soc. Am.* 89(2), 789-798 (1985)
- J.D. MAYNARD, E.G. WILLIAMS & Y. LEE.
"Nearfield acoustic holography: I. Theory of generalised holography and the development of NAH" *J. Acoust. Soc. AM.* 78(4) 1395-1413 (1985)
- E.G. WILLIAMS, H.D. Dardy & R.G. FINK.
"A technique for the measurement of structure borne intensity plates" *J. Acoust. Soc. Am.* 78(6) 2062-2068 (1985)
- J. HALD.
"Simulation of partial noise source attenuation" *Proc. Noise Con.* 85, 453-458

- K.B. GINN & J. HALD.
"Spatial transformation of sound fields" *Proc. 2nd International Congress on Acoustic Intensity*, CETIM, Senlis, France (1985)
- K.B. GINN & J. HALD.
"A practical system for spatial transformation of sound fields" *Proc. Institute of acoustics, spring conference, Salford* (1986)

TEXTBOOKS ON ACOUSTICS

- A.B. WOOD.
"A Textbook of Sound." G. Bell and Sons, Ltd., London, (Third (revised) Edition) (1955).
- A.D. PIERCE.
"Acoustics, An Introduction to its Physical Principles and Applications." McGraw-Hill Book Company, New York (1981).
- L.E. KINSLER, A.R. FREY, A.B. COPPENS and J.V. SANDERS.
"Fundamentals of Acoustics". John Wiley and Sons, New York, (Third Edition) (1982).
- E. SKUDRZYK.
"The foundations of acoustics". Springer-Verlag Wien, New York (1971)