



Conference proceedings | © 2022

# Advances in Structural Mechanics and Applications

Proceedings of ASMA-2021 (Volume 3)

**Editors:** [José António Fonseca de Oliveira Correia](#),  
[Satyabrata Choudhury](#), [Subhrajit Dutta](#)

**Part of the book series:** [Structural Integrity](#) (STIN,  
volume 27)

**Conference series link(s):** [ASMA: International  
Conference on Advances in Structural Mechanics and  
Applications](#)

**9889** Accesses | **12** Citations

Conference proceedings info: ASMA 2021.

## Sections

[Table of contents](#)

[Other volumes](#)

[About this book](#)

[Keywords](#)

[Editors and Affiliations](#)

[Bibliographic Information](#)

This is a preview of subscription content, [access via your institution.](#)

## Table of contents (32 papers)

Search within book

← Previous

Page

2

of 2

Next →

### [Influence of Hot Air Exposure on CFRP Shear Strengthened RC T-Beams](#)

Franklin F. R. Frederick, U. K. Sharma, V. K. Gupta  
Pages 257-271

### [Mathematical Models for Seismic Analysis of Elevated Water Tanks: A Review](#)

Kangkana K. Baruah, Satyabrata Choudhury  
Pages 272-281

### [Seismic Vulnerability Assessment Methods: A Review](#)

N. Sarma Roy, Satyabrata Choudhury  
Pages 282-300

### [Advancement in Direct Displacement-Based Design: A Review](#)

Manish Pal, Satyabrata Choudhury  
Pages 301-324

### [Study on High Strength Concrete with Hybrid Combination of Steel and Polypropylene Fibers](#)

G. Prasanna, A. Sumathi  
Pages 325-335

## [Response of T-shaped Tall Building Under Wind Load](#)

P. G. Priyadarsh, Neelam Rani

Pages 336-343

---

## [Source Localization in a Framed Structure for Effective Damage Detection Using Acoustic Emission Technique](#)

Anupam Kumar Biswas, Alope Kumar Datta, Pijush Topdar, Sanjay Sengupta

Pages 344-352

---

## [Study on Evaluation of Angle Connection for Transmission Towers](#)

Vinay Kumar Singh, Abhishek Kumar Gautam

Pages 353-363

---

## [Performance-Based Seismic Design on Bridge Piers: A Review](#)

Gaddam Sudheer, Satyabrata Choudhury

Pages 364-372

---

## [Vibration and Stability Characteristics of the Laminated Composite Plates \(LCPs\) for Various Delamination Positions](#)

H. S. Rakshith, L. Ravi Kumar, D. L. Prabhakara, T. Rajanna

Pages 373-389

---

## [Strengthening of Distressed Reinforced Concrete Structural Member by Use of FRP Composites: A Review](#)

Nitesh Kumar, H. K. Sharma

Pages 390-403

---

## [Performance-Based Seismic Design: A Review](#)

Shruti Chaudhary, Satyabrata Choudhury

Pages 404-415

---

## [Evaluation of Role of Hybrid Damping System in Seismic Assessment](#)

Ankita Thorat, Hanamant Magarpatil  
Pages 416-428

---

Back Matter

[PDF](#) ↓

Pages 429-430

← Previous

Page

2

of 2

Next →

[Back to top](#) ↑

## Other Volumes

---

1. [Advances in Structural Mechanics and Applications](#)
2. [Advances in Structural Mechanics and Applications](#)
3. Advances in Structural Mechanics and Applications

[Back to top](#) ↑

## About this book

---

*The proceedings of the conference is going to benefit the researchers, academicians, students and professionals in getting enlightened on latest technologies on structural mechanics, structure and infrastructure engineering. Further, work on practical*

*applications of developed scientific methodologies to civil structural engineering will make the proceedings more interesting and useful to practicing engineers and structural designers.*

[Back to top ↑](#)

## Keywords

---

**Structural Mechanics**

**Sustainable and Resilient Structures**

**Smart Structures**

**Fluid-Structure Interaction**

**Vibration and Control**

[Back to top ↑](#)

## Editors and Affiliations

---

**Faculty of Engineering, University of  
Porto, Porto, Portugal**

José António Fonseca de Oliveira Correia

**Department of Civil Engineering,  
National Institute of Technology Silchar,  
Silchar, India**

Satyabrata Choudhury, Subhrajit Dutta

[Back to top ↑](#)

## Bibliographic Information

Book Title	Book Subtitle	Editors
Advances in Structural Mechanics and Applications	Proceedings of ASMA-2021 (Volume 3)	José António Fonseca de Oliveira Correia, Satyabrata Choudhury, Subhrajit Dutta

Series Title	DOI	Publisher
<a href="#">Structural Integrity</a>	<a href="https://doi.org/10.1007/978-3-031-04793-0">https://doi.org/10.1007/978-3-031-04793-0</a>	Springer Cham

eBook Packages	Copyright Information	Hardcover ISBN
<a href="#">Engineering</a> , <a href="#">Engineering_(R0)</a>	The Editor(s) (if applicable) and The Author(s), under exclusive license to Springer Nature Switzerland AG 2022	978-3-031-04792-3

eBook ISBN	Series ISSN	Series E-ISSN
978-3-031-04793-0	2522-560X	2522-5618

Edition Number	Number of Pages	Number of Illustrations
1	VII, 430	58 b/w illustrations, 229 illustrations in colour

### Topics

[Structural Materials](#), [Engineering](#), [Mechanics](#)

[Back to top](#) ↑

Not logged in - 103.102.123.142

Dr B. C. Roy Engineering College (3000708921) - AICTE Electrical & Electronics & Computer Science Engineering (3000684219)

**SPRINGER NATURE**

© 2022 Springer Nature Switzerland AG. Part of [Springer Nature](#).



### International Conference on Advances in Structural Mechanics and Applications

ASMA 2021: **Advances in Structural Mechanics and Applications** pp 344–352

## Source Localization in a Framed Structure for Effective Damage Detection Using Acoustic Emission Technique

[Anupam Kumar Biswas](#) , [Aloke Kumar Datta](#), [Pijush Topdar](#) & [Sanjay Sengupta](#)

Conference paper | [First Online: 03 June 2022](#)

**314** Accesses

Part of the [Structural Integrity](#) book series (STIN, volume 27)

### Abstract

---

Acoustic Emission (AE) technique is capable of detecting real time small-scale damage long before failure in a structure. However, the placement of sensors in a framed structure is an important issue for effective damage detection, which remains a challenge for many researchers. In this study, an experimental investigation is carried out for the localization of mounted AE sensors on a prototype rigid framed structure, and by detecting simulated AE source using Pencil Lead Break (PLB), on



different beam and column locations of each floor levels of the framed structure. Then with the recorded AE signal waveforms, frequency analyses have been performed using the wavelet transform to get the signal's energy concentration. To localize the damage the wavelet transform is used in the time-frequency domain along with the group velocity. From the data comparison and analysis, it is found that for effective damage detection a single AE sensor can to be placed at the beam-column joints of each floor level of framed structure on every plane of the frame.

## Keywords

**Acoustic emission technique**

**Structural health monitoring**

**Wavelet transformation**

**Hsu-Nielsen pencil lead break**

---

This is a preview of subscription content, [access via your institution.](#)

---

▼ Chapter

EUR 29.95

Price includes VAT (India)

- DOI: 10.1007/978-3-031-04793-0\_26
- Chapter length: 9 pages
- Instant PDF download
- Readable on all devices
- Own it forever
- Exclusive offer for individuals only
- Tax calculation will be finalised during checkout

> eBook	EUR 149.79
> Hardcover Book	EUR 179.99

[Learn about institutional subscriptions](#)

## References

---

Biswas, A.K., Datta, A.K., Topdar, P., Sengupta, S.: On Effective placement of acoustic emission sensor in steel framed structure for damage detection. In: National Conference on Emerging Trends on Sustainable Technology and Engineering Applications (NCETSTE-2020), pp. 1–5, IEEE, February 2020

---

Datta, A.K., Shrikhande, M., Paul, D.K.: On the optimal location of sensors in multi-storeyed buildings. *J. Earthq. Eng.* **6**(01), 17–30 (2002)

---

Isabelle, B., Gallimard, L., Nikoukar, S.: Optimal piezoelectric actuator and sensor location for active vibration control, using genetic algorithm. *J. Sound Vib.* **329**(10), 1615–1635 (2010)

---

Dong, L., Li, X.: Three-dimensional analytical solution of acoustic emission or microseismic source location under cube monitoring network. *Trans. Nonferrous Metals Soc. China* **22**(12), 3087–3094 (2012)

---

Gary, J., Hamstad, M.A.: On the far-field structure

of waves generated by a pencil lead break on a thin plate. *J. Acoust. Emiss.* **12**(3–4), 157–170 (1994)

---

Michael, G.R., Prosser, W.H.: AE source orientation by plate wave analysis. *J. Acoust. Emiss.* **9**(4), 283–288 (1991)

---

Schumacher, T., Linzer, L., Grosse, C.U.: Signal-based AE analysis. In: Grosse, C.U., Ohtsu, M., Aggelis, D.G., Shiotani, T. (eds.) *Acoustic Emission Testing*. Springer Tracts in Civil Engineering, pp. 51–99. Springer, Cham (2022).

[https://doi.org/10.1007/978-3-030-67936-1\\_5](https://doi.org/10.1007/978-3-030-67936-1_5)

---

Hao, Q., Zhang, X., Wang, Y.S., Makis, V.: A novel rail defect detection method based on undecimated lifting wavelet packet transform and Shannon entropy-improved adaptive line enhancer. *J. Sound Vib.* **425**, 208–220 (2018)

---

Hsu, N.N.: Characterization and calibration of acoustic emission sensors. *Mater. Eval.* **39**, 60–68 (1981)

---

Li, Z.N., Tang, J., Li, Q.S.: Optimal sensor locations for structural vibration measurements. *Appl. Acoust.* **65**(8), 807–818 (2004)

---

Alireza, P., Bunnori, N.M., Vakili, A.H.: Damage

source identification of reinforced concrete structure using acoustic emission technique. *Sci. World J.* **2013** (2013)

---

Sengupta, S., Datta, A.K., Topdar, P.: Structural damage localisation by acoustic emission technique: a state of the art review. *Latin Am. J. Solids Struct.* **12**(8), 1565–1582 (2015)

---

Suzuki, H., Kinjo, T., Hayashi, Y., Takemoto, M., Ono, K., Hayashi, Y.: Wavelet transform of acoustic emission signals. *J. Acoust. Emiss.* **14**, 69–84 (1996)

---

Zhang, X., Cui, Y., Wang, Y., Sun, M., Hu, H.: An improved AE detection method of rail defect based on multi-level ANC with VSS-LMS. *Mech. Syst. Signal Process.* **99**, 420–433 (2018)

---

Zhang, X., Feng, N., Wang, Y., Shen, Y.: Acoustic emission detection of rail defect based on wavelet transform and Shannon entropy. *J. Sound Vib.* **339**, 419–432 (2015)

---

Ziola, M.S., Gorman, M.R.: Source location in thin plates using cross-correlation. *J. Acoust. Soc. Am.* **90**(5), 2551–2556 (1991)

---

## Author information

---

### Authors and Affiliations

**NIT Durgapur, Durgapur, India**

Anupam Kumar Biswas

**Department of Civil Engineering, Dr. B C Roy****Engineering College, Durgapur, India**

Anupam Kumar Biswas

**Department of Civil Engineering, NIT Durgapur,****Durgapur, 713209, W.B., India**

Aloke Kumar Datta & Pijush Topdar

**Dr. B.C. Roy Engineering College, Durgapur,****713206, W.B., India**

Sanjay Sengupta

Corresponding author

Correspondence to [Anupam Kumar Biswas](#).

## Editor information

---

Editors and Affiliations

**Faculty of Engineering, University of Porto,****Porto, Portugal**

José António Fonseca de Oliveira Correia

**Department of Civil Engineering, National****Institute of Technology Silchar, Silchar, India**

Prof. Satyabrata Choudhury

**Department of Civil Engineering, National****Institute of Technology Silchar, Silchar, Assam,****India**

Prof. Subhrajit Dutta

## Rights and permissions

---

## [Reprints and Permissions](#)

## Copyright information

---

© 2022 The Author(s), under exclusive license to  
Springer Nature Switzerland AG

## About this paper

---

### Cite this paper

Biswas, A.K., Datta, A.K., Topdar, P., Sengupta, S. (2022).  
Source Localization in a Framed Structure for Effective  
Damage Detection Using Acoustic Emission Technique. In:  
Fonseca de Oliveira Correia, J.A., Choudhury, S., Dutta, S.  
(eds) Advances in Structural Mechanics and Applications.  
ASMA 2021. Structural Integrity, vol 27. Springer, Cham.  
[https://doi.org/10.1007/978-3-031-04793-0\\_26](https://doi.org/10.1007/978-3-031-04793-0_26)

[.RIS](#)  [.ENW](#)  [.BIB](#) 

DOI

[https://doi.org/10.1007/978-3-031-04793-0\\_26](https://doi.org/10.1007/978-3-031-04793-0_26)

Published	Publisher Name	Print ISBN
03 June 2022	Springer, Cham	978-3-031- 04792-3

Online ISBN	eBook Packages
978-3-031- 04793-0	<a href="#">Engineering</a> <a href="#">Engineering_(R0)</a>

Not logged in - 103.102.123.142

Dr B. C. Roy Engineering College (3000708921) - AICTE Electrical & Electronics & Computer Science Engineering (3000684219)

**SPRINGER NATURE**

© 2022 Springer Nature Switzerland AG. Part of [Springer Nature](#).