Dr. Piyush

Post Doctoral Fellow

Department of Mechanical Engineering

University of Memphis, Memphis, TN, USA, 38152

Postdoc Title: *Design, Development and Study of Instrumentation for Ultrasonic Dispersion Method for Aerosol Generation*

PhD Thesis Title: *Design, Development and Study of Instrumentation for Ultrasonic Pulse Velocity Measurement*

Education

Qualification	***University***	***Institute***	***M/Y***
Ph.D. (Physical Sciences)	Academy of Scientific Innovative and Research, India	CSIR-National Physical Laboratory	May/2024
M.Sc. in Physics (CMP & Electronics)	Kurukshetra University, Kurukshetra, India	Department of Physics	Jul/2018
B.Sc. (Honours) in Physics	University of Delhi, India	Sri Aurobindo College	Jul/2016

Research Experience

Year	***Designation***	***Place of Work***
1st Jan 2025 - Till Date	Post Doctoral Fellow	University of Memphis, TN, USA
13th August 2021 – 15th May 2024	Senior Research Fellow	CSIR – National Physical Laboratory, New Delhi, India
13th August 2019 – 12th August 2021	Junior Research Fellow	CSIR – National Physical Laboratory, New Delhi, India

Achievement & Award

1. Qualified National Eligibility Test of India for Junior Research Fellowship (JRF) and Lectureship (LS) / Assistant Professor (Joint CSIR-UGC NET JRF, 2018).
2. Qualified Graduate Aptitude Test in Engineering of India (GATE, 2019).
3. Dr. M. Pancholy Memorial Award, 2022 has been awarded by the Ultrasonic Society of India for best oral presentation.
4. Qualified Graduate Aptitude Test in Engineering of India (GATE, 2023).
5. 1st Prize in poster presentation has been awarded by CSIR-NPL in poster symposium held during National Science Day, 2024.

Area of Expertise

I. Ultrasonic Metrology & Non-Destructive Testing:

- ❖ Power measurement of ultrasonic transducers using radiation force balance (Primary Standard) & Vertical float balance.
- ❖ Ultrasonic Pulse Velocity (UPV) measurement in concrete structure (bridge, budlings, roads, walls etc.) for the estimation of concrete strength and homogeneity.
- ❖ Couplant free ultrasonic assessment of electrically conducting material using Electromagnetic Acoustic Transducer (EMAT).
- ❖ Liquid characterization using Ultrasonic Interferometer (UI) (variable distance and variable frequency method)
- ❖ Ultrasonic immersion scanning systems (A, B and C scan).
- ❖ Flaw and crack detection in metal using Ultrasonic Flaw Detector (UFD) (example: Rail, airplane sheets etc.)
- ❖ Calibration of ultrasonic probes, UFD, UPV tester and ultrasonic standard Blocks.

II. Electronics:

- ➢ Reverse Engineering of circuit
- ➢ Signal Conditioning circuit development
- ➢ RF (Receiving & Transmitter) & Digital (Timing) circuit development
- ➢ Circuit simulation and optimization
- ➢ PCB development
- ➢ Device experience design
- ➢ Computer based instrumentation
- ➢ Embedded System Development

III. Programming Skills:

- language C/C++
- CodeVisionAVR (Embedded C programming of 8-Bit micro-controller)
- STM32 CubeIDE (Embedded C programming of 32-Bit micro-controller)
- Microsoft Visual basic (PC Software Development)
- KiCad (PCB design)

Patents & Copyright

1. P K Dubey, Sanjay Yadav and **Piyush**, "**Ultrasonic pulse velocity tester device with threshold error correction**" (Indian Patent application reference no. 202111048097, Date: 21/10/2021)

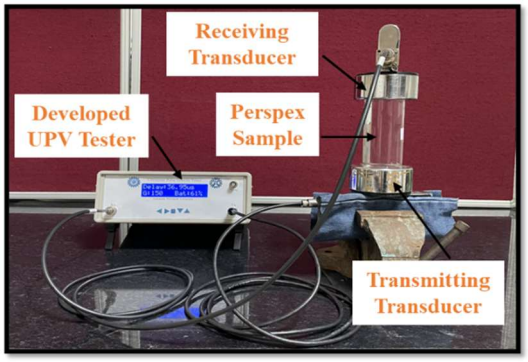
2. P K Dubey, Sanjay Yadav and **Piyush**, "**Ultrasonic pulse velocity tester device with threshold error correction**" (US Patent application reference no. US17/936,018, Date: 28/10/2022)

3. P. K. Dubey, Sanjay Yadav, **Piyush**, Nitin Dhiman **"PC-based control automation and analysis software for sweep frequency ultrasonic interferometer"** (Indian Copyright registration no. SW-17268/2023).

Technologies & Software developed

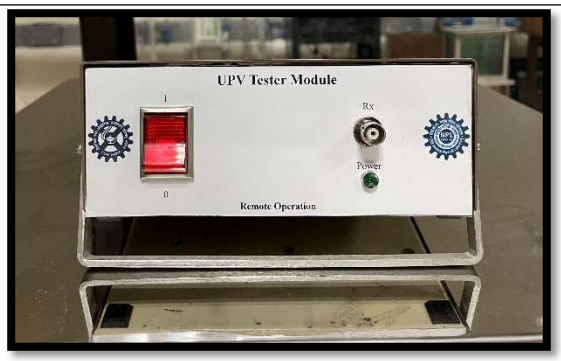
1. **Ultrasonic pulse velocity tester device with threshold error correction**
   (Team: P. K. Dubey, Sanjay Yadav, Ravinder Kumar, **Piyush**)

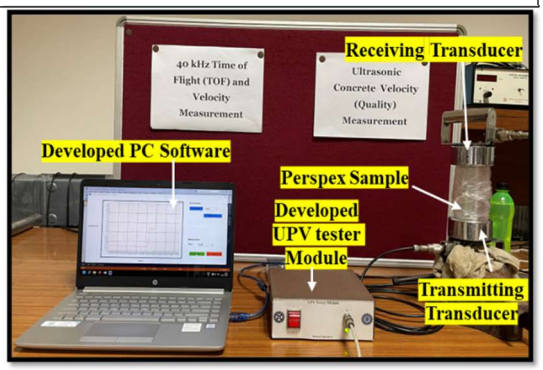
Ultrasonic pulse velocity (UPV) is an extremely important parameter for the assessment of strength of concrete structures and study of elastic properties.



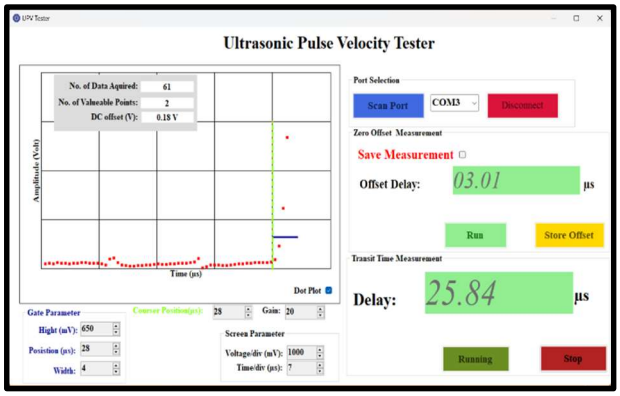
2. **PC based ultrasonic pulse velocity tester with automatic threshold error correction**
   (Team: P. K. Dubey, Sanjay Yadav, Ravinder Kumar, **Piyush**)

The developed ultrasonic pulse velocity tester module is used to acquire and amplify the transmitting and received analog ultrasonic signal for UPV measurement.





3. **PC-based control automation and analysis software for ultrasonic pulse velocity tester with automatic threshold error correction**
   (Team: P. K. Dubey, Sanjay Yadav, Ravinder Kumar, **Piyush)**

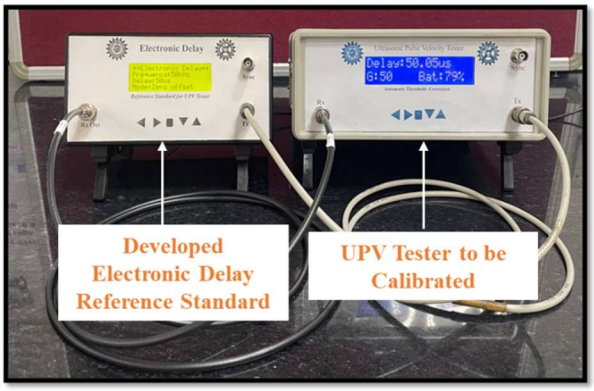


The developed software has the capability to analyze received ultrasonic analog signals and to measure ultrasonic transit time while also offering automatic threshold error correction.

4. Electronic Delay Reference Standard for Ultrasonic Pulse Velocity Measurement Devices

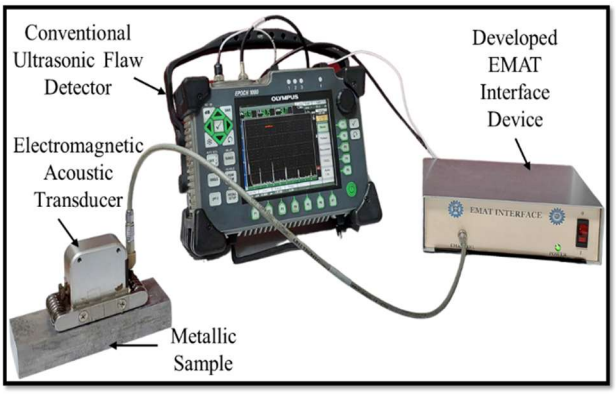
(Team: P. K. Dubey, Sanjay Yadav, Ravinder Kumar, **Piyush)**

Electronic delay is developed to mimic the functionality of the delay block, providing an alternative for UPV tester calibration that is not affected by temperature variations.



5. Device to use conventional ultrasonic flaw detector as EMAT based flaw detector

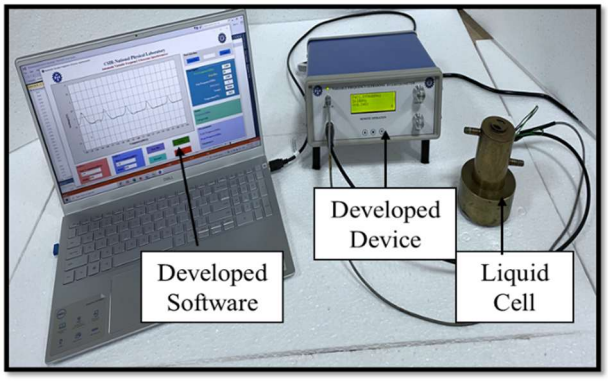
(Team: P. K. Dubey, Sanjay Yadav, Ravinder Kumar, **Piyush,** Bishan Kumar)



Ultrasonic flaw Detector are extremely used for the detection of flaw, and crack detection in the field of Nondestructive testing (NDT) of material.

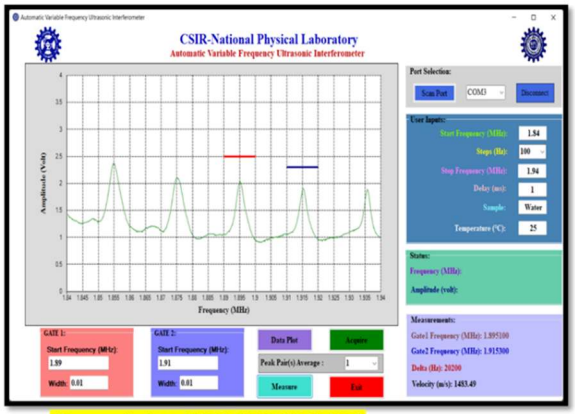
6. CSIR-NPL developed PC-based variable frequency ultrasonic interferometer

(Team: P. K. Dubey, Sanjay Yadav, Ravinder Kumar, **Piyush**, Nitin Dhiman)



Ultrasonic interferometers are used for the ultrasonic velocity measurement in liquids.

7. **PC-based control automation and analysis software for sweep frequency ultrasonic Interferometer**
(Team: P. K. Dubey, Sanjay Yadav, **Piyush**, Nitin Dhiman)



Copyright :SW-17268/2023

The sweep frequency ultrasonic interferometer software provides graphical images of the maxima and minima obtained in the liquid sample as well as the value of the ultrasonic propagation velocity. The response of the transducer disc can also be determined with this software.

Technology and Reference Material Transferred

---

1. **"Ultrasonic pulse velocity tester device with threshold error correction"** (Team: P. K. Dubey, Sanjay Yadav, Ravinder Kumar, **Piyush**) has been transferred to "**M/s SRK instruments Co. Hyderabad, India"** on 24 August 2022.

2. **Three reference materials: BND 2220 (UPV Block 26 µs), BND 2221 (UPV Block 46 µs), BND 2222 (UPV Block 83 µs),"** (NPL Team: P. K. Dubey, Nita Dilawar, Ravinder Kumar, **Piyush,** Vidya Nand Singh, S. P. Singh, Vipin Jain, Nahar Singh) have been released with reference material producer "**Global PT Provider Private Limited, India"** (Team: Umesh Gupta, Sahil Gupta, Asim Dash) on 4 October 2023.

SCI Publications

1. **Piyush,** Nitin Dhiman, Bishan Kumar, Sanjay Yadav, and P. K. Dubey, **"Measurement of ultrasonic pulse velocity with improved accuracy using automatic threshold error correction"**, *Review of Scientific Instruments* 94 (4), 045101 (2023). https://doi.org/10.1063/5.0142739

2. Nitin Dhiman, Sahil Sharma, **Piyush,** Bishan Kumar, Sanjay Yadav, and P K Dubey **"Development of sweep frequency ultrasonic interferometer for high precision velocity measurement in liquids"**, *Review of Scientific Instruments,* 94 (11), 115103 (2023). https://doi.org/10.1063/5.0151763

3. Bishan Kumar, Nitin Dhiman, **Piyush,** Sanjay Yadav and P K Dubey, **"Electromagnetic acoustic transducer and method for residual stress detection in conducting materials",** *MAPAN*, 39, 845–850, (2024). https://doi.org/10.1007/s12647-024-00762-1

4. **Piyush**, Sanjay Yadav, and P. K. Dubey, **"Metrological perspective of ultrasonic pulse velocity measurement technique"**, *MAPAN*, 39, 1045–1052, (2024). https://doi.org/10.1007/s12647-024-00763-0

5. **Piyush**, Sanjay Yadav, and P. K. Dubey, **"Development and study of ultrasonic pulse velocity measurement system using wave analysis and two-point detection approach"**, *Journal of Instrumentation*, 19 (8), P08019 (2024). https://iopscience.iop.org/article/10.1088/1748-0221/19/08/P08019

6. **Piyush Verma**, Sanjay Yadav, and P. K. Dubey, **"Development and study of electronic delay reference standard for ultrasonic pulse velocity measurement devices"**, *2024 IEEE South Asian Ultrasonics Symposium (SAUS)*, Gujarat, India, 1-4, (2024). https://doi.org/10.1109/SAUS61785.2024.10563748

Invited Talk

- "Ultrasonic NDT: Legal Metrology Implications for Inspection Accuracy" National Workshop/Seminar, *Legal Metrology*, Government of India, 25 January 2025.

Conference Presented

1. **Piyush**, Nitin Dhiman, Sanjay Yadav, Sahil Sharma, Bishan Kumar, Abhilasha, Kalpana Yadav and P. K. Dubey, **Modern technologies for ultrasonic non-destructive evaluation of concrete structures**, PP32, Page-70, *6th National Conference on "Advances in Metrology", AdMet-2020*, CSIR-NPL, Delhi, 5th-6th January 2020.

2. **Piyush**, Bishan Kumar, Nitin Dhiman Sanjay Yadav, and P. K. Dubey, **On-spot grade testing of plywood using ultrasonic pulse velocity measurement**, OP-42, Page-40, *International Conference on "Ultrasonics and Material Science for Advanced Technology", ICUMSAT-2022*, Telangana University, Telangana, 1th-3rd August 2022. (**Dr. M. Pancholy Memorial Award – 2022**)

3. **Piyush**, Bishan Kumar, Nitin Dhiman, Sanjay Yadav and P. K. Dubey, **Method to obtain best transducer position in ultrasonic pulse velocity measurement**, PP-053, Page-98, *11th International Conference on "Advances in Metrology - 2022", AdMet-2022*, CSIR-NPL, Delhi, 24th-26th August 2022.

4. **Piyush,** Nitin Dhiman, Bishan Kumar, Sanjay Yadav, and P. K. Dubey, **" Development of ultrasonic pulse velocity measurement device based on counter method"**, SM-08, Page 47, *National Science Day Poster Symposium*, CSIR-NPL, Delhi, 28th February 2024. **(1st Prize)**

5. **Piyush**, Sanjay Yadav, and P. K. Dubey, **"Development and study of electronic delay reference standard for ultrasonic pulse velocity measurement devices"**, PP-23, 2024 *IEEE South Asian Ultrasonic Symposium (SAUS 2024)*, IIT Gandhinagar, India, 27th to 29th March 2024.

Conference and Workshop Participated

1. Bishan Kumar, **Piyush**, Nitin Dhiman, Sanjay Yadav, Sahil Sharma**,** Abhilasha, Kalpana Yadav and P. K. Dubey, **Polarized shear wave electromagnetic acoustic transducer (EMAT) for ultrasonic non-destructive testing**, PP37, Page-75, *6th National Conference on "Advances in Metrology", AdMet-2020*, CSIR-NPL, Delhi, 5th-6th January 2020.

2. Nitin Dhiman, Sanjay Yadav, Sahil Sharma, **Piyush** and P. K. Dubey, **Estimation of thermal conductivity of liquids using CSIR-NPL indigenously developed ultrasonic interferometer,** PP37, Page-75, *6th National Conference on "Advances in Metrology", AdMet-2020*, CSIR-NPL, Delhi, 5th-6th January 2020.

3. Bishan Kumar, Kalpana Yadav, Nitin Dhiman, **Piyush**, Sanjay Yadav and P. K. Dubey, **Design and development of radially polarized shear wave electromagnetic acoustic transducer for non-contact ultrasonic non- destructive testing,** OP 43, Page-41, *International Conference on "Ultrasonics and Material Science for Advanced Technology", ICUMSAT-2022*, Telangana University, Telangana, 1th-3rd August 2022.

4. Nitin Dhiman, Kalpana Yadav, Bishan Kumar, **Piyush**, Sanjay Yadav and P. K. Dubey, **Limitation of conventional variable distance ultrasonic interferometer for the measurement propagation velocity in liquids,** OP 38, Page-36, I*nternational Conference on "Ultrasonics and Material Science for Advanced Technology", ICUMSAT-2022*, Telangana University, Telangana, 1th-3rd August 2022.

5. Aman Dubey, **Piyush**, Nitin Dhiman, and Nita Dilawar, **Design and study of ultrasonic energy calibration system for ultrasonic cleaners,** OP 56, Page-33, *International Conference on "Ultrasonics and Material Science for Advanced Technology", ICUMSAT-2023*, Bhundelkhand University, Jhansi, 25th-27th November 2023.

6. Nitin Dhiman, Bishan Kumar, **Piyush**, Sanjay Yadav and P. K. Dubey, **Effect of ultrasonic attenuation on velocity measurement accuracy in liquid using frequency sweep approach,** OP 98, Page-38, *International Conference on "Ultrasonics and Material Science for Advanced Technology", ICUMSAT-2023*, Bhundelkhand University, Jhansi, 25th-27th November 2023.

7. Participated in the Authoring workshop "**A Better Approach to Quality Publications**" organized by CSIR-National Physical Laboratory in collaboration with IEEE at CSIR-National Physical Laboratory, New Delhi, India on 13th September 2019.

Book Chapter

---

1. Kalpana Yadav, **Piyush**, Bishan Kumar, Nitin Dhiman, and P. K. Dubey "**Primary radiation force balance",** *Metrology and measurement : Recent Advances at CSIR-NPL*,Page:19-20, (2023), ISBN :978-93-5906-009-5.

2. Kalpana Yadav, **Piyush**, Bishan Kumar, Nitin Dhiman, and P. K. Dubey " **Ultrasonic pulse velocity tester with threshold error correction ",** *Metrology and measurement : Recent Advances at CSIR-NPL*, Page:21,(2023) ISBN :978-93-5906-009-5.

3. Kalpana Yadav, **Piyush**, Bishan Kumar, Nitin Dhiman, and P. K. Dubey " **Electro-magnetic acoustic transducer (EMAT) for generation and detection of ultrasound in electrically conducting materials"**, *Metrology and measurement : Recent Advances at CSIR-NPL*, Page:22, (2023), ISBN :978-93-5906-009-5.

4. Kalpana Yadav, **Piyush**, Bishan Kumar, Nitin Dhiman, and P. K. Dubey " **Ultrasonic C-scan system developed for metrological industrial applications ",** *Metrology and measurement : Recent Advances at CSIR-NPL*, Page:23, (2023) ISBN :978-93-5906-009-5.

5. Kalpana Yadav, **Piyush**, Bishan Kumar, Nitin Dhiman, and P. K. Dubey " **Device to use conventional ultrasonic flaw detector as EMAT based flaw detector",** *Metrology and*

measurement : Recent Advances at CSIR-NPL, Page:24, (2023) ISBN :978-93-5906-009-5.

6. Kalpana Yadav, **Piyush**, Bishan Kumar, Nitin Dhiman, and P. K. Dubey " **PC-based variable frequency ultrasonic interferometer ",** *Metrology and measurement : Recent Advances at CSIR-NPL*, Page:25, (2023) ISBN :978-93-5906-009-5.

Technical Visit

✓ Jindal Steel & Power Limited, Raipur, Chhattisgarh, India

Curriculum Activity

---

1. Cadets of Junior Division, National Cadet Corp (NCC), India, 2009
2. Local Organizing Committee member in AdMET, 2022
3. Technology Exhibitor at Platinum Jubilee Celebration of CSIR-NPL, 2022
4. Technology Exhibitor at Bharat Parv, 2023
5. Technology Exhibitor at Laghu Udyog Bharati, 2023
6. Technology Exhibitor at India International Science Festival, 2023

Professional Membership

---

1. Student Member of Metrology Society of India, SM No. 346, December 2020
2. Associate Member of Ultrasonic Society of India, AM No. 2023-1, June 2023

Professional Profile Links

LinkedIn: https://www.linkedin.com/in/piyush-verma-5456311a4/

Google Scholar: https://scholar.google.com/citations?user=itHJE4gAAAAJ&hl=en

I declare that all the information provided above is true to the best of my knowledge.

--Piyush