IIT MADRAS
Indian Institute of Technology Madras

Technology Transfer Office
TTO – IPM Cell

Industrial Consultancy & Sponsored Research (IC&SR)

Flexible Ribbed Bar Waveguide Array Transducer Add-on For Ultrasonic Guided Wave Generation

IITM Technology Available for Licensing

Problem Statement

- Traditional ultrasonic transducers lack the ability to **selectively enhance specific guided wave modes**, **hindering accurate testing.**
- Methods like **angle beam techniques** and comb transducers are widely used but they are **bulky, imprecise and inflexible, limiting adaptability** to various test specimen shapes, **impacting reliability** of non-destructive testing processes**.**
- Achieving **precise control** over guided wave modes is crucial for effective inspection.
- Hence, the present patent invention is needed to address the limitations and challenges posed by existing methods in ultrasonic testing applications.

Technology Category / Market

Category: Non-Destructive Testing Methods and Equipment (NDT/NDE)

Industry: Materials Testing, Lab Testing Automotive, Structural Health Monitoring (SHM), Biomedical Application, Environmental Use

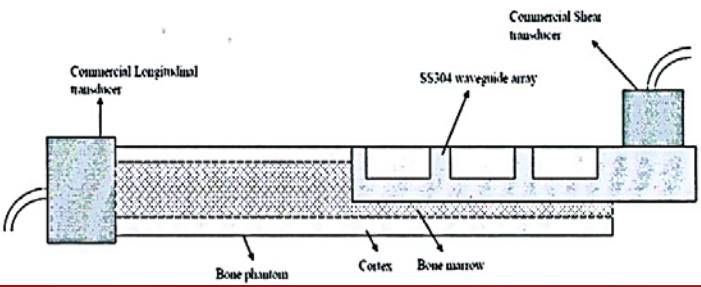
Application: NDT Equipment & Service, Pipeline Inspection, Biomedical Imaging Devices, Civil & Health Structural Monitoring Solutions

Market: The global waveguide market was valued at **$1.30 Bn** in **2021,** expected to reach **$2.14 Bn** by **2030** at **5.8% CAGR** in **2022 to 2030.**

Technology

The present patent invention primarily discloses a **Flexible Ribbed Bar Waveguide Array Transducer**. The technology overcomes traditional ultrasonic transducers drawbacks by offering a flexible & precise system to **selectively generate guided wave modes** in ultrasonic testing.

FIG 1 illustrates the **experimental setup** of the ribbed bar waveguide array on bone phantoms.



Key Features / Value Proposition

User perspective:-

- **Offers precise control** over guided wave modes, **enhancing the accuracy of non-destructive testing.**
- **Adapts** to various shapes and sizes of test specimens, providing **versatility** in testing.
- **Streamlines testing processes, making it user-friendly & efficient.**

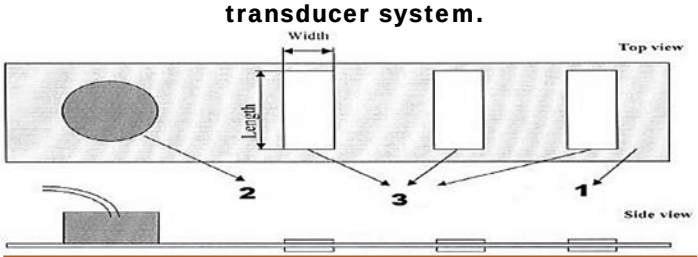
Industrial perspective:-

- **Improves NDT efficiency & reliability,** providing a **cost-effective solution** compared to bulky & complex alternatives.
- **Applicable in diverse industries** such as civil engineering, pipeline inspection, and biomedical applications.

Technology perspective:-

- **Allows targeted testing** by enhancing specific guided wave modes.
- Utilizes materials with different velocities for waveguide and test object, **optimizing wave mode efficiency**.
- Simplifies technology with single excitation element, **reducing complexity and cost**.

FIG 2 shows ribbed bar waveguide array transducer system.



Intellectual Property

IITM IDF No.: **1441** | IP No.: **394271 (Granted)**

TRL (Technology Readiness Level)

TRL-4: Validated in Laboratory

Research Lab

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Invention Disclosure

The key components of this technology include:

The technology includes a **flexible central waveguide bar** that transfers signals from an excitation element to the test object, adapting to different shapes and sizes of specimens.

- **Multiple secondary films** are attached at set widths and intervals on both sides of the central waveguide bar.
- These films are **essential** for **selectively boosting** specific guided wave modes in the test object.

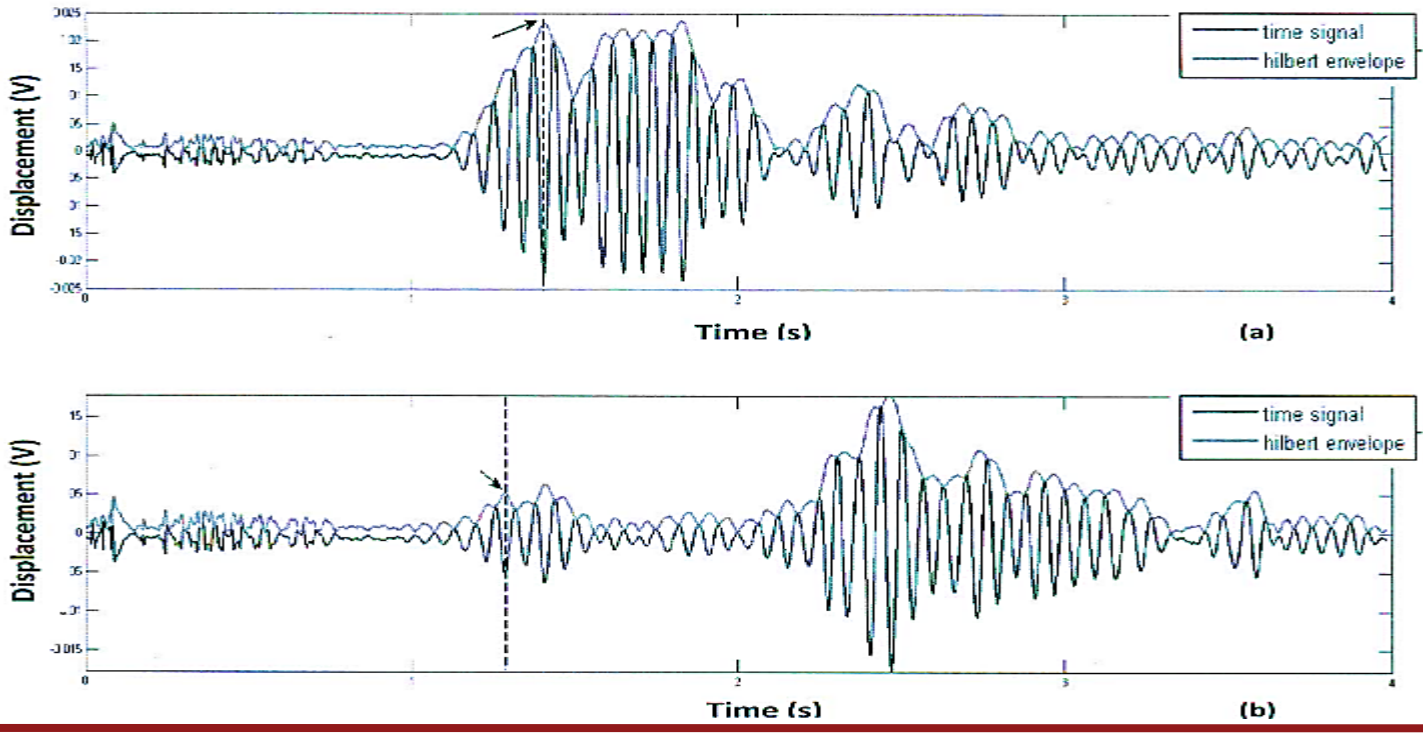
An **excitation element**, like a piezoelectric transducer, is used to **activate the central waveguide bar**. This triggers the creation of guided wave modes that are **transmitted** to test object through attached secondary films.

- The **central waveguide bar's material is selected for a different velocity** than the test object. This velocity difference, coupled with correction factors, **corrects time delays** & **optimizes guided wave mode efficiency**.

Method of Non-Destructive Testing:

- The technology involves a non-destructive testing method:
- **excite the central waveguide bar, contact the test object, and receive signals from the test object for further analysis.**

FIG 3 Comparison of the signals of excitation with a waveguide array and reception with a commercial longitudinal transducer for a **(a)3 mm thick healthy phantom against (b) 1 mm thick degraded phantom.**



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