NEWS RELEASE

Niterra Co., Ltd.
Nihon University

Niterra and Nihon University Announce the Development of Small yet Powerful BLT[*1]-Type Ultrasound Emitter

Emitter achieves the world's best[*2]-class sound pressure output.

NAGOYA, JAPAN, Aug. 21, 2024 — Niterra Co., Ltd., a leading Japanese manufacturer of spark plugs and sensors with an evolving portfolio focused on ceramics and beyond, in collaboration with Nihon University (College of Science and Technology／Dean: Tomoyuki Todoroki, Location: Chiyoda-ku, Tokyo), have jointly developed a small yet powerful airborne ultrasound emitter called the "Bolt-clamped Langevin-type Transducer (hereinafter BLT)." This collaborative research project has been conducted by Niterra and a research group led by Professor Hikaru Miura of Nihon University, College of Science and Technology.

Airborne ultrasound has numerous potential applications in fields such as nondestructive testing, acoustic levitation, pest and wildlife control, and ultrasonic therapy. However, practical implementation has been challenging especially regarding device size. As a compact and low-power emitter, the newly developed BLT Type Ultrasound Emitter offers new value by making practical use easier and expanding its applications.

1. Background of the Development

Ultrasound emitters that generate airborne ultrasounds have been used in applications such as distance measurement and position detection in automotive sonars and certain robot sensors. By increasing the sound pressure of airborne ultrasound, various effects such as aggregation, dispersion, detachment, levitation, and excitation can be achieved, leading to a wide range of applications.

While using an array structure with multiple ultrasound emitters to increase sound pressure, there have been challenges, such as device enlargement and complex control circuits. Niterra has been manufacturing BLT as a high-output ultrasonic vibration source. In this joint research, Niterra and Nihon University, College of Science and Technology have combined a vibrating plate that transmits ultrasonic vibration in the air with the BLT, resulting in the development of a small-sized BLT-Type Ultrasound Emitter.

2. Small yet Powerful BLT-Type Ultrasound Emitter

The BLT Type Ultrasound Emitter, which resulted from collaborative research, is notable for its ability to generate high sound pressure despite its compact size. Its optimized design allows the main body to be around 15mm in diameter (25mm, including the flange) and less than 60mm in total length.

It also achieves high sound pressure and low power consumption using high-performance piezoelectric ceramics. The emitter integrates the main body and vibrating plate into a single structure, ensuring reliability.

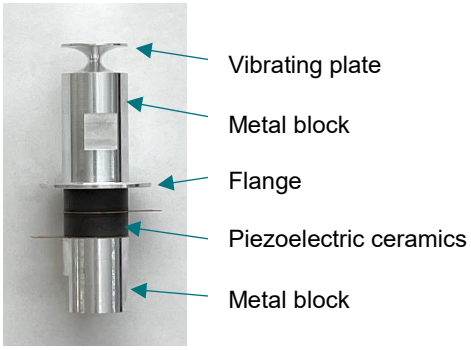


Photo: BLT Type Ultrasound Emitter

3. Overview of the BLT-Type Ultrasound Emitter

-Size: Height 59.2mm × Diameter 15mm (Flange: Diameter 25mm)
-Output Frequency: 40kHz
-Sound Pressure Output: 1.7kPa (approximately 159dB) at a distance of 300mm from the tip
6.6kPa (approximately 170dB) at a distance of 100mm from the tip
-Power Consumption: 5W

4. Future Outlook

The newly developed BLT-Type Ultrasound Emitter is expected to find applications in various fields utilizing contactless effects on objects. Niterra and Nihon University, College of Science and Technology will continue to develop emitters that can accommodate different frequency outputs as part of expanding their product lineup. Additionally, they aim to contribute to creating a sustainable society by pursuing the development of emitters that utilize environmentally friendly lead-free piezoelectric elements, which have been in high demand in recent years.

*1: BLT - Bolt-clamped Langevin-type Transducer
*2: Comparison based on sound pressure output per unit area (according to Niterra Co., Ltd.)

<Reference Data>

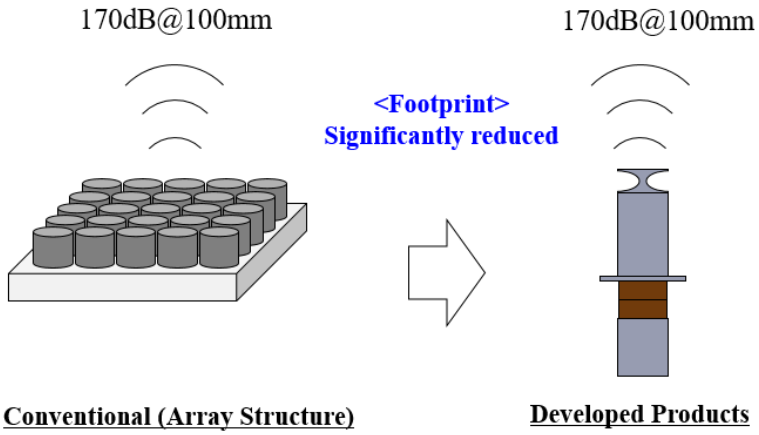


Figure 1. Comparison with Conventional (Array Structure)

To increase sound pressure in ultrasound output, it is common to use multiple ultrasound emitters (approximately 10mm in diameter) in an array structure. However, the developed product allows device implementation with fewer emitters, significantly reducing the device's footprint and simplifying control circuits.

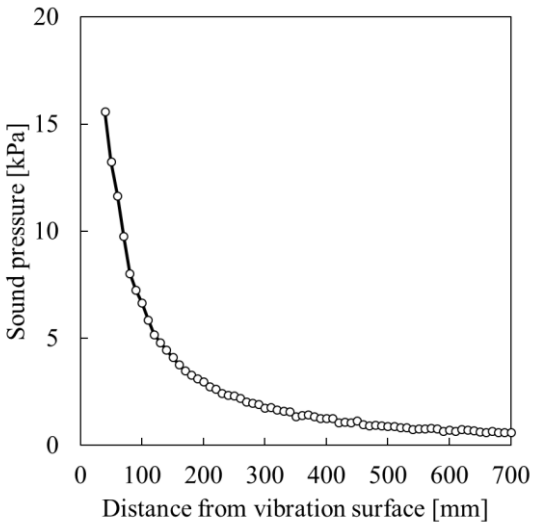


Figure 2. Relationship between Distance and Sound Pressure

At a distance of 300mm from the tip: 1.7kPa (approximately 159dB)

At a distance of 100mm from the tip: 6.6kPa (approximately 170dB)

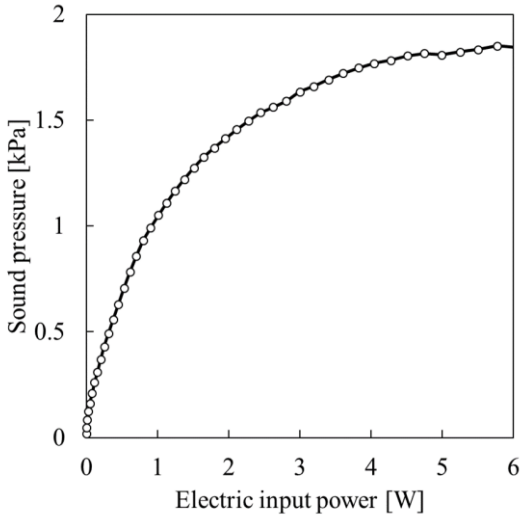


Figure 3. Relationship between Power Consumption and Sound Pressure (at a distance of 300mm from the tip)

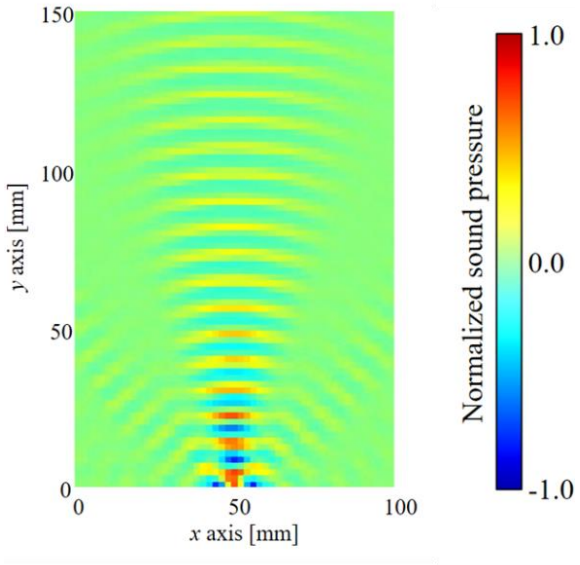


Figure 4. Sound Pressure Distribution

About Niterra

Founded in Nagoya, Japan in 1936, Niterra Co., Ltd. (formerly NGK SPARK PLUG CO., LTD.) is renowned for its NGK-branded spark plugs and NTK-branded ceramic products. Niterra, a coined word combining the Latin words "niteo" (shine) and "terra" (Earth), was introduced in April 2023 to express the reborn company's commitment to sustainability through an evolving portfolio focused on ceramics and beyond. Under the corporate message "IGNITE YOUR SPIRIT," Niterra is now expanding into the growth fields of mobility, healthcare, environment and energy, and communications. The company's consolidated revenues in fiscal 2023 (to March 2024) totaled 614.4 billion yen (4,389 million USD). Niterra has 32 bases in Japan and 61 overseas, and approximately 16,000 employees worldwide. Please visit https://www.ngkntk.co.jp/english/.