

Precision Handling

With Alchemia Analytica



Problem & Opportunity

Handling small, delicate, or irregular objects remains a challenge across industries, from agriculture and electronics to life sciences. Existing solutions rely on mechanical grippers, vacuum systems, or vibratory feeders, each with key limitations:

- Physical contact can cause damage or contamination
- Complex geometries reduce reliability and precision
- Singulation from bulk inputs is inefficient and error-prone
- Mechanical systems require frequent maintenance and calibration

As sensing and automation improve, the bottleneck shifts to physical manipulation. There is a growing need for a flexible, precise, and contactless method to pick, move, and position items, especially in high-value or sensitive workflows.

Singulation & Precision Handling

A core capability is singulation: isolating and extracting individual objects from bulk inputs such as hoppers or bins.

Using acoustic fields, the system can:

- Select and lift individual items without mechanical separation
- Reduce jamming and misfeeds common in traditional feeders
- Enable precise downstream placement and inspection

This enables more flexible automation, particularly where object variability or fragility has previously limited performance.

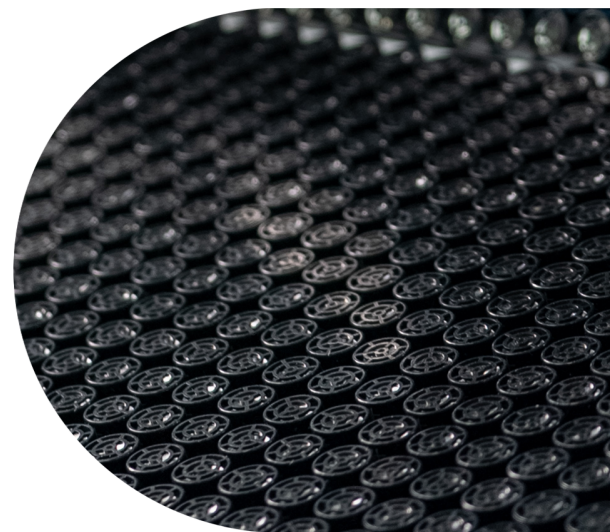
Solution: Acoustic Lifting

Alchemia Analytica uses ultrasonic phased arrays to levitate, transport, and position objects in mid-air without physical contact. By generating programmable acoustic pressure fields, it provides real-time control of individual items, lifting them from surfaces, conveyors, or bulk containers and moving them along defined paths.

Key capabilities:

- Contactless levitation and transport of mm-scale objects
- Real-time repositioning in 3D space
- Operation in motion, including conveyor environment
- High-speed control using AcoustoFab's core acoustic technology

The platform is modular and scalable and can be integrated seamlessly with upstream detection, supporting both standalone systems and integration into existing automation lines.



AcoustoFab



Programming the physical world

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Alchema Analytica

Pilot programmes are available for early partners

Alchema Analytica is built for precision manipulation and transport. Each module consists of an array of transducers capable of generating finely controlled acoustic fields, enabling stable levitation and movement of objects across a defined workspace.

System Capabilities

Levitated transport across 2–20 cm working volumes

Millimetre-scale positioning precision

Real-time field updates (up to tens of kHz)

Support for static and conveyor-based workflows

Scalable arrays for larger or multi-object systems

Objects that can be handled include: Seeds and agricultural materials, microelectronic components, biological samples and other small, lightweight items

Architecture & Integration

Modular 16×16 transducer arrays
(scalable to larger systems)

On-board processing for real-time acoustic field control

Simple integration via standard communication protocols

Compatible with machine vision and robotic systems

The system can be deployed as a standalone manipulation unit, a singulation module upstream of automation lines, a precision positioning tool within assembly or inspection systems

Technical Overview

Operating frequency: 40KHz Ultrasound

Number of transducers: 256 per module

Working distance: ~2–20 cm
(optimal ~10–15 cm)

Control interface: USB-C /
custom integration

No moving parts

AcoustoFab 
Contactless control of matter using sound