

The Rise of Contactless Manipulation

Manipulating objects without touching them has always been one of the most widely used magic tricks. Unfortunately, these tricks cannot be used in industrial environments to produce actual products. The ability of manipulating components without touching them would be especially useful for very delicate or fragile components like microstructures, thin dies or photonics. The latter is especially important because almost every component that deals with the interaction between light and matter needs to have an almost perfect surface.

Manufacturing these components is cumbersome and many producers report double-digit defect rates. At the same time, the implementation of such components in multiple fields has been steadily growing in recent years. In 2010, only top level smartphones had two cameras and the sensors were just checking if your phone was close to your ear. Now, the top smartphones can have more than six cameras and a whole set of sensors that can do a wide range of tasks such as facial recognition or 3D imaging. But it's not just commercial electronics that have implemented these changes. Telecommunications is every day more optical oriented and the upcoming wave of autonomous driving cars will heavily rely on

photonics components.

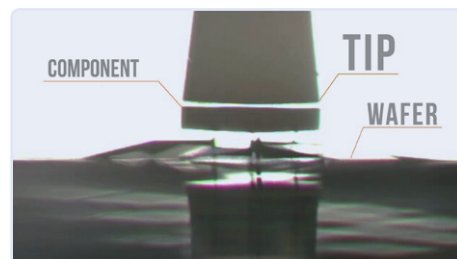
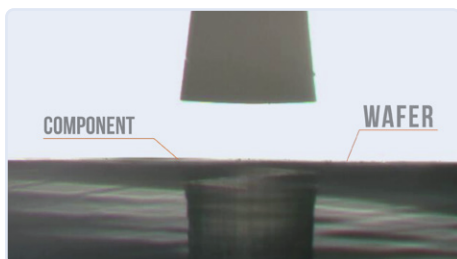
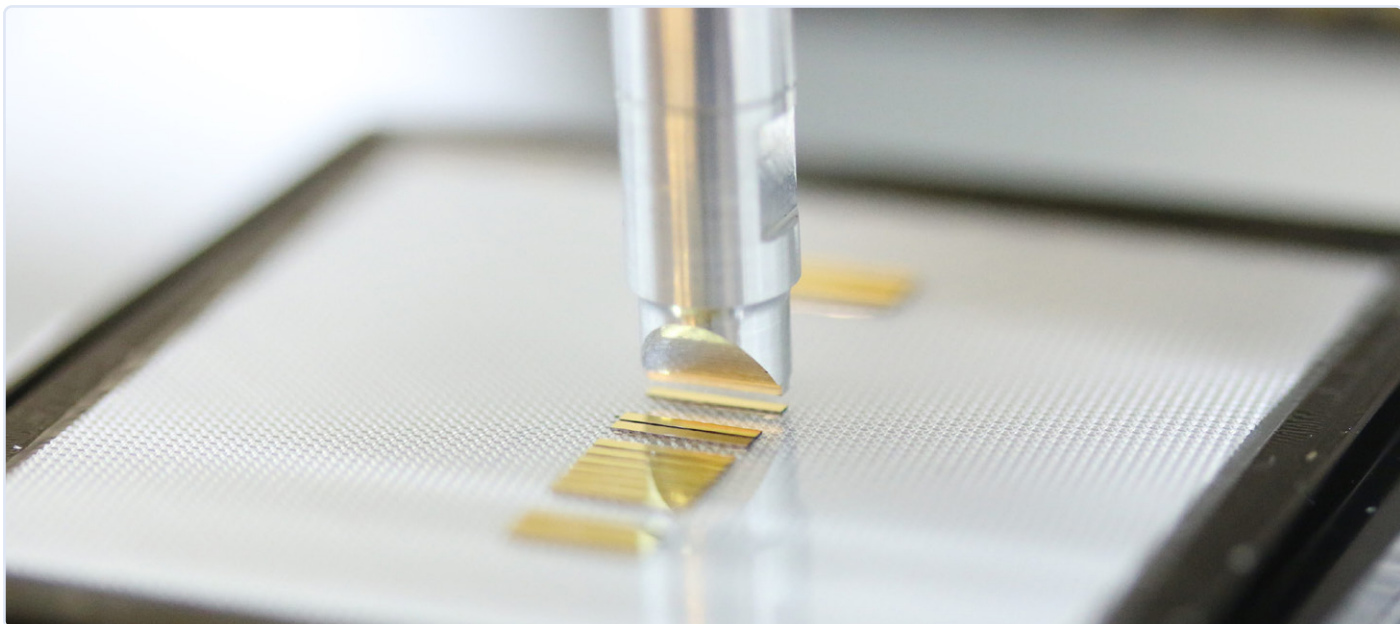
Photonics has been rising and gaining importance but, unlike standard semiconductors, the heart of its R&D and production still lies within western countries. A document issued earlier this year by the European Commission ("A New Industrial Strategy for Europe", 10.03.2020) clearly puts Photonics as one of the Key Enabling Technologies for the future and promises further investments in the field. These efforts are particularly effective also thanks to multiple initiatives at European level such as the European Photonics Industry Consortium, EOS and many more local ones, such as SwissPhotonics or Photonics France. Despite the wide spread of the technol-

ogy, manufacturing still copes with multiple challenges. The operations of picking the components from adhesive tape, manipulating them or bonding them to a substrate are still creating surface imperfections that sometimes require cleaning, sometimes affecting the component functionality for good. Here, contactless manipulation comes in to play.

Contactless handling is a reality

Touchless Automation has been focusing on providing contactless manipulation solutions since its birth. The company is located in Bienne, a small town in Switzerland famous for being the center of the Watch Valley. Starting from the need of watchmakers to have perfect surfaces for their high-end parts, the company perfected this manipulation and launched a line of industrial machines dedicated to Photonics components.

The last product, Levio, has been presented at SPIE Photonics West in San Francisco in 2019 and it's already at work on customer applications. This machine is able to pick up from adhesive tape, visually inspect the components and sort them according to the results of the inspection. As of today, the largest amount of customer requests have come from laser diodes, micro lenses and optical filter producers. But the technology has already proven useful in a multitude of other



fields. The company successfully completed projects for MedTech components such as pacemaker parts or standard semiconductor components.

This flexibility in the final application attracted the interest of large entities such as the European Commission, which financed part of the development and the European Space Agency, which welcomed the company in its ESA BIC Switzerland program.

The technology

The innovation of the company lies in its technology. The manipulation is the result of a combination of two opposite forces. A vacuum suction pulls the component up and allows it to be lifted. At the same time, the very tip of the gripper vibrates at high frequency. This vibration generates a thin air cushion between the component and the tip itself, which forbids them from coming into contact.

This manipulation technology allows for a very stable grip but, at the same time, never physically touches the piece. In this way, all of the component surfaces remain unscathed and the final component is processed without any defect.

Relying entirely on air and fluidic phenomena, it is possible to manipulate components of any material and with a wide range of shapes. Even components with convex or concave surfaces

can be manipulated, provided that such shapes are known while the system is designed.

However, **Touchless Automation**'s main strengths are not just in the manipulation of components. With years of experience in machine making and commissioning, the company focuses on developing systems that, starting from the Levio platform, can be easily adapted to many different processes. To align further with the needs of the application, the inspection system can be modified according to the defect to be caught. For instance, laser diode facets usually require detection of submicron defects, while for optical components such defects can be orders of magnitudes larger and still be tolerated. This flexibility allows for cost effectiveness and proper allocation of resources, without wasting money on a system that is more powerful than is needed.

A brighter future

The coming of contactless manipulation will enhance state of the art processes, increasing component quality, decreasing defect rates and the need for cleaning steps, also providing also industrial waste reduction. However, this is only the first and most direct effect. The possibility of handling components in such a delicate way will unlock design possibilities for microcomponents that are currently forbid-

den and could accelerate the implementation of materials that are too brittle or soft to be held. Many industry experts have deemed this technology to be revolutionary and potentially the new paradigm of future manufacturing. With customers already in three different continents, **Touchless Automation** has been expanding quickly and aims to become an industry leader in the coming years. The list of applications has been expanding greatly, but the company is always looking for new challenges. ◀

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