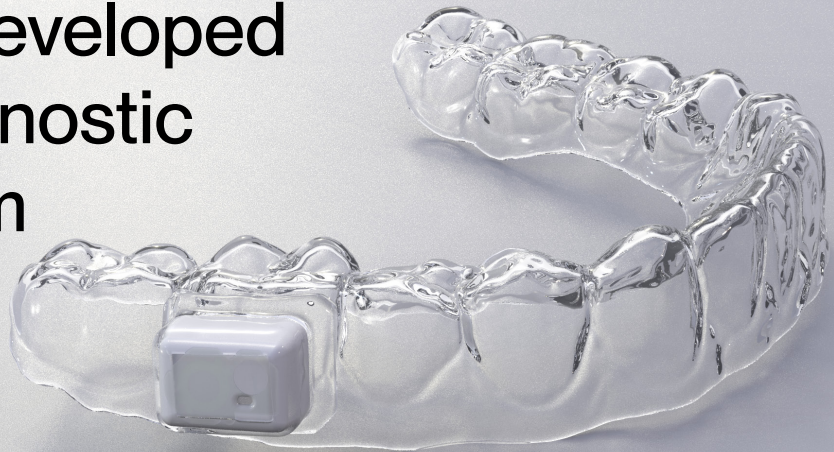


# How Lura Health Developed a Miniaturized Diagnostic Device to Transform Preventative Care



## Overview

This case study explores how Lura Health, in collaboration with Resonant Link, Ilika, and Cirtec Medical, harnessed cutting-edge medical device technology to develop a groundbreaking wearable health sensor for salivary diagnostics. Lura Health's device showcases three significant healthcare technology innovations: real-time monitoring, remote diagnostics, and medical device miniaturization. These innovations leverage Resonant Link's wireless charging technology and implantable medical device battery maker Ilika's Stereax M300 battery to optimize power and energy storage in an ultra-low-profile design.

## An Opportunity for Better Care

Traditional diagnostic procedures often involve invasive blood tests, causing discomfort and inconvenience for patients. In addition, it can take days or weeks for care providers to receive critical information via test results. To address this challenge, Lura Health embarked on a mission to develop a noninvasive, pain-free way to access essential health information anytime, anywhere. Within months, their wearable health sensor for salivary diagnostics was born.

## Real-Time Monitoring and Remote Diagnostics

To make their dream of improving preventative care a reality, Lura Health created a biosensor technology that delivers real-time updates through a mobile app using Bluetooth. The device continuously monitors biomarkers like pH levels and transmits data to the patient and care provider's device, ensuring they can be proactive and act on any potential concerns. Lura Health has plans to expand the biomarkers tracked currently to monitor for and indicate potential conditions like periodontal disease, inflammation, diabetes, cancer, and more.

Key to the device functionality is the ability to continuously transmit data without interruption. To meet this challenge, Lura Health partnered with Resonant Link to develop a wireless power system that maximized power in a small space while ensuring convenient recharging. The wireless power system Resonant Link developed ensured Lura Health's device would remain non-invasive and convenient for patients, as it has no cumbersome wires or connectors, and is portable and easy-to-use. Because Lura Health's salivary diagnostic is worn in the mouth, they worked with Resonant

Link to develop a charging case that recharges the retainer to which the sensor is attached. The retainer simply goes in the case to recharge, like wireless earbuds.

Complementing this solution, Ilika's Stereax M300 battery, with its compact size and high energy density, became the power source for the device. This battery allows continuous monitoring of critical health markers in real-time, contributing to the comfort and efficiency of the device. Together, Resonant Link's industry-leading wireless charging and Ilika's miniature high-performance batteries opened the door to noninvasive salivary diagnostics, providing users with real-time insights into their health.

## Miniaturization of Medical Devices

The second challenge Lura Health overcame in developing their salivary diagnostic device was miniaturizing their device to be small enough to fit comfortably in a patients' mouth. Traditional medical devices are often bulky and intrusive, leading to discomfort and reluctance among patients to use them. A common challenge with designing smaller devices is getting enough power into the device to achieve the desired capabilities. As devices have gotten smarter, additional data needs have exacerbated the challenge, as more data and more frequent data and communications transfer requires more power.

To provide more power and energy storage capabilities, medical device batteries and conventional wireless power systems have been large. But Lura Health aspired to create a miniature medical device so small that it would be virtually undetectable within the oral cavity.



## High Performing Power and Energy

In response to this challenge, Lura Health collaborated with Resonant Link to develop a high performing wireless power system that uses a 3 mm diameter receiver attached to a similarly sized battery to power the implant. The charger sends 10 mW of power to the receiver, which charges the battery, giving it the power needed to run continuously throughout the day. Key to this innovation is Resonant Link's multi-layer self-resonant structure (MSRS), a first-of-its-kind coil structure that provides 5-10x higher charging performance than existing technologies and is built on common PCB or MLCC manufacturing lines. Instead of using copper litz wire, the MSRS uses a layered structure of alternating foil and thin film dielectric. This ensures the implant receives the power it needs in an ultra-low-profile design, so small it's almost unnoticeable. The result is the world's fastest, smallest, patient friendly wireless charging for medical devices.

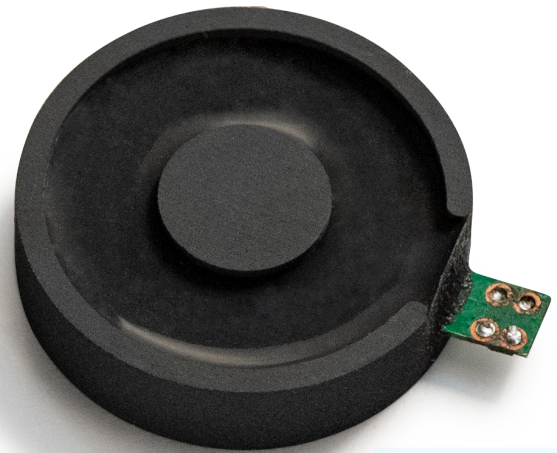
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We were the perfect use case for Resonant Link's wireless charging,” says Lura Health co-founder and CEO Daniel Weinstein. “We need power that's as small as possible, as efficient as possible, and as fast as possible, with no heat generation,” adds Weinstein. “We're thoroughly convinced that Resonant Link is the only partner who could have done what we needed.

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—DANIEL WEINSTEIN, CEO of Lura Health

In addition to eliminating the need for bulky batteries and wires, Resonant Link's unique wireless power system makes Lura Health's diagnostic device discreet and comfortable within the oral cavity, while ensuring it's easy to charge. To maximize their device's power and energy capabilities, however, Lura Health needed to leverage a complementary innovation: high-energy-density solid state battery technology.



## Solid State Batteries

Implantable medical device battery maker Ilika's Stereax M300 battery was the perfect solution. Its compact size and high energy density provided the necessary power for Lura Health's tiny sensor, allowing it to operate efficiently for extended periods and enabling continuous monitoring of critical health markers in real-time.

“ Solid state batteries are the future,” says Weinstein, “enabling smaller, safer, and smarter medical devices like our salivary diagnostic sensor.”

Stereax batteries can be configured such that they can be stacked, which makes their battery capacity adaptable to different applications. As solid-state batteries, they're smaller and safer than traditional batteries because they use solid electrolytes and electrodes instead of the liquid or polymer gel electrolytes traditionally used in lithium-ion batteries. When paired with Resonant Link's wireless charging, the Stereax M300's small form factor, long life, low leakage, and rechargeability gave Lura Health the miniature design they wanted without sacrificing the capabilities they needed, from ease of use to continuous, real-time monitoring and communications.

## A Manufacturing Partner to Help Them Grow

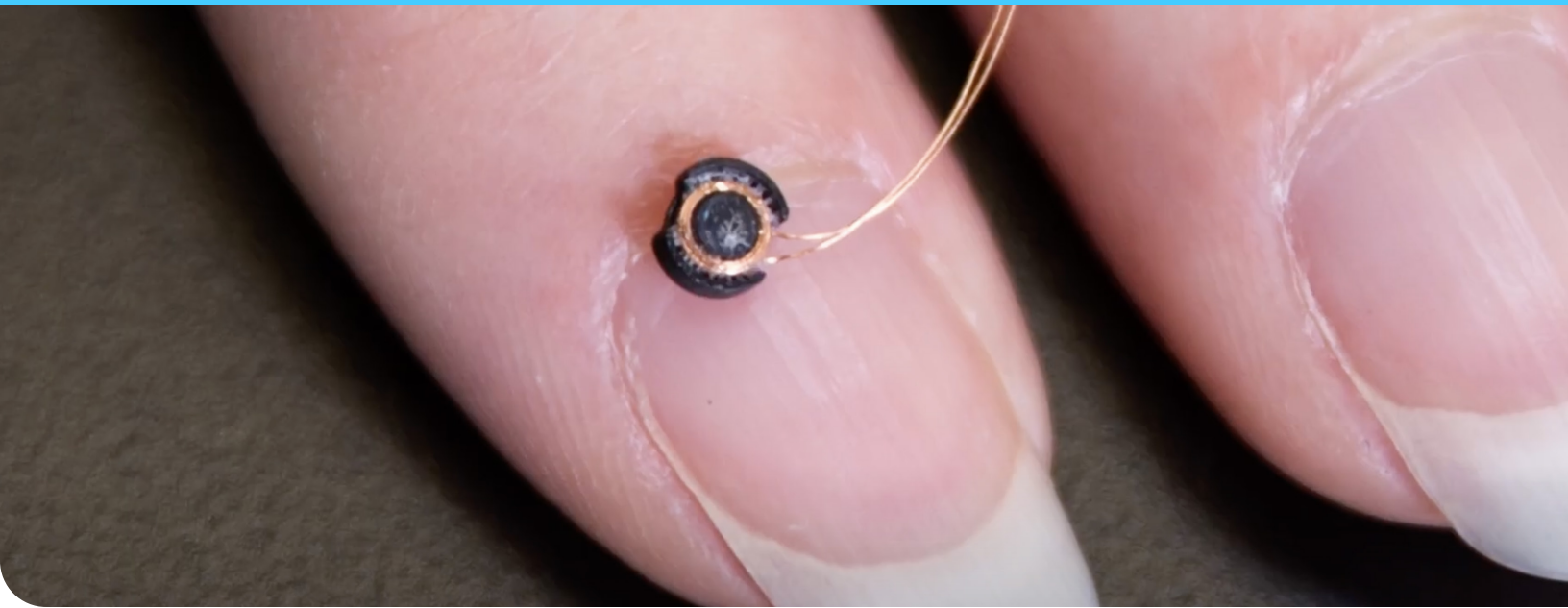
Under a licensing partnership, the tiny mm-scale Stereax batteries are manufactured by medical device design, development, and manufacturing company Cirtec Medical in Cirtec's Lowell, Massachusetts facility. However, the Lura Health team had already chosen to work with Cirtec before they announced their partnership with Ilika. They did so because of Cirtec's deep expertise in implantable medical device design, development, and manufacturing, and their ability to support Lura Health at every stage of their company.

Cirtec Medical partners with medical device companies of all sizes to help them grow. Lura Health needed a manufacturing partner they could trust to take them from the prototype phase, where they already had a device and had proven it worked, to the design for manufacturing phase where they could build high quality devices in a predictable way. Cirtec standardized both their parts and manufacturing processes so they would have a repeatable, predictable process for each device build and know exactly what to expect, from how long it would take to how much it would cost.

“Cirtec has the expertise we need to ensure the highest quality and reliability of our product,” says Weinstein. “As entrepreneurs, we need partners we can trust to pay attention to every detail, so we can focus on growing our business. Cirtec has done that for us, helping us improve our design and creating a path for us to scale production.”

Many of Cirtec Medical's customers are medical device startups who have never commercialized a medical device before, so they don't know what they don't know. Cirtec Medical has deep implantable and wearable medical device expertise that brings unique approaches to solving common challenges. For example, manufacturing processes for implantables and miniaturized devices are often manual. This is because their volumes are lower than other devices for which investing in robotic equipment makes sense, and because their small size and intricacies require doing things by hand.





Cirtec excels at taking their customers' designs and manufacturing them so there's a low level of waste. They do this by ensuring both devices and manufacturing processes are designed for repeatability. They create custom fixtures for manual, repeatable processes. They make replacement parts for parts with low tolerances or inconsistent quality, and they source new vendors for needs like ultrasonic welding and wire and die bonding to make sure all parts are manufactured at the highest level of quality. For implantable pulse generators and sensing devices like Lura Health's salivary diagnostic, this is especially important as startups often use foreign components or nonstandard parts to start due to their availability and low cost. With Cirtec Medical, device makers get a partner who not only provides high quality and low-cost manufacturing of their device, but who can quickly grow with them because of how they approach manufacturing from day one. In fact, they're positioned to go from producing 50 devices to four thousand devices a month once their customers need it. And for Lura Health, that ability to scale is essential.

## Summary

The combination of Resonant Link's wireless charging and Ilika's Stereax M300 battery empowers Lura Health's salivary diagnostic device to provide patients with noninvasive, real-time insights into their health. Users can now monitor and manage their health conveniently and painlessly, reducing the burden of traditional diagnostic methods.

By partnering with Resonant Link, Ilika, and Cirtec Medical, Lura Health leveraged advanced medical device technology and manufacturing to make their vision a reality, paving the way for more accessible and effective preventative care. Together, Resonant Link, Ilika, Cirtec Medical, and Lura Health are opening doors to new tiny medical devices that can go virtually anywhere in – or on – the body.