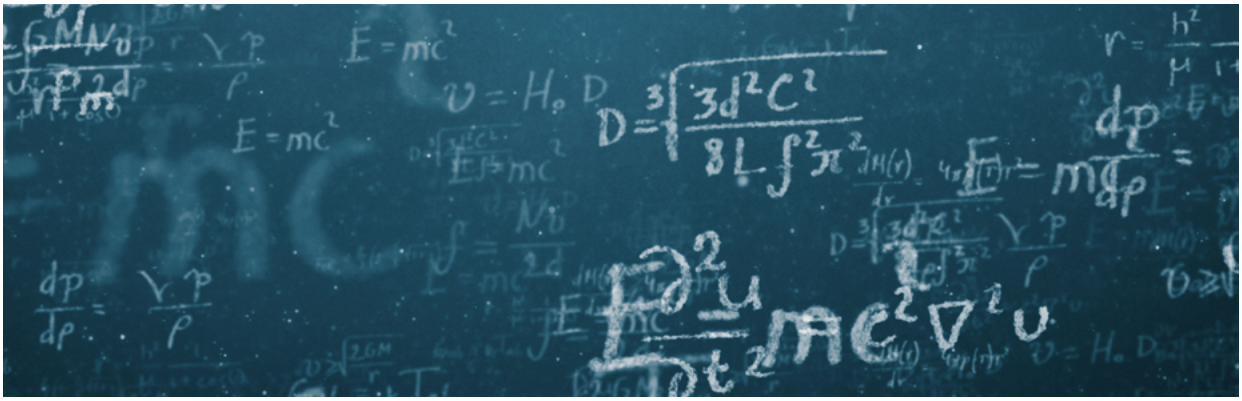
NANODIMENSION
Electrifying Additive Manufacturing®

CASE STUDY: RESEARCH INSTITUTES

CBN-IIT RAPID PROTOTYPING FOR ELECTRONICS

DragonFly LDM enables optimized embedded sensors



CLIENT PROFILE

The Center for Biomolecular Nanotechnologies (CBN) in Arnesano, Lecce, is part of the Italian Institute of Technology (IIT), a leading research institute in Italy with the mission of promoting technological development and higher education in science and technology.

Coordinated by Prof. Massimo De Vittorio, the CBN has developed a strong knowledge and expertise in the design and fabrication of electronic, photonic and MEMS transducers, in particular, through its research line, "Nanotechnologies for Humans and Biosystems."

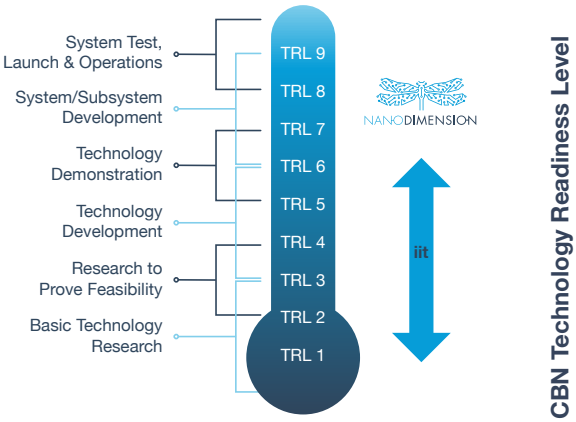
cbn.iit.it

THE CHALLENGE

CBN conducts studies in the fields of medical devices for body sensing, body control and data management. To improve their technology readiness – as measured by the TRL scale – they are constantly developing and evaluating new technologies and processes.

THE SOLUTION

CBN chose Nano Dimension and its DragonFly LDM system, which, with its many advantages, was clearly the ideal platform for their needs. The key features of the system included its combination of dielectric and conductive inks, and its process for additively manufacturing electronic components that could optimize how the MEMS transducers used by CBN were embedded in both PCBs and 3D-printed packaging.



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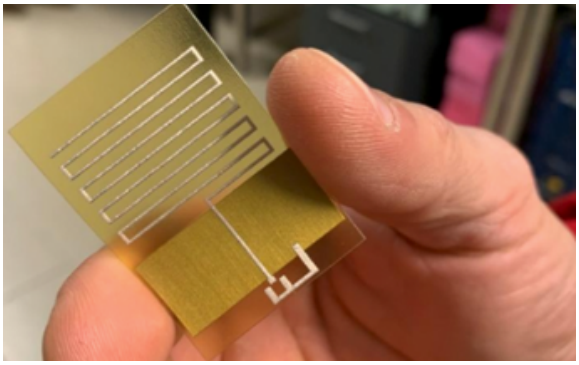
OPTICAL FIBER PACKAGING FOR BRAIN ACTIVITY READOUT AND CONTROL

The Dragonfly LDM was used in several CBN studies, each with superb results. The first was a study in which researchers used optical fibers to generate light that stimulated the brains of mice and then collected evidence of the resultant brain activity. To enable the connection of electrodes to the mice's brains, the researchers used Additively Manufactured packaging that was 3D printed using the Dragonfly LDM. This enabled a connection between the sensor, the printed base and the top package print.

EMBEDDED SENSOR IN A SEALED PACKAGE FOR FLOW SENSING WITH ARTIFICIAL HAIR CELLS

For the second study, the researchers were required to collect and correlate signals from an embedded sensor, to extract information about different velocities, linear direction and periodicity of flow fluctuation. The Dragonfly LDM again enabled the 3D printing of additively manufactured packaging, so that they could connect the sensor to the printed base and exterior printing.



PRINTED ANTENNA AT A FREQUENCY OF 800 MHZ FOR WEARABLE SENSOR THAT MONITORS VITAL PARAMETERS

The third project involved the creation of a compact, battery-less, non-invasive, wearable sensor that could monitor a human's vital signs, both biochemical and physiological, using a particular frequency that would enable the wireless protocol of choice. Researchers here chose the Meander Line Antenna (MLA) composed of two metallic layers.

> *"The suitability of the DragonFly system to rapidly and affordably manufacture functional prototypes, combined with the broad ecosystem of applications for health and energy harvesting, makes it an ideal choice for our team to achieve higher performance, quick development and print complex shapes not achievable using traditional manufacturing processes."*
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> **Prof. Massimo De Vittorio (CBN-IIT — Lecce — Italy)**