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B-CRATOS - Press release

B-CRATOS delivers two striking outcomes

After working closely together for several months, in March 2024 Uppsala University and Deutsches Primatenzentrum GmbH achieved a crucial milestone to the success of the entire project. If one imagines a scenario in which communication is interrupted due to a spinal injury, for example, how would one restore bodily functions?

Research into intra-body or body-centred communications has been carried out for decades, but fluid communication technique has never been achieved because of the many shortcomings within past technologies. Finally, B-CRATOS has been at the **heart of this innovation**: through the work of several researchers from Uppsala University, the most intuitive tissue support, **fat**, which is an electrical insulator in itself, has been used to transmit data at high speed and in large quantities! Moreover, the obtained data rate has been among the **fastest measured with intrabody communication**.

Through testing different antenna configurations and phantom lengths in a shielded environment, the study showcased the possibility of rapid and dependable communication within the body using established wireless communication norms.

Fat-IBC as a *human body-centric wireless communication link*

Fat-Intra Body Communication (Fat-IBC) is an innovative human body-centric wireless communication technology that enables devices to communicate with each other through the human subdermal fat as a medium. Fat-IBC utilizes the human fat as a communication medium, allowing devices to communicate directly through the body without the need of tethers. Designed to consume minimal power, Fat-IBC is an energy-efficient communication solution, particularly beneficial for battery-powered devices, as it helps to extend battery life. Communication through the human body provides a high level of security, making Fat-IBC suitable for applications where data security is crucial. Fat-IBC is effective for short- and long-range intra-body communication. Its potential applications include healthcare (e.g., medical implants, health monitoring devices), wearable technology (e.g., smartwatches, fitness trackers), and secure data transfer (e.g., authentication systems, secure payments).

In-vivo demonstration: real-time Fat-IBC

Recently, B-CRATOS was able to demonstrate for the first time the transmission of neuronal signals through Fat-IBC of a primate in order to operate a neuronal decoder that controls the grip aperture of a robotic hand in real-time. Previously, the animal was trained to grasp and lift various objects and it has learned to operate a brain-machine interface that could read out the animal's grasp

intentions from neuronal population activity within the brain. In the crucial experiment, the recorded signals of 25 neuronal channels were propagated through Fat-IBC to a decoding computer that extracted hand movement commands for the robotic hand. In addition, sensory signals were transmitted through Fat-IBC in the opposite direction for simultaneous sensory feedback from the robot hand to the brain. These results pave the way to further technological refinements that will ultimately enable human patients with debilitating neurological diseases to reestablish communication from the central nervous system to the periphery over larger distances wirelessly through Fat-IBC.

About B-CRATOS

B-CRATOS is an innovative and revolutionary project established as part of Horizon 2020, the European Union's five-year programme for research and innovation. B-CRATOS, which stands for Empowering independence through wireless **B**rain-**C**onnect inte**R**f**A**ce **TO** machine**S**, aims to create for the first time a battery-free high-speed wireless in-body communication platform for Brain-Machine-Body connectivity.

To achieve ambitious findings, B-CRATOS is coordinated by a diversified consortium spanning research, engineering and medicine. Among the various partners involved are Blackrock Microsystems Europe GmbH, Deutsches Primatenzentrum GmbH, Links Foundation, Norwegian University of Science and Technology, Scuola Superiore Sant'Anna, SiNANO Institute and Uppsala University.

What the members of our Advisory and Ethics Boards say

John Donoghue – Professor of Neuroscience and Professor of Engineering at Brown University and member of our Advisory Board – considers B-CRATOS as a *project* ***very ambitious*** falling impressively within brain-computer interface technologies which could ***help people restore their life***. However, it should be noted that issues such as FAT-IBC demand a major awareness of the ethical issues involved. This is the reason behind B-CRATOS' decision to set up an External Ethics Board: the project's innovation also lies in the fact that it calls for a ***shift towards a novel and more adequate ethical framework***, as explained by Nicola di Stefano – the committee's chair.

For more information

Please visit our website Modern BCI - B-Cratos