



# iBrain's Seminar

Monday, April 8<sup>th</sup> – from 11h am to noon

Faculty of Medicine - Conference room 2

## W. Apoutou N'Djin

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## Neural activities causally evoked by single-pulse focused ultrasound stimulation

Low-energy focused ultrasound (FUS) is a promising alternative to existing neurostimulation strategies, and has already given rise to proof-of-concept clinical studies. However, exploring the fundamental biophysical mechanisms involved remains a hot topic. In particular, the type, dynamics and success of the onset of basic neural responses remain to be described in order to better control the therapeutic effects of FUS on highly integrated brain functions. In recent years, our group has conducted preclinical studies exploring the immediate and causal stimulation effects of FUS, down to single FUS pulses. Here, we will describe several hybrid platforms combining FUS technologies with electrophysiology techniques, and discuss our observations of FUS-evoked electrophysiological responses (nature, dynamics, success rate) on several neuronal models: *in-vivo* giant axons (earthworm), *in-vitro* cellular networks (human) and *ex-vivo* brain circuits (mouse). We will present conditions in which action potentials (APs), local field potentials (LFPs) or calcium (Ca<sup>2+</sup>) fluxes were causally, selectively and transiently evoked by single FUS pulses lasting a few hundred microseconds. Finally, the predominant role of the Acoustic Radiation Force (ARF) in the neurostimulation success rate and the involvement of intra- and extra-cellular pathways will be discussed. Overall, multi-scale and multi-model studies are crucial to improve our knowledge and control of FUS neurostimulation strategies, in order to consolidate their transfer to clinical applications. Supports: French Research Agency, Focused Ultrasound Foundation, French LabEx DevWeCan and Cortex.

### Contact

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