

# MIND-READING - EARLY EXPERIENCE OF APPLYING LOCAL FIELD POTENTIALS (LFP) FROM SUBTHALAMIC NUCLEI (STN) IN DEEP BRAIN STIMULATION (DBS)

THE HONG KONG NEUROSURGICAL SOCIETY ASM 2022

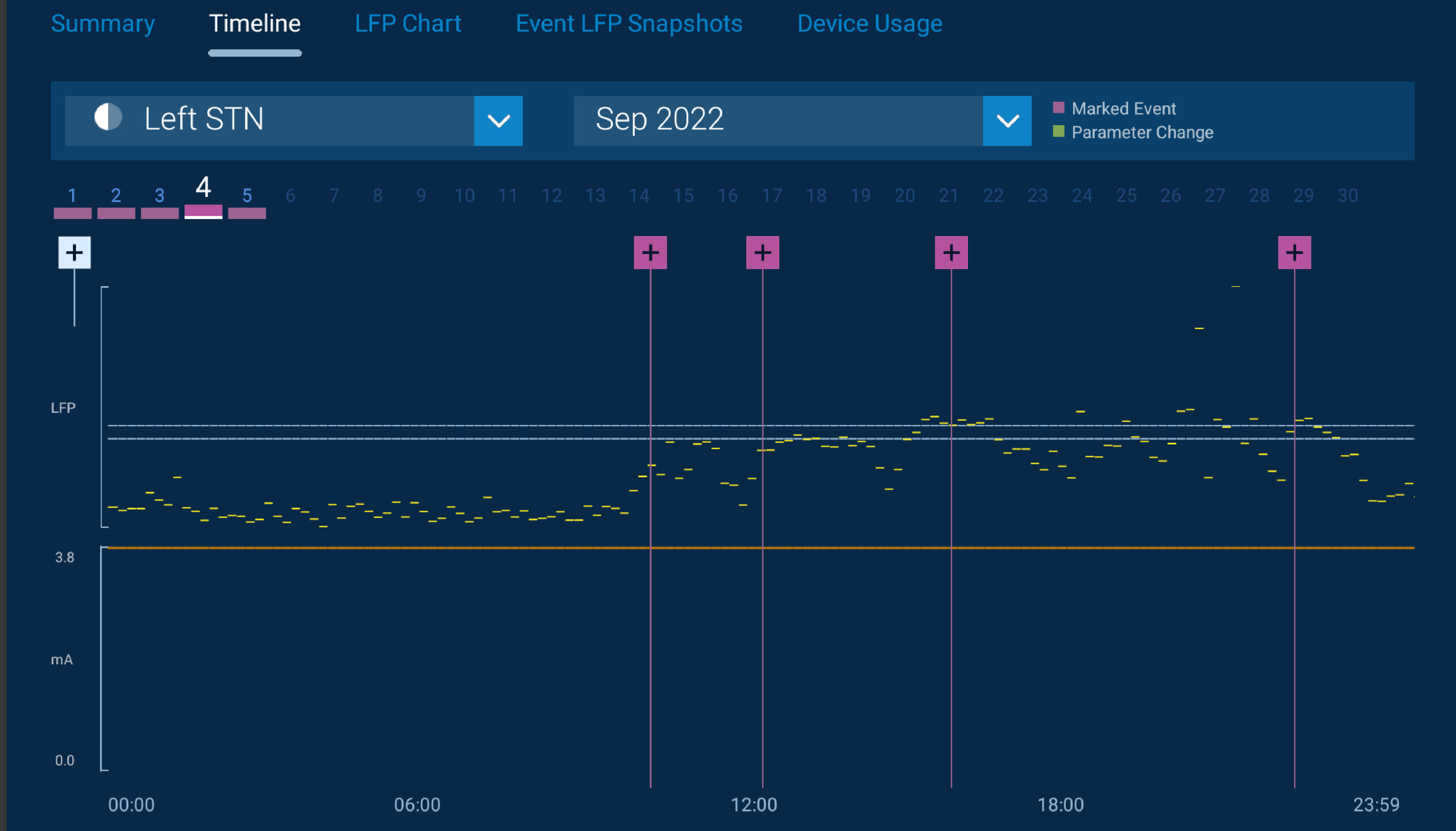
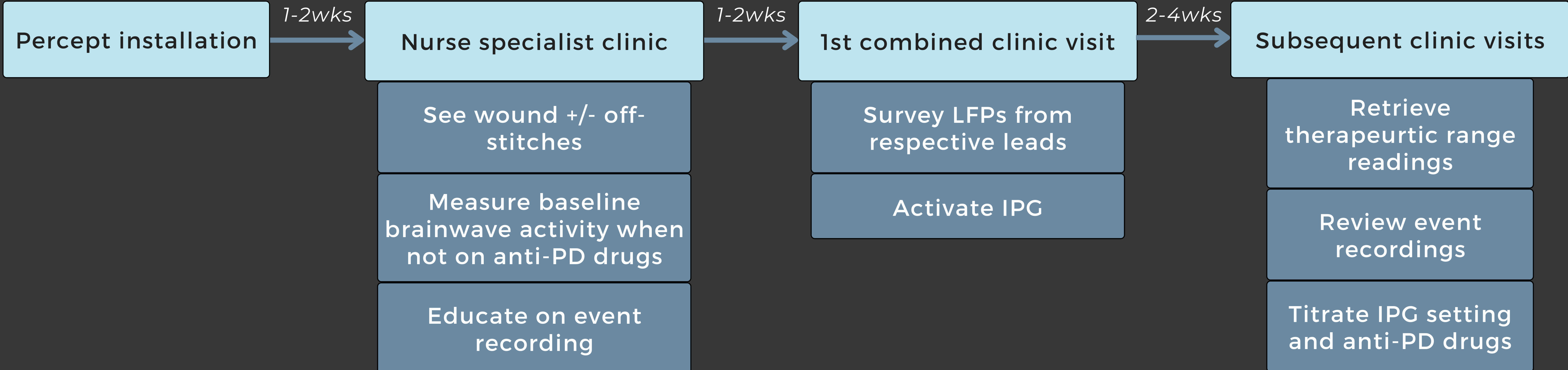
William XUE <sup>1</sup>, Ka Wing SEE <sup>1</sup>, Tak Lap POON <sup>1</sup>  
<sup>1</sup>.Department of Neurosurgery, Queen Elizabeth Hospital, Hong Kong

## INTRODUCTION

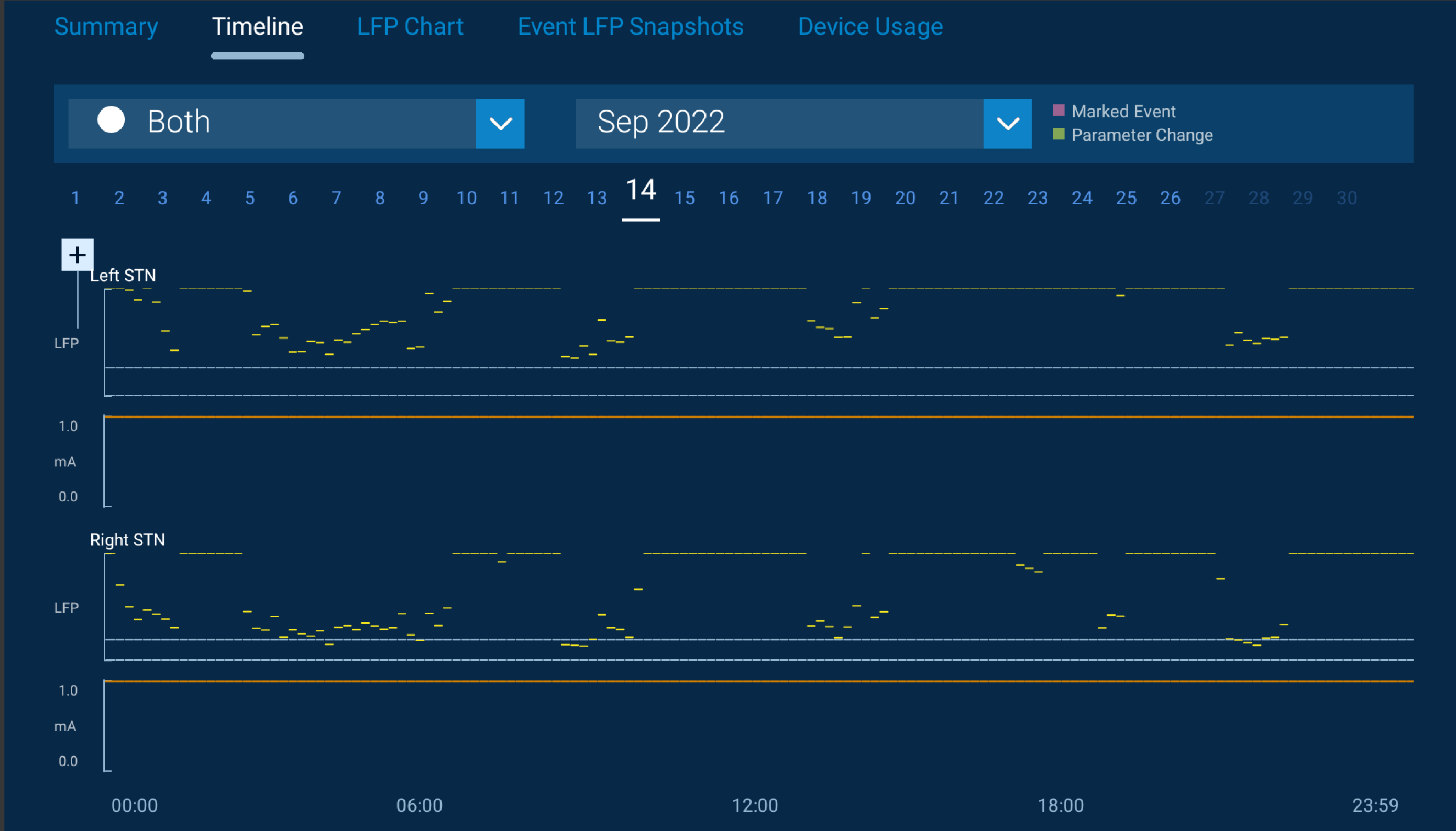
Deep Brain Stimulation (DBS) to subthalamic nuclei (STN) is a well-established treatment for idiopathic Parkinson’s disease with motor complications. Local field potentials (LFPs) detected from STN are proposed to correlate with clinical phenomena, such as beta oscillations with Parkinsonism (Kühn et al, 2004) and gamma oscillations with dyskinesia (Swann et al, 2016). Here we describe our early local experience in implementing brainsensing in clinical practice

## METHODOLOGY

This is a case series of 3 patients with the Medtronic Percept implantable pulse generator (IPG) installed since May 2022. Patients and their carer were educated on recording sentinel Parkinsonism events - fall, tremor, involuntary movement, and medication. Their STN beta (13-35Hz) and gamma (60-90Hz) wave oscillations were reviewed and correlated to their recorded events at our joint neuromodulation clinic with Neurologists. Anti-Parkinsonism medications and IPG settings were titrated according to LFPs.



Understimulation

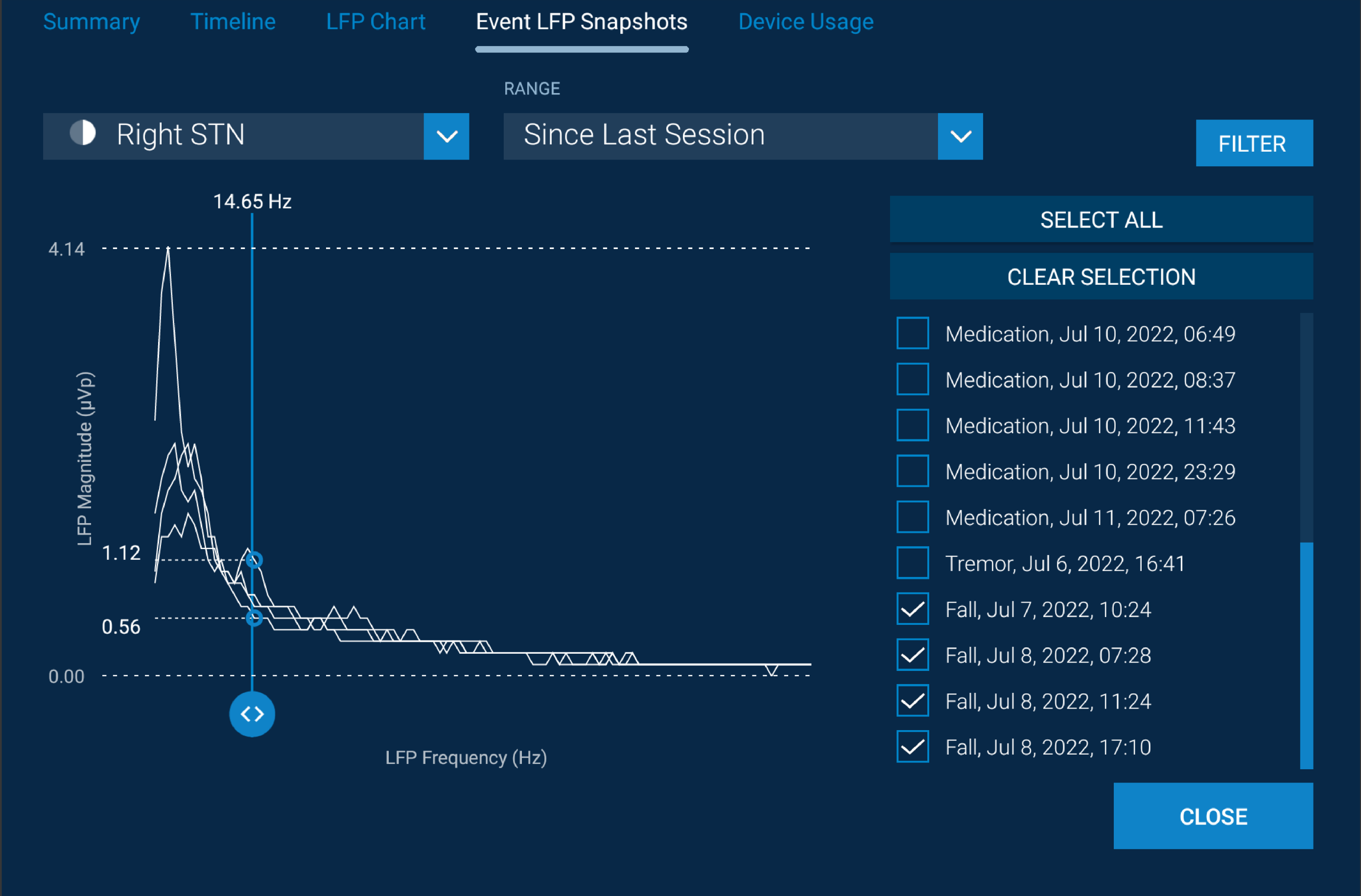


Overstimulation

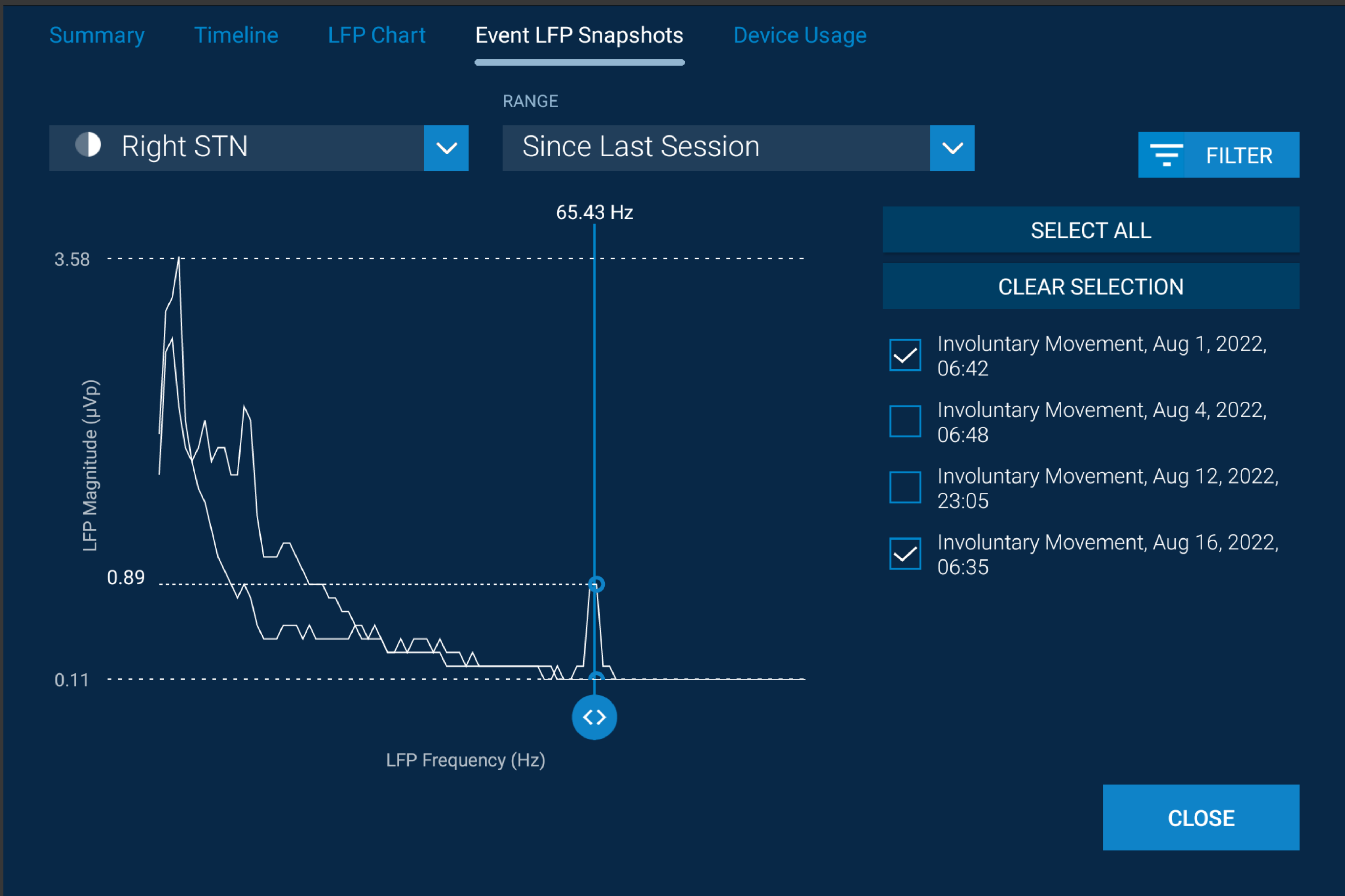
Raise IPG current / anti-PD drug for better therapeutic control

Drop IPG current / anti-PD drug to reduce dyskinesia

Beta oscillations



Gamma oscillations



## RESULTS AND DISCUSSION

Most commonly recorded events by patients and their family were (near-)falls. Patients volunteered subjective improvement after each titration but there was no significant reduction in number of recorded fall events. Capturing LFPs could provide a promising gateway to further our understanding in how DBS works. It also potentially helps the titration of medical and stimulation treatment. Further research is needed to correlate LFPs to clinical events, and ultimately guiding the development of close-loop DBS.

## REFERENCES

Kühn, A. A., Williams, D., Kupsch, A., Limousin, P., Hariz, M., Schneider, G. H., Yarrow, K., & Brown, P. (2004). Event-related beta desynchronization in human subthalamic nucleus correlates with motor performance. *Brain*, 127(4), 735–746. <https://doi.org/10.1093/brain/awh106>

Swann, N. C., de Hemptinne, C., Micišinović, S., Qasim, S., Wang, S. S., Ziman, N., Ostrem, J. L., San Luciano, M., Galifianakis, N. B., & Starr, P. A. (2016). Gamma oscillations in the hyperkinetic state detected with chronic human brain recordings in parkinson's disease. *The Journal of Neuroscience*, 36(24), 6445–6458. <https://doi.org/10.1523/JNEUROSCI.1128-16.2016>