



**HAL**  
open science

## Should frequency band selection algorithms include neurophysiological constraints?

Maria Sayu Yamamoto, Camille Benaroch, Aline Roc, Thibaut Monseigne, Fabien Lotte

### ► To cite this version:

Maria Sayu Yamamoto, Camille Benaroch, Aline Roc, Thibaut Monseigne, Fabien Lotte. Should frequency band selection algorithms include neurophysiological constraints?. Journées CORTICO 2021 - Collectif pour la Recherche Transdisciplinaire sur les Interfaces Cerveau-Ordinateur, May 2021, Online, France. hal-03290293

**HAL Id: hal-03290293**

**<https://inria.hal.science/hal-03290293>**

Submitted on 19 Jul 2021

**HAL** is a multi-disciplinary open access archive for the deposit and dissemination of scientific research documents, whether they are published or not. The documents may come from teaching and research institutions in France or abroad, or from public or private research centers.

L'archive ouverte pluridisciplinaire **HAL**, est destinée au dépôt et à la diffusion de documents scientifiques de niveau recherche, publiés ou non, émanant des établissements d'enseignement et de recherche français ou étrangers, des laboratoires publics ou privés.

# Should frequency band selection algorithms include neurophysiological constraints?

**Maria Sayu Yamamoto<sup>1,3,\*</sup>, Camille Benaroch<sup>1,2</sup>, Aline Roc<sup>1,2</sup>, Thibaut Monseigne<sup>1</sup>, Fabien Lotte<sup>1,2</sup>**

<sup>1</sup>Inria Bordeaux Sud-Ouest, Talence, France; <sup>2</sup>LaBRI (CNRS / Univ. Bordeaux / Bordeaux INP), Talence, France;

<sup>3</sup>Tokyo University of Agriculture and Technology, Tokyo, Japan

\*200 avenue de la Vieille Tour, 33405 Talence cedex, France. E-mail: yamamoto18@sip.tuat.ac.jp

*Introduction:* In order to build a reliable BCI, it is useful to calibrate the BCI system considering the characteristics of each user's ElectroEncephaloGraphy (EEG) [1]. A concrete approach is to select user-specific frequency bands based on data. Our previous work suggested a correlation between online BCI performances and the selected user-specific frequency bands [2]. In particular, users with the highest performance were the ones for whom the selected frequency bands' width was larger than 3.5Hz, and selected frequency band mean belonged to  $\alpha$ -low $\beta$  (5-16 Hz). However, it did not reveal whether the selected user-specific frequency band in  $\alpha$ -low $\beta$  causes higher performance or if users with higher performance have their user-specific frequency bands in  $\alpha$ -low $\beta$  range. In this study, we developed a frequency band selection algorithm to select user-specific frequency bands only from  $\alpha$ -low $\beta$  range and investigated how the online BCI performance change [3].

*Methods and Results:* We conducted a Motor Imagery (MI) BCI experiment with the same protocol as our previous work [4] with 12 healthy users who performed left or right hand MI. Their user-specific frequency bands were selected restrictively between 5-20 Hz and the minimum width was set as 3.5Hz. Then the average online BCI accuracies were compared with control users who have selected user-specific frequency band between 8-30Hz and without restriction for width from our previous study in [4]. The comparison results showed no significant difference ( $p=0.26$ ) in online BCI performance. We will still continue this investigation with several users but this current result may suggest the users with higher performance can modulate their  $\alpha$ -low $\beta$  range activity well and their user-specific frequency bands belong to  $\alpha$ -low $\beta$  range as a result.

## References

[1] Benaroch C & al., 2019(submitted)

[2] Blankertz, B & al., 2007.

[3] Benaroch C & al., 2020(submitted)

[4] Roc, A & al., 2019